Supplementary Materials for

New pixel-level low-cost Polar Star tracking technique and device for the instantaneous evaluation of atmospheric turbulence (seeing)

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Data S1 to S7 (actual data)

Supplementary Text

Potential astronomical sites in less developed countries (as regards seeing)

In here we give the detailed description of site characteristics, as analysed from Figure 3 of *(2)*, dark green colour, for regions i, iii, v, vi, vii, viii, x, and xi. For each country we show its 2021 UN Human Development Index (HDI; *(21)*):

i) *Northern Andean Region.* In **Venezuela** (HDI=0.69), the best area is close to Merida, either north (Parque Nacional Sierra La Culata) or east (Parque Nacional Sierra Nevada). In the first site, coming from the sea (about 40-50 km away, at the sea-connected lake of Maracaibo), there is a succession of peaks that keep rising all the way until the culmination above 4000 m. The seeing is likely to be only adequate at this height (too high…), away from the turbulence induced by any high peak. The second site is actually the same idea but in reverse (from above 4000 m and going down) but, further inland from the sea and with a massive 4000 m set of peaks in between, the seeing is likely to be much worse there. For northernmost **Colombia** (HDI=0.75), there is a rather more interesting site, close to the sea (35km away), the Parque Nacional Sierra Nevada de Santa Marta; the situation is the same, though, with peaks steadily rising until above 4000 m and, probably, only there might the seeing be any good. There is another region of interest in Colombia, with three Parques in a row (Hermosas; Nevado del Huila; Puracé); the other possible region is further inland, with likely much worse seeing. Still, even the Hermosas-Huila-Puracé region is quite away from the ocean (100km) and the same situation of a rising set of peaks until 4000-5000 m high; worse: this time, towards the ocean, there is a somewhat lower set of peaks (3000 m high) that might compromise the seeing quality of the site.

iii) Taliouine to Tata is a desert area in **Morocco** (HDI=0.68), quite far from the ocean (150 km). There are some peaks, reaching almost 2 km in height, but the dominant Atlas in the north (over 4 km-high) and a few 2 km-high peaks on the way to the ocean (west), make the area likely seeing-poor.

v) *Ring of Ethiopian highlands facing Djibouti.* At a large distance from the sea (300-500 km), the north-south mountainous barrier that corresponds to the left of the **Ethiopian** (HDI=0.49) "ring" is 2-3 km high but has similar height mountains in a great expanse to its west. As regards the bottom of the "ring", in the Deder to Ghelemso area, this is somewhat more interesting, albeit lower (2 km). And its west side (from north to south) it's bound to be turbulence-affected by the above-mentioned mountains and also by the Bale Mountains (southwest).

vi) *South Namibia.* There is some interest in the mountainous "spine" of south **Namibia** (HDI=0.62), from its centre to the border with South Africa. The northern portion of it (Gamsberg) has been well studied as regards seeing and found as a good site *(46)*. However, the southern portion is still unexplored. Closer to the ocean than Gamsberg (100 km), the Transfrontier Park is worth exploring, especially at its highest peak area (1600 m). There are two potential problems: the relatively low-height and the fact that the peak area is actually surrounded by many similarly high peaks (1200-1400 m), within a few km. The

South Africa side is actually not a problem since all peaks are below 1 km and far enough away.

vii) The mountains in the NE of **Lesotho** (HDI=0.51) have some potential, due to their height (3 km), but this is hindered by not having some highest peak clearly standing above all others. It is a vast expanse of similarly high peaks, 150-200 km away from the ocean (which does not help, either).

viii) *Highlands NW of Medina.* This 600 km-long mountain range in **Saudi Arabia** (HDI=0.88) is only 50-75 km from the sea all the way. The most promising area are the mountains between Shigry and Al Muwaileh, north of the 1600 m-high Jebel Shar: several isolated 2000 m-high peaks deserve inspection. They are surrounded by lower peaks (<1.5 km) and then the even lower desert. The nearest similar height mountains (Jebel al Lawz) are 100 km north. And these are not as good because of many similarly high peaks that extend almost all the way to/from the ocean.

x) *Highlands in south Iran.* There are two areas that stand out in this region of **Iran** (HDI=0.77) as the best in this extense region: in the east, between Kerman and Bam, the Kuh-e Jupar mountainous massif. There a few dominant 4 km-high peaks worth exploring. One disadvantage, besides the height (as regards human comfort), is the distance to the sea: ~300 km. The similarly high peak 20 km towards northeast (Kuh-e Palvar) is not so good, since it has quite an expanse of 3-4 km-high peaks towards north of it. The other area of interest in south Iran is the Dena Protected Area. But the problem, besides its height (4 km) and being quite far from the sea (almost 200 km), are the 3 km-high mountains between it and the sea. Curiously, a recent survey for sites in Iran *(47)* did not considered any of the regions here mentioned.

xi) Near Quetta, in **Pakistan** (HDI=0.54), there is a ridge north of Perai, 3 km-high, that might be worth exploring. The 40 km away, similar altitude Loe Nekan is not as isolated, especially towards Quetta (on its west side). The ocean being 600 km away is the only handicap for the site.

Seeing at 0.5 m is worse than higher from the ground

In Table S16(A), we reproduce the values that *(35)* show in their Figure 5 (from Paranal, 2635 m high), with cumulative seeing as a function of height (all values except the ones in italic). What they call "ground level" is not good enough for us, since it is a layer from 0 to 50 m from the ground. Thus, we fitted eight of their points (140 m high and higher) with a double exponential (Figure S17; R^2=0.998, adjusted). A triple exponential gives exactly the same results. We used their 50 m point to test our model and, for a 0.74´´ seeing, we get 37 m in height (26% error), which gives us confidence to obtain the extrapolation results shown in Table S16(A) for 6 m (DIMM height), 2.5 m (Walker's Method (WM) height), and 0.5 m (our telescope tube height). Our results, thus, if using our technique at Paranal, would be 30% worse than *(35)* DIMM results. Compared to WM, we expect 19% worse results at Paranal.

In Table S16(B), we reproduce the values of median seeing at Ellesmere Island, Canada (610 m high) from Table 2 of *(45)*. We fitted six of their points with an exponential function (Figure

S18; R^2=0.992, adjusted). As for *(35)*, we used their 7 m point to test our model and, for a 0.716′′ seeing, we get 11 m in height (36% error), which gives us confidence to extrapolate the results of Table S16(B). In conclusion, if using our technique at Ellesmere Island, we would get a seeing result 78% times worse than a 6 m DIMM and 39% worse than WM.

(36) conducted a similar study at the Maidanak Observatory site in Uzbekistan (2600 m high) but, this time, it was the lowest ground layer the one of concern: 2 m and 3 m high (cf. DIMM at 6 m). In conclusion, *(36)* found 18% and 15% degradations, respectively. Assuming linearity, WM (2.5 m) degradation is in between (16.5%) while our own (0.5 m) is 22.5% worse (our results are 6% worse than Walker's). An earlier study at Maidanak *(30)* found a 20% contribution to seeing between 1.9 m and 3.4 m and a 10% contribution on 3.4-6 m. Since our height (0.5 m) is further down, we estimate a >30% worse seeing compared to the DIMM value there, while WM would be >10% worse than the latter (our method is >20% worse than Walker's).

Madeira results compared with La Palma

Something to note from the logs is that our random pick found it hard to get seeing measurements in a night. Indeed, although not always due to poor weather, out of the 23 nights (that gave our 50 points), 11 (48%) had no *seeing* data at La Palma. Furthermore, some gave us a hard time: in two situations only the 3rd night searched had information, in one situation only the 5th night, and the record holder, at the 10th night, in January 2009, when many days of bad weather caused trouble at La Palma.

Full description of purchased or extant materials at the University of Madeira

Our equipment was:

- Newtonian reflector telescope Mizar Tal-1 with a diameter of 11.0 cm and focal length 80.6 cm.
- Kendrick collimation eyepiece.
- Standard 25 mm eyepiece.
- (extra) Barlow 3× (OPT ED), making the telescope an f/22 optical system.
- CCD SBIG ST-7XE, non-antiblooming model, saturation at 85000-240000 e^-/pixel, depending on horizontal/vertical lines and temperature of operation: sensitivity 2.3e^- (15e^- rms), full well capacity ~10×10^4 e^- (~40000 analogue-to-digital units: ADU), 9 μm pixel matrix 765×510 (w×h), minimum exposure time 0.12 seconds, electromechanical shutter, maximum cool down 33 ± 3° C below environment (as measured by us), with a closed-loop single-stage thermoelectric cooler *(39,48)*; CCD chip: enhanced Kodak KAF0401E *(49)*; matched Johnson B filter quantum efficiency on 24-47% (30% at 400nm; *(48)*); dynamic range 70-74 dB; noise floor 15-20 electrons.
- Default SBIG CCDOps data acquisition and processing software.
- Johnson B filter (by Schuler Imaging).
- (extra) SBIG CCD power supply (12 V).
- (extra) Motorbike battery MiGM, model YTX20L-BS, 12V/18Ah (6 kg); later changed to 12V/20Ah (7 kg).

- Compass.
- Portable PC (Toshiba Satellite 2610): 433 MHz Celeron, 128 Mb extended RAM, 6 Gb hard drive.
- (extra) Two PC replacement batteries.
- (extra) Thermo-hygrometer CENTER 315 ([−20° to 60° C] range with 0.8° C error; [0–100]% range with 3% absolute error), with spare 9 V battery.
- (extra) Anemometer SKYWATCH Xplorer 1 ([0–42] m/s range with 3% error).
- Torches and spare rechargeable batteries (+ battery charger).
- (extra) About 100 circular reflectors (5 cm in diameter).
- (extra) 12 V portable hair dryer.
- Two meter-long wood planks.
- Bag with sand.
- Handheld shovel.

A purpose-built base, rucksack and the items taken on field trips

We have built a special 354-litre rucksack with l×w×h dimensions 1.23×0.40×0.72 m^3 from waterproof fabric. It was sewn with nylon wire into the front part of a commercial 75-litre rucksack so that its straps could be used. Being more a bag than a sack, it is actually closed with a rope (with knots). It also includes two security straps to hold everything steady inside (Figure S13).

The materials were distributed into two large rucksacks, the 354-litre custom-made one carried by IA (#1; Figure S13) and a 90-litre commercially-available one carried by PA (#2). Their contents were, by rucksack number:

1) M.BASE.MATE (12 kg) and a small 10-litre commercial rucksack (#3) containing: two torches, six batteries, Swiss army knife, eyepiece box, Barlow 3×, Johnson filter B, universal clamp, CCD, USB cable, portable PC (3 kg) with battery, two extra PC batteries, screwdriver, 12V small hair dryer (for condensation removal), reflectors (for replacement on the B1-B2 path), anemometer, thermo-hygrometer, 9V spare battery, and compass. The small rucksack was firmly attached (using its straps) to M.BASE.MATE.

2) Telescope (4 kg), two long wood planks (2 kg), a bag with sand (5 kg), a handheld shovel (for leveling M.BASE.MATE on the ground), tent nails, hammer, 12 V CCD power supply, 12 V/18 Ah (later 20 Ah) battery (6 kg, alter 7 kg), emergency plastic cover, protection towel, string, adhesive tape, pliers, three pens, two spare torches, eight batteries, Swiss army knife.

Obviously, quite a few more items were also taken with us, related with personal comfort such as warm clothes, good walking boots, rainwear waterproofs, water, food, and mobile phones. In addition, for emergency purposes, our vehicle always carried two large blankets, a first aid box, an extra sand bag, a 5-litre water bottle, tissues, etc. Hot drinks were also available (two thermos bottles).

Technical problems

CCD diaphragm blockage. This was the most common problem and it happened on five nights (28th-29th March, 23rd-24th April, 25th-26th July, 6th-7th August 2008, and 20th-21st February 2009). It seemed to be related with temperature/humidity conditions (it was not mechanical), since going back to the lab would bring it back to normal again (when tested: after a couple of days). On the 23rd of April we actually managed to overcome the problem in the field after some direct handling of the diaphragm (the CCD was opened) but this only worked for two of the five sites in the observing plan of that night. And the same tactic failed for all other four nights.

Portable PC battery exhausted. Right on the first observing trip (1st February 2008) the portable PC run out of power so fast that we were not even able to do seeing measurements at the first site of the observing plan! The field behavior of our PC+battery set was surprisingly much worse than in lab simulations. The solution was to order two new batteries for back up and, in the meantime, since these took two months to arrive, we borrowed another PC, bringing along two extra batteries as well. This temporary solution also failed due to our 'success' on the 7th-8th March 2008, when we had our first all-site seeing measurement observing run: it failed at the fifth and last site.

Software problems: CCDOps. The CCD control software (CCDOps) failed to operate normally on 12th-13th June 2008 (for no apparent reason). Unfortunately this happened rather early on what would be another five-site seeing measuring night and only the first site had seeing measurements made. The solution was to upgrade the software to a more recent version (lab tests confirmed it to be working fine). However, this was not to last too long since, right the following week (18th-19th June), on another five-site seeing measurement night, the software failed again, also with no apparent reason: both versions were tried in the field but failed. A couple of days later both were tested in the lab and both worked... never to fail again!

Condensation in the primary mirror. It took us two-and-a-half months to get the first condensation problem in our telescope (18th-19th April 2008; only one site was affected). From the following trip we always carried with us a 12V portable hair drier... and any condensation that arose (only a couple of times more) was swiflty removed.

12 V/18 Ah motorbike battery run out of power. On the 27th-28th June our first battery got exhausted pretty quickly (on the second site) so, for later trips, we had to replace it with a more powerful (20Ah) and 1 kg heavier one... At least the latter never failed us until the end of the project.

USB cable failed. On the 22nd-23rd September 2008 the PC to CCD connection failed. We replaced the cable by a new one (problem solved).

Sequence of tasks in an observing session

In what follows we list all tasks related to the actual observing session at each site. We divide these into three parts, totaling about one hour: set-up (25–30 minutes), 5-min exposure (15 minutes), and dismounting (15 minutes). We do not list the (un)packing of all materials and equipment from the sacks. We indicate which one of us would perform each task (PA or IA) –

many would be simultaneous.

So, starting with the set-up:

IA Switch-on the portable PC.

IA Place M.BASE.MATE on the ground roughly aligned with the direction of Polaris.

PA Place the 12V battery and power supply cable close to M.BASE.MATE.

IA Connect the CCD to the 12V battery through the power supply and to the portable PC via the USB cable.

PA Place the telescope in M.BASE.MATE and use the universal clamp to firmly secure it to the base.

PA Point the telescope roughly towards north with the help of a compass. Level M.BASE.MATE by placing the wood planks underneath it and filling the ground-wood connection with sand, as much as possible. The bubble level was used to confirm the leveling in two orthogonal directions.

IA On the portable PC, open the software CCDOps and switch on the cooling of the CCD.

IA If the Sun did not set too long ago, place the CCD into the telescope and make flat exposures (using the mounted telescope pointing towards east). In this case, when first stars appear, redo from two steps above.

PA Place the 25 mm eyepiece into the telescope.

PA By rotating its end screws (Figure S12), elevate M.BASE.MATE until Polaris appears centered through the telescope finder.

IA Make measurements of the air temperature, relative air humidity, and wind speed at ground level and 2 m-high. Make a note of the soil and cloud cover and of any precipitation.

PA Attach M.BASE.MATE to the ground by hammering down the tent nails through its 12 holes (Figures 1 and 2).

PA Recenter Polaris on the telescope finder. By very slightly moving the end screws off the base, center Polaris as viewed through the 25 mm eyepiece.

PA Remove the eyepiece from the telescope and replace it with the CCD + B filter + Barlow 3× set.

IA With the software CCOPS choose the AutoFocus mode for the CCD and keep a look on the Polaris focus...

PA ... while slowly moving the telescope focus knobs in one or other direction...

IA ... until the best possible focus is reached (e.g. *(19)*).

Now, the tasks related to the 5-minute exposure:

IA With the software CCOPS make a 5-minute exposure of Polaris (after giving a 40-second delay so that we could be well away from the set-up, in order not to induce vibrations into the system). Meanwhile...

IA ... again, make measurements of the air temperature, relative air humidity, and wind speed at ground level and 2 m-high. Make a note of the soil and cloud cover and of any precipitation. Typically, this second round took place half-an-hour after the first.

IA,PA Check that the raw 5-minute exposure of Polaris looks fine (no major problems – this includes, ideally, initial data reduction to get a seeing value). Otherwise, repeat it.

Finally, the tasks related to dismounting:

IA On the software CCDOps, switch-off the cooling of the CCD, after the completion of which the software is shut down, as well as the portable PC.

PA Remove the CCD from the telescope.

PA Remove the telescope from M.BASE.MATE and place this in its minimum-height position with the help of its end screws. Lock it in this position (Figure S12).

IA Disconnect the portable PC from the CCD and the latter from the power supply and from the battery.

PA Collect, with the shovel, as much sand as possible into the bag, for reuse and also for minimum impact at each site.

Data reduction and analysis (consistency checks)

A. Deciding on the best Master Flat

Since the flats were only collected in summer (Table S11) and we have a full year of data, the first question that arises is how to use them. We could, for example, use a proximity criterion. However, this would mean that many months of data (before 4th July 2008 and after 6th August 2008) would use the same Master Flat. On the other hand, within one month, there would be five different Master Flats available. Thus, we first decided to compare the five Master Flats in order to find out if it would really be relevant to use different ones (Table S17). The main result is that all means are within 3% of the overall mean and, at most, 6% away from each other (column 10). Peak (Column 8) and median (Column 11) values are similarly close while minimum comparisons to the mean (Column 9) give values on the 0-12% range (and 19% maximum difference between pairs). Finally, standard deviation (Column 12) is on the 1-15% (and 22% maximum difference between pairs). The mean/median ratios (Column 13) only deviate <1% from unity, which suggests a symmetrical distribution of the values around the central one.

All in all, it seems reasonable to conclude, within the 6% maximum error between the means, that any of the five master flats created can be used to calibrate all data collected in the range 4th July 2008 to 6th August 2008. Since there are no master flats available outside this range, we can only guess what the performance of those would be in the beginning or end of the data collection (1st February 2008 to 5th March 2009). However, the performance during the full month as presented in Table S17, where no apparent deterioration is seen, helps us to assume that any other master flat collected in the full 13-month period would give similar results, say, within a 10% error. Furthermore, the conclusions from this paper do not depend on the actual ADU values of the pixels but, rather, on the **location** of pixels at the full-width-at-half-maximum (FWHM) – Section Results – which would only be marginally affected by any future deterioration of the CCD. We, thus, decided to use the same master flat (and only **one**) for the full dataset (Column 9 of Table S12): we picked the 6th August 2008 one for two reasons: i) for being closer, on average, than any other, to most data points (about six months and seven months away from each end); ii) for having the 2nd largest number of flats on its built (72 – see Table S11); iii) comparing the results from using the 31st July master flat (the one with more flats: 77) with the 6th August one in one actual dataset (Pico Ruivo de Santana – 050708_B3) showed no relevant difference (see next).

B. Master Flat comparison on the dataset 050708_B3

Indeed, in order to confirm that the 6th August 2008 Master Flat is as suitable as the 31st July 2008 one for processing the full dataset, we tested them comparatively using the data point 050708_B3 and the "RMS" data reduction method. We here summarise the results of the 31st July 2008 Master Flat (compared with the 6th August 2008, between brackets – see Table S15): i) 1-pixel peak at 34797 ADU (3% above); ii) main + two lobes (rather than one); iii) different c+f = h vectors definition with vector_h having 5+7+25 (total of 37, 30% less); iv) **same seeing result for both parabola and circle fits**; v) ten times smaller peak-to-1st point fluctuation, same peak-to-last point fluctuation and longitudinal seeing; vi) 4-pixel peak at 34068 ADU, minimum at 11560 (2% and 4% above, respectively); same percentual difference between the two.

As for the full comments (see column 9 of Table S15 for the 6th August 2008 comments) the version for 31st July is: "Main: vectors c and f had to be truncated at 4 and one point, respectively, for cycling (h with 5 points). Near-right Lobe (x>340): vector_c stopped alone at 2 points but vector_f has to be stopped for cycling with c at 5 points (vector_h here with 7 points). Far-right Lobe (x>355): both vectors c and f stopped alone at 5 and 21 points, respectively, but last point of c was removed for a 50% drop. Thus, vector_h has 25 points here. So, the overall vector_h contains 37 points (5+7+25 points), separated by about 1 and 5 points in distance, respectively." Compared with the 6th August comments (which are between brackets), we sum up: i) c+f=h; 4+1=5 (10+1=11); ii) lobes at x>340 (h=2+5) and x>355 (h=4+21) cf. (one lobe at x>325, h=c=42).

C. Final evidence on good Master Flat decision

IA actually used all nine Master Flats, according to which one was closest in time to the data point in question (including the five main ones of Table S11; see Column 8 of Table S12). From the calibrated data comparison of Table S18, the first obvious result is in the differences (maximum, mean, and S.D.), where, of course, using the same Master Flat (last six lines)

produced almost the same results, with very low values of maximum difference pixel-to-pixel and (near) zero median, mean, and S.D. In this regard, the 230908_C1 result stands out (even in the individual median differences; Column 9): it is actually due to a single hot pixel that did not get cleaned away on the PL data but did so in IA (a few other hot pixels still hang around in both data). Overall, on the Master Flat analysis, it is quite relevant that the median difference (Column 14) is typically zero and, when not zero, it lies just a few units above it. The relevant mean (Column 15), which will normalize each flat, shows larger differences but of only a few units, typically (with one exception: 050708_B3, which was, by far, the exposure made closest to sunrise of all; a quite bright sky was increasing the pixel ADUs everywhere). As conclusion: any Master Flat could have been used, since the results of our study would hardly change.

D. Direct comparison of two ways to produce calibrated data

In Table S18 we present the results of the full calibrated data comparison (IA vs PL), both between each Polaris five-minute calibrated exposure, labeled "individual" (Columns 4-12), and after subtracting the PL results from the IA ones (labeled "difference"; Columns 13-16). The peak differences are normally quite small (Column 6), in more cases zero than greater than 10% (maximum 15%). Median values (Column 9) are exactly the same except in three situations (1-2% difference). Standard deviation (Column 12) gives results similar to the peaks comparison, this time never above an 11% difference. Two data points stand out, for the reasons mentioned in C.

E. FWHM independent data processing

Referring to Table S14, there is a further comparison to make for ensuring the methodology is robust, however. AC and PA got the same seeing result with the same number of points in the last run just before consensus for 21 of the 59 data points (36%). However, for two of these the final vector_e (Polaris path) was actually different: i) in one case the difference was in two points (the first two: the seed point is two pixels different; the one following is one pixel different; the remaining 56 points coincide); ii) in the other case the difference was only in one point, by one pixel: the seed point. We found this out by performing a subtraction in Mathematica between the two vectors e (from PA and from AC). In addition, there are 10 data points where the number of points is the same but the seeing is 2-7% different: in only six of these because vector_e is different (1-2 pixels, never more than one pixel away); the other four are circle fit curvature decision differences – PA picked the'-' option while AC chose '+' (in one case the seeing difference is marginal – 1% - but in the other three it is larger – 17-21% - although, in absolute values, this translates into only 0.12-0.15″ difference in seeing). There are 14 situations where vector_e comparison is not possible (rejections; unbending work by one (PA) and not the other (AC)). Three situations give the same seeing with a different number of points (1-3, always at beginning or end (seed point and, eventually, followers), 1-2 pixels away). Finally, there are 11 cases with a different number of points and different seeing. This is the most interesting sample. To start with, in order to make the comparison (subtraction) in Mathematica, since the two vectors e must have the same length, we had to remove the extra points (at one or both ends), corresponding to 1-11% of the total. In one situation (050708_B1), just one point difference, in a pretty vertical path, implied one had to use parabola fitting (AC) while the other used the usual circle fit (PA). And, yet, the seeing results were 0.37" and 0.44", respectively! Three situations were like above, with the difference in pixels due to different seed points (1, 1, and 3 pixels

different, mean distance of 1, 1, and 3 pixels, respectively). Now, looking at the 11 data points as a whole, we got seeing results that differ by 2-32%, with mean 18% and median 16%. The maximum absolute seeing difference is 0.24′′.

The RMS and FWHM methods compared

We compared the RMS and FWHM methods via a direct comparison between their final vectors (h and e, respectively) for the full dataset (Table S13; Data S7). There were two main steps: i) since vector_h has 2×2 pixels, we transformed vector_e by averaging its points in consecutive pairs; with an odd number of points, the last point was removed; ii) when comparing vectors h and e graphically, several "jumps" and "turns" in vector_h do not have correspondence in vector_e: those points are removed from vector_h; points at the extremities of vector_e might have to be removed too.

Very rarely do points exactly coincide (expected) and, unsurprisingly, there are 27 situations where the vectors are really too different to compare (or with not enough points) – Table S13. Surprising is the fact that for 54% of the dataset (32 out of 59 data points) vectors e and h are similar enough for comparisons (in one case, 230908_C1, *exactly* so).

Using for weights the lengths of Column 4 of Table S13, we get the overall mean distance between the vectors of 1.6 ± 0.5 pixels (from Column 6) and the overall median of 1.4 ± 0.5 pixels (from Column 7). From Column 8, the (weighted) relative error is 30% ± 11% (after removing an 82% relative error outlier). These results are impressive and show that two methods as disparate as the RMS and FWHM ones can get similar paths for Polaris (and similar seeing), typically.

The seeing of a large telescope from the measurements of Polaris motions

(15) method allows the "non-subjective" evaluation of the resolving power of a large telescope at wavelength λ from image motion measurements in trails of Polaris, obtained with a small telescope of diameter D. Splitting the motion into two components (parallel and perpendicular to the trail), for long exposures (e.g. 5 min) the r.m.s. of both can be considered equal and, thus, we obtain the photographic/CCD seeing (σ_α) from the former component, *supposedly* half the "visual" seeing (V), directly related to the effective aperture (D_{eff}) of the large telescope. *(12)* determine the Fried *(50)* parameter r_0 from:

$$r_0 = [6.88/(4\sigma_\alpha^2 (2\pi/\lambda)^2 D^{1/3})]^{3/5} \qquad (1)$$

Now, with the D and r_0 values in hand, we could estimate D_{eff} from the Fig.1 of *(15)* but *(50)* shows a different curve! This is most easily seen from the peak of curve C which differs by more than 50%. We have, thus, independently obtained curve A of Fig.1 of *(15)*, the one for long exposures, using *(51)* to fit data in *(50)*, namely table I, getting (see Figure S19), with R^2=1.000

$$D_{eff} = r_0 (0.985 \, Exp[-0.801(D/r_0)^{-1.14}] + 0.0112) \qquad (2)$$

Altogether we have, for a Johnson B filter (λ=420.45 nm), σ_α in arc seconds and for D and r_0 in meters, from equation 1:

$r_0 = 8.11\times10^{-3}\ \sigma_\alpha^{-6/5}\ D^{-1/5}$

This actually comes from the more general formula:

$r_0 = 2.30\times10^{-2}\ [\sigma_\alpha(´´)]^{-6/5}\ [\lambda(\mu m)]^{6/5}\ [D(m)]^{-1/5}$

So, we can now write, from equation 2:

$D_{eff}(m) = 2.30\times10^{-2}\ [\lambda(\mu m)/\ \sigma_\alpha(´´)]^{6/5}\ D(m)^{-1/5}\ (0.985\ Exp[-1.09\times10^{-2}\ [\lambda(\mu m)/(D(m)\ \sigma_\alpha(´´))]^{1.37}] +0.0112)$

And, finally,

$D_{eff} = 8.11\times10^{-3}\ \sigma_\alpha^{-6/5}\ D^{-1/5}\ (0.985\ Exp[-3.32\times10^{-3}\ (D\sigma_\alpha)^{-1.37}] +0.0112).$

The visual seeing in a large telescope is given by the standard resolution formula (in arc seconds):

$206265\times1.22\lambda/D_{eff}$.

So, we can have it all in one go, with the visual seeing V in a large telescope given by

$13.0\ [\sigma_\alpha^{-6/5}\ D^{-1/5}\ (0.985\ Exp[-3.32\times10^{-3}\ (D\sigma_\alpha)^{-1.37}] +0.0112)]^{-1}$

or, for our final equation,

$10.9\ \sigma_\alpha(")^{6/5}\ [D(m)/\lambda(\mu m)]^{1/5}\ (0.985\ Exp[-1.09\times10^{-2}\ [\lambda(\mu m)/(D(m)\ \sigma_\alpha(´´))]^{1.37}] +0.0112)^{-1}.$

We have actually reproduced *(15)* results for r_0 (within an 8% relative error), given their example of a 0.20-0.35´´ photographic seeing interval, as well as their 1.5-2.4´´ range for a large telescope (in our case, 1.5-2.7´´).

However, we cannot reproduce their empirical conclusion of a 2:1 V/σ_α ratio (Figure S20). Indeed, not only such a low ratio is never reached (the minimum is 8.7:1for values on σ_α=0.45-0.70´´) but there is a V/σ_α quasi-linear ratio of 10:1 for $\sigma_\alpha > 0.5´´$. Using our own observational set-up values of (λ,D) hardly changes anything. *(52)* showed that the star trailing technique, done in small telescopes, has the seeing disk related to r_0 but most motion comes from large scale turbulence, which does not have much influence in a large telescope. Extrapolation is, thus, problematic.

Walker's technique *(15)* compared photographic seeing results obtained at a small telescope with standards at a very large one (Lick 3m telescope) that were produced by having that same small telescope side by side with the large one. Walker gives only three concrete pairs of values, but these are enough for us. His small telescope (like ours) had a resolution of about 1´´ and, when σ_α was as low as this, the large telescope had "≤1´´ or 1´´ seeing". For σ_α about 2´´ the large telescope had 2´´ seeing and, finally, when σ_α about 3.5´´, the large one had 4-6´´. Hence, the V/σ_α ratio is, clearly, less than two, and likely closer to one.

<u>The RMS method</u>

The so-called 'RMS method' for reducing the full dataset initially tried to follow the "crest" of the Polaris path, starting at the peak and then picking the next strongest, etc. It failed, since it would produce unphysical paths (circles, etc.). We had to force a "move forward" in the routine which means that from a given pixel, the next pixel choice will have to be one of the three pixels

on the "ahead" side (which implies previous knowledge of the path), until reaching 10000 ADUs (minimum allowed). The only exception is at the beginning, of course: from the peak (central pixel), we identify which of the eight pixels surrounding it has the highest value in ADUs (2nd peak) and define one path in that direction (which we called "vector_c"). Since the peak is usually not at an extremity of the Polaris track, we defined a second path ("vector_f") from the 3rd peak (second brightest among the eight surrounding the central peak). This is expected to follow a direction opposite to vector_c and, in combination with it, define the full Polaris path ("vector_h", equal to c+f or, more formally, c+g where "vector_g" is the vector opposite to vector_f. Not allowing for loops (Figure S21), the full dataset would have extremely short paths (say, 10 pixels long). Therefore, instead of using single pixels, we decided to build a new dataset with 2x2 pixels. This slows down the routine somewhat (765×510 = 390 150 pixels are averaged in sets of four (in (x, y) position and ADU intensity), but it works!

In some cases vector_h comprises less than two-thirds of the full path. When this happens we use "lobe work" in order to recover the missing data: the original vector_h data section is deleted and the search for a new peak goes on in the remaining data. This way, we obtain a new vector_h2 that we add to the original vector_h (now called h1). Sometimes we had to do this twice (obtaining a further vector, which we called h4).

The RMS method was performed independently by PA and PL for the 23 data points from 4th November 2008 (before that IA worked on the data – *(53)*; these were used for training and developing the routines). The results and steps followed were compared and a consensus was reached (Table S19). Consensus was immediate for only two points out of 23 (9%): 281108_A1 and 090109_A2. In the first round there were eight major differences (35%), 12 minor (52%) and one aesthetical. The seeing result was only **different** in five of the major difference cases (22%) and in one minor (26% in total); and the values are only 5-18% different. A second run of discussion settled all differences and the data became final (Table S15). These results demonstrate a strongly auto-consistent data reduction method.

Illustrated examples for the RMS method

In order to help understanding the RMS data reduction process, two text files are used here as examples (calibrated raw data for 040708_A2, without lobe work; calibrated raw data for 310708_A2, with lobe work) as well as the two respective commented Mathematica files (FinalRoutine_commented_RMS and FinalRoutine_commented_lobes_RMS – Data S1). We suggest the reader to use the blank routine file (FinalRotine_RMS – Data S1) and start from scratch, following the examples. Step-by-step instructions are, respectively, in the pdf files Commented_code_RMS and Commented_code_LOBEwork_RMS. In here we will mostly summarize the process but include all the images, for better understanding. The full set of images of our data reduction process with the RMS method is presented in Data S6.

A. 040708_A2 data (no lobe work)
After the standard initial procedures of directory setting, file reading, and CCD pixel information input, we get the full data plotted in 3D (with the vertical axis the intensity in ADUs) – Figure S22(A). This image helps guessing where the path base sits in (x, y) (if it is seen with some colours: if in black and white, it must be enlarged in Mathematica). Routine 2 now uses (x, y)

information the user keeps entering (iterative mode but in the actual code) to frame the path and the maximum value (that was previously shown on-screen) in order to make the data just fit a 3D box, as in Figure S22(B). Routine 3 (the only routine that takes a while to run) uses the frame just created to organize all data into 2x2 pixels and shows, in the end, vectors c and f for analysis (Figure S22(C,D)). Note that we can already make out, "by eye", vector_h = "c-f" (or h=c+g, defining vector_g as the opposite of vector_f). Vector_c is checked first, to see if the path is well behaved from peak until it stops (on its own, before the routine reaches 100 cycles; or by force, reaching that number, which means that it was cycling). If a cycle/loop is seen, that vector_c must be truncated as shown in Figure S21. Routine 4 is run (uncommented) for these corrections (in our example this was not necessary – 7 cycles for c). For vector_f the analysis is exactly the same, except that now we are talking about the 3rd peak. In this example vector_f also stopped on its own (42 cycles). Vector_h is created in Routine 5. Its output includes six graphs, which we have to carefully analyse (Figure S22(E)-(J)).

For example, by looking at Figure S22(H,I) we check, by eye, if the profile makes sense: in (H), vector_h starts with low values from the top of the frame and in the middle it has a "dive" of two points. Since we see the same in (I) there is consistency (we incorporated sorting vector_h in the Mathematica routine, which solves most inconsistencies). The final points (one in each extreme) must have their values compared with the ones immediately preceding. If there is a >33% rise/drop then the last point is removed (it might be a "cluster" of points; see the recipe for more details – Data S1). In this case there is, actually, a >33% rise in vector_h (left side in Figure S22(I)). So, Routine 4 was run to remove the first point and create a new vector_h (which is the one actually shown in Figure S22(J)).

Finally, the Routine 6 "pack" of seeing fit curves is run. The first section (6.1) fits an arc of circle to the path (vector_h) with the numerical routine run only on the (Δx, Δy) limits (where the images of Figure S22(E)-(H) lie). Of course, the fit is always in a pair: arc circle up (which we label with '+') and arc circle down (which we label with '-'). These curves are shown in Figure S22(K,L), respectively. Although they are virtually the same most of the time (and, by default, we always pick '+'), this must be checked upon the data (Figure S22(M,N)). Sometimes the curvature of the path suggests to choose clearly '-' instead of '+'. Again, six graphs pop up (Figure S22(K)-(P)).

On occasion '+' fails (so '-' is, really, the only one that is used). In fact, three results can happen with circle fitting: at least one of them gives a result of seeing that makes sense (of the order of one arc second); both of them give nonsense results (very large values of seeing); both of them fail. In the latter two cases we must try parabola fitting, or even "horizontal fiting", in sections 6.2 and 6.3 of the routine, respectively.

Section 6.2 fits a parabola. A lot of times these are unphysical since they only work locally. Three graphs come out, as for each one of the circle fits (Figure S22(Q)-(S)). Finally, section 6.3 describes "horizontal fitting" which is used when "all else fails": typically, when the path is too vertical for either the circle or parabola fit having a chance. Sorting the data does not solve such issues all the time. The last resource, then, is to calculate the distance parallel to the x-axis from vector_h to the arc of circle.

B. 310708_A2 data (with lobe work)
When less than two-thirds of the raw data track is covered by the Polaris path (vector_h; see Figure S23(A)) we try to reach it by "extending" vector_h (now renamed h1) with a new one (say, vector_h2) wherein the data already covered by vector_h is fully deleted (along the x or y direction, depending on the orientation of vector_h) and then read in as if it was the only one available. It might be necessary more than one run of the special "lobe work" subroutine built (producing vectors h1, h2, etc.) – see Data S1. Most work to be done is very similar to the one described in part A of this Section, so we do not repeat it here.

When "lobe work" starts, the crucial initial step is to decide where to chop the data: this will be in one direction alone. E.g. if in the x-direction we must define the [x1,x2] section to **remove**, with x1 being either 1 or the lower limit of the area to remove and x2 being either 765 or the upper limit of the area to remove; in this case, it is the [y1,y2] range that remains unchanged from the initial data processing. The "lobe work" routine starts by requiring those values (x1, x2, y1, and y2) before performing the same procedures as in a standard reduction process.

In the example given here (Figure S23) since we want, first, to remove vector_h (immediately renamed h1) it is more obvious to do so on the y-axis, due to its inclination (Figure S23(A)). We, thus, remove all data with $y \in [1,240]$. After processing the data this way, we get vector_h2 (the new vector_h) as in Figure S23(B,C). This is also a short vector and not even h=h1+h2 is enough to reach two-thirds of the full Polaris track. So, we must do it again, this time chopping out all data with $y \in [1,270]$. Thus, it is the combination of three vectors (h=h1+h1+h4) that solves the initial problem (now, about three-quarters of the data are covered by the combined path) – Figure S23(D,E). We get the usual final plots of vector_h (Figure S23(F)-(I)) and to conclude the process, we now run one of the "section 6" routines (Data S1) for curve fitting (and seeing finding) on the final vector_h.

Routines for Mathematica
On Data S1 we present the Mathematica routines used to process the data, following either the RMS or the FWHM methods. Although detailed commented files are given there for each, as well as step-by-step recipes, in here we summarize these.

A. RMS
The detailed routine instructions are in the file "DataProcessing_Recipe_RMS.pdf" while the two fully commented codes (extracted from the Mathematica commented routines) can be found in files "Commented_code_RMS.pdf" and "Commented_code_LOBEwork_RMS.pdf", where the names make each content obvious. Here we summarize the "recipe":

i) Routine 1: input into Mathematica the final calibrated file, ASCII format.
ii) Routine 2: first data viewing (3D) – adjust limits in the three-directions for optimum data viewing and analysis later; immediately one can see if there were any major problems or, even, if the seeing looks promising (in the case of a straight and narrow Polaris path).
iii) Routine 3: after organizing the data into 2x2 pixels, this routine defines the two vectors c and f that, together, make vector_h (Polaris path); careful analysis of each

vector must be made, since they might be modified when entering loops (going backwards); vector_c (or f) might even be entirely ignored (having h=c or h=f).

iv) Routine 4: only ran if vector_c and/or f need modification (or, even, h=c+g).

v) Routine 5: this is the critical routine to check that all is fine with the data: vector_h (profile, shape vs visual points, etc.); might have to remove points (if there is a >33% rise/drop in the extremities) and run it again.

vi) Lobe work: if more than 1/3 of the Polaris track is not covered by vector_h then "lobe work" must be done: delete the section where vector_h (=h1) lies and restart (with a new peak), defining a new vector_h2; in the end (section "combining lobes" in the routine), the final vector_h is defined by h1+h2+… until ≤1/3 of data are left uncovered. Routine 5 might have to have a final go, if a "border effect arises" between lobes – a suspicious line of points right at the data new border (right up until the previous one was removed) – Figure S24.

vii) Routine 6.1 (Circle fit): this is the main seeing fit routine. Its output (text, figures and images) must be checked carefully to make sure that the fit has worked; it includes deciding between "arc circle up" or "arc circle down" – usually they give the same results. Failing (which includes ridiculously high values) implies proceeding to…

viii) Routine 6.2 (Parabola fit): to be used only if circle fit fails.

ix) Routine 6.3 (Horizontal fit): to be used only when the path is too vertical and, for that reason, both circle and parabola fits fail (which includes ridiculously high values).

B. FWHM

The detailed routine instructions are in the file "DataProcessing_Recipe_FWHM.pdf" while the fully commented code (extracted from the Mathematica commented routine) can be found in file "Commented_code_FWHM.pdf". Here we summarize the "recipe":

i) Routine 1: input into Mathematica the final calibrated file, ASCII format.

ii) Routine 2: first data viewing (3D) – adjust limits in (x,y) for optimum data viewing and analysis later; the data are presented already chopped at the FWHM.

iii) Routine 3: view from the top, in order to help choosing the extremities of the path ("middle" points on each side, as regards an orthogonal line to the imaginary central path – Figure S14) – it is recommended that the two extreme points are actually chosen just outside the data range seen. But, first, it is required to decide which direction does Polaris seem to follow: left-right or up-down. Six 2D top-view graphs will then be presented to allow several iterations until the extreme points are at the right places. And, finally, a check is also made on the path (vector_e).

iv) Routine 4: this routine will only be run if some points need to be deleted from vector_e.

v) Routine 5.1 (Circle fit): this is the main seeing fit routine. Its output (text, figures and images) must be checked carefully to make sure that the fit has worked; it includes deciding between "arc circle up" or "arc circle down" – usually they give the same results. Failing (which includes ridiculously high values) implies proceeding to…

vi) Routine 5.2 (Parabola fit): to be used only if circle fit fails.

vii) Routine 5.3 (Horizontal fit): to be used only when the path is too vertical and, for that reason, both circle and parabola fits fail (which includes ridiculously high values).

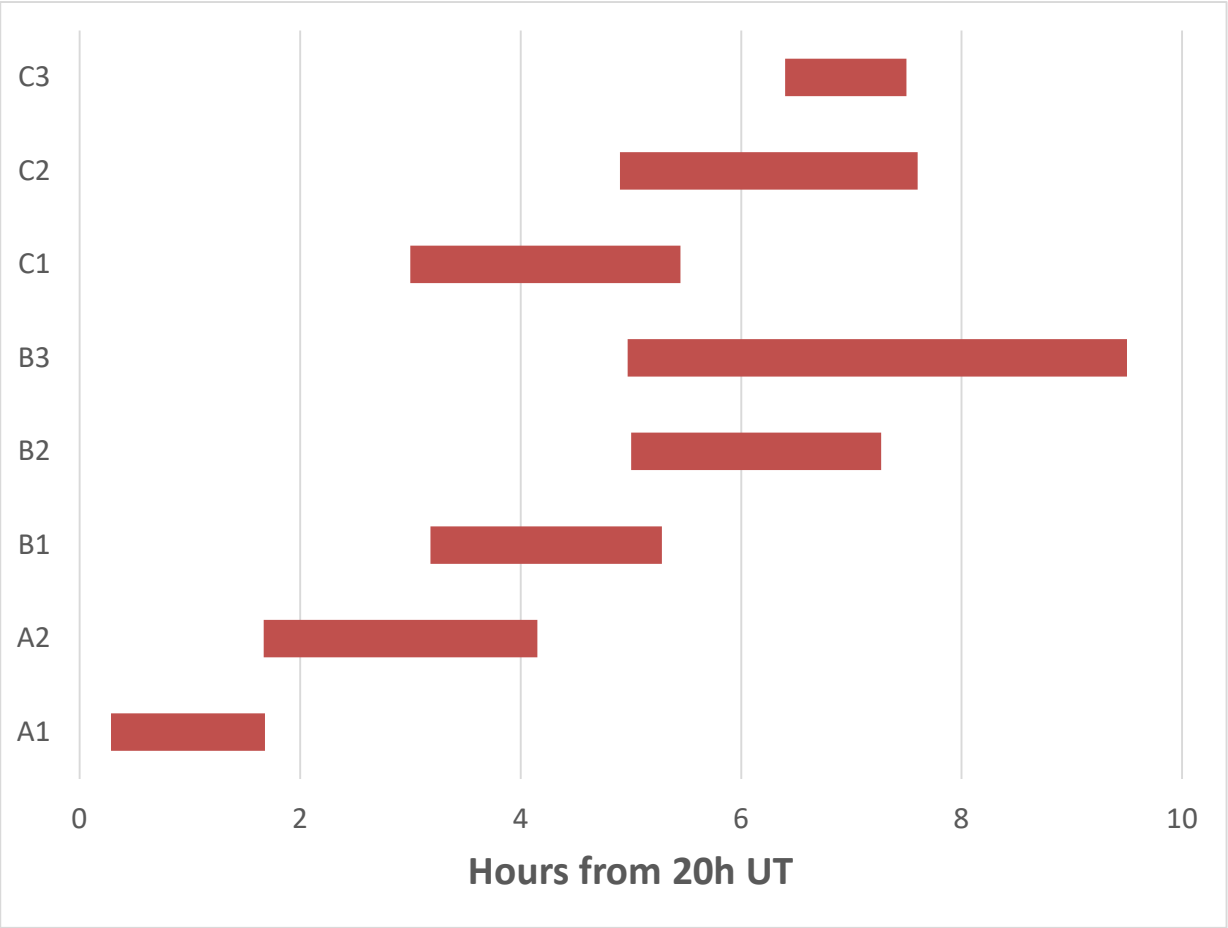


Fig. S1. The range of observations in time, each night, for all eight sites. We here show the compared ranges over our full program. Note that some ranges overlap (such as B2, B3, and C2), others appear in sequence (such as A1, A2, and B1/C1); some are short (such as C3) and others long (such as B3).

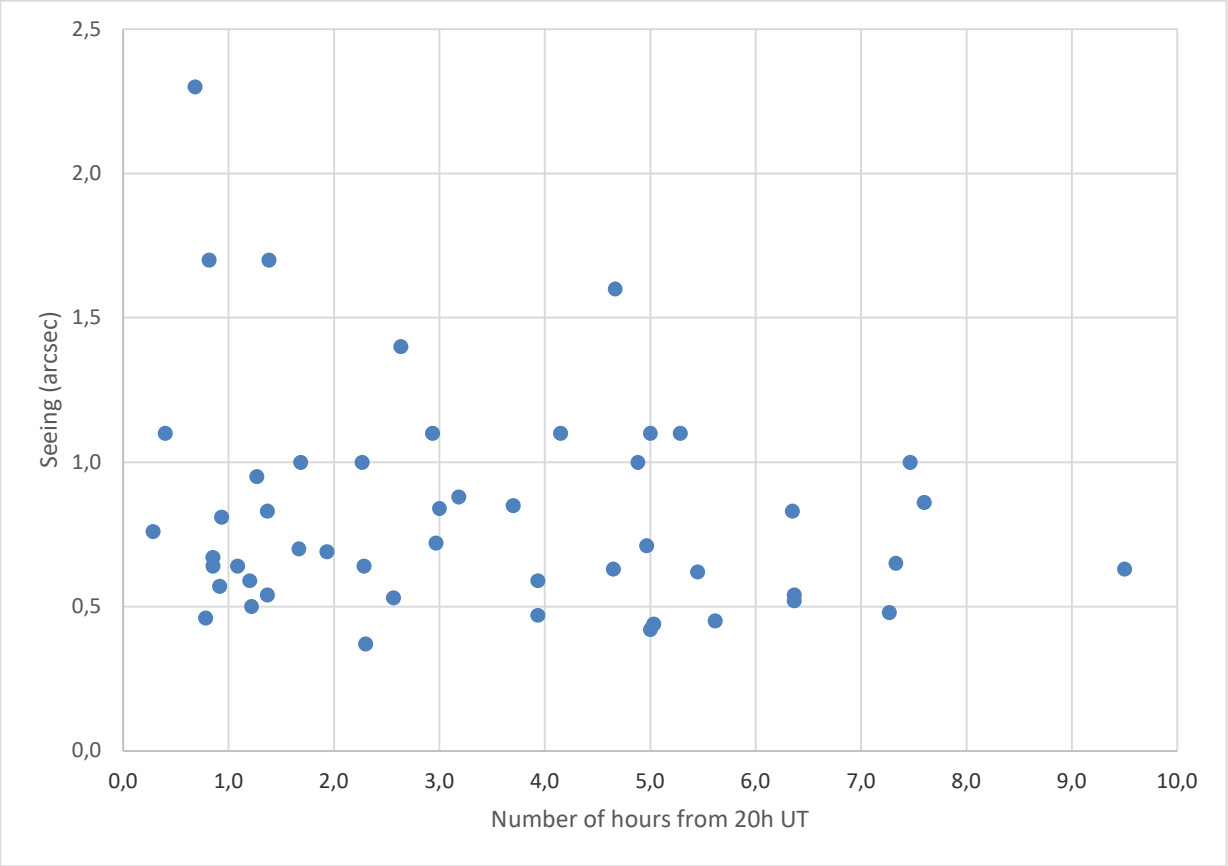
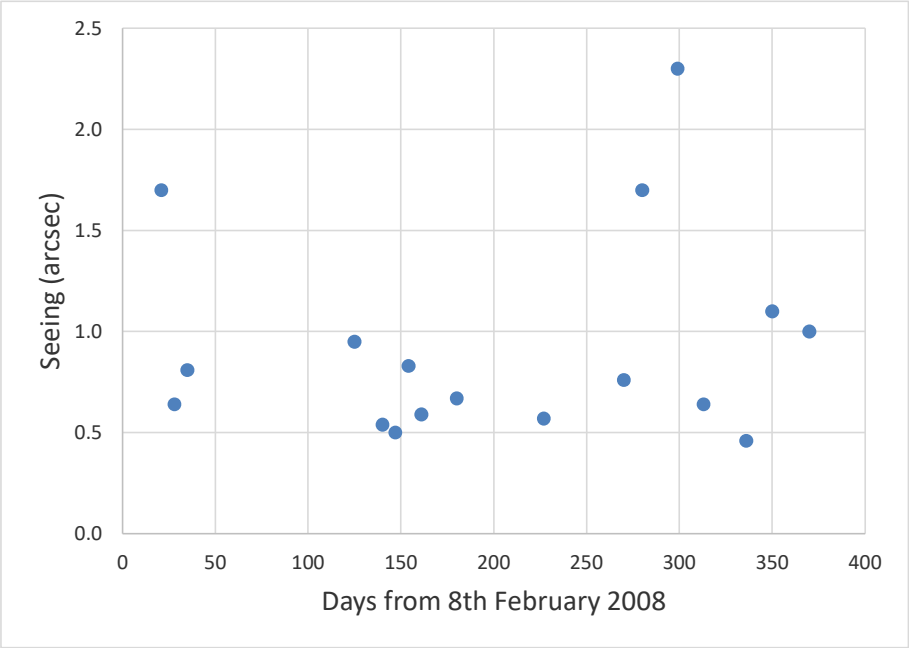
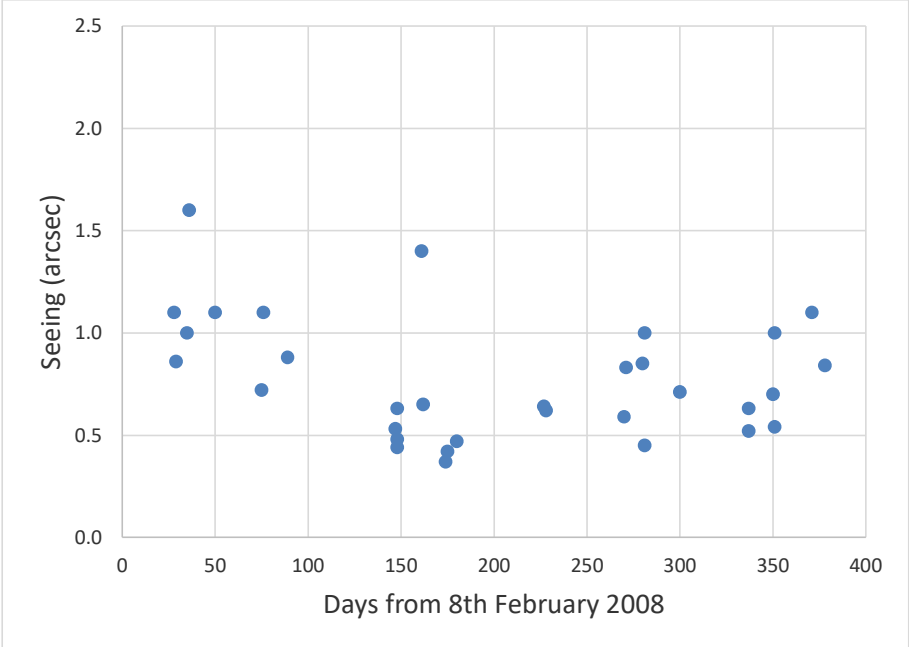


Fig. S2. The seeing as a function of the time of observation. All nights when the seeing was measured are shown here, for all sites. There is a hint for worse seeing in the beginning of the night.



(A)



(B)

Fig. S3. The seeing as a function of observing date. Spring goes, approximately, from day 40 to day 130 and summer from day 130 to day 220. The remaining days correspond to the autumn/winter period. The same scale is used in both plots, for a better comparison. **(A)** Juncal. **(B)** Other seven sites.

Fig. S4. The view towards north at the eight sites during the day. All photos were taken in January 2008. Some of the photos show the elevatory base (M.BASE.MATE). Some sites have a negative horizon. Clockwise, from top left, this page: A1, A2, C2, and C3; next page: B1, B2, B3, and C1. See Table 1 and Figure 4.

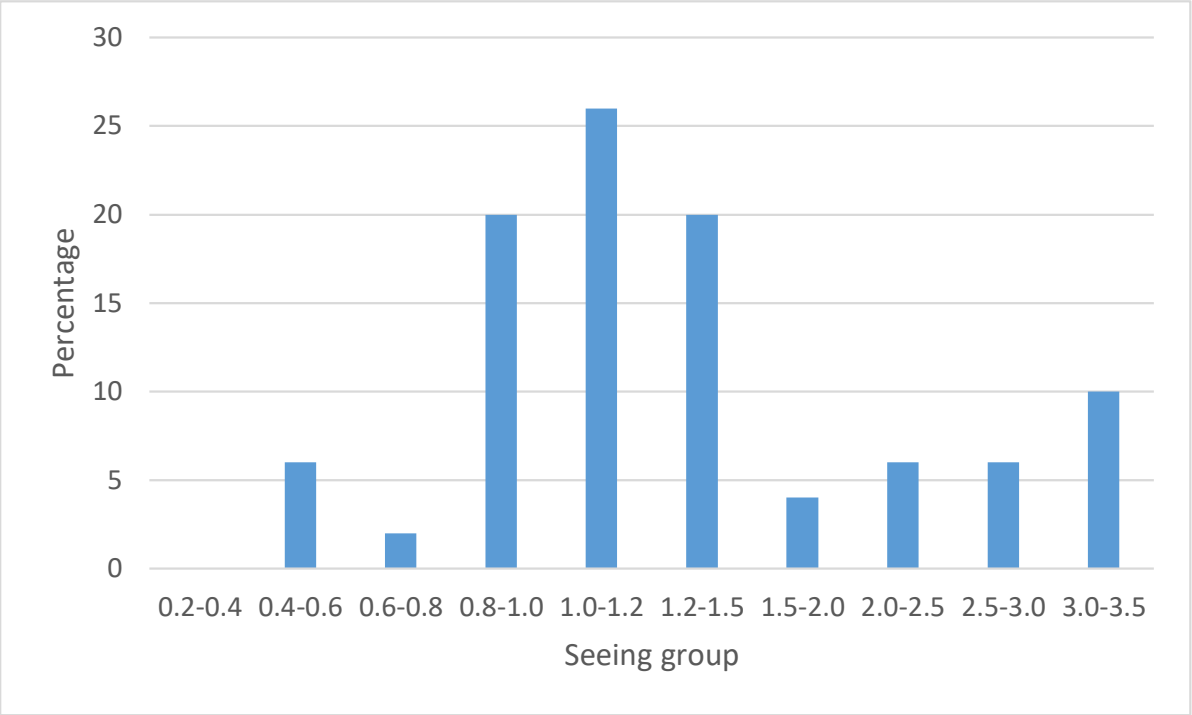
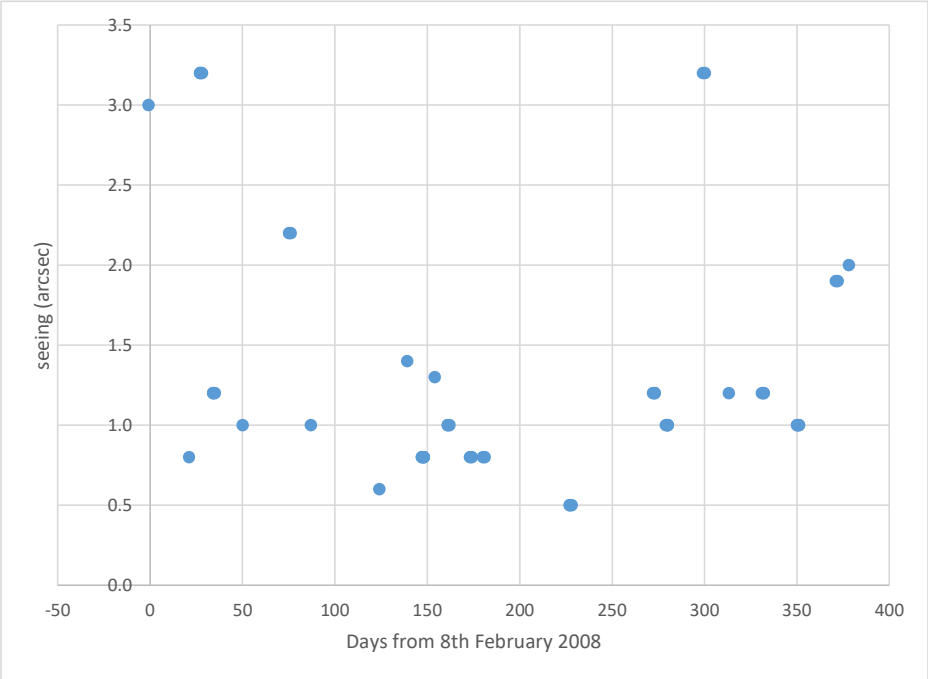
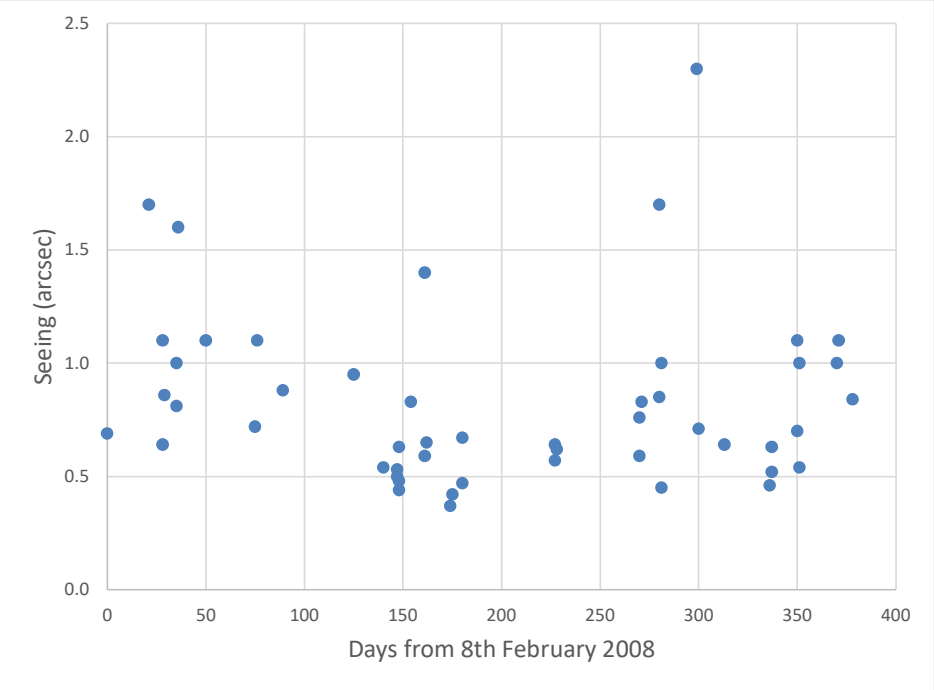


Fig. S5. The seeing distribution at La Palma. The 50 values used came from column 11 of Table S8 and cover exactly the same period as our own 50 values (February 2008 to March 2009) – cf. Figure 3(D).



(A)



(B)

Fig. S6. The seeing as a function of date of observation for La Palma and Madeira. Spring goes, approximately, from day 40 to day 130 and summer from day 130 to day 220. The remaining days correspond to the autumn/winter period. **(A)** La Palma. The 50 values used came from columns 2 and 11 of Table S8. They appear to be much less here because there are many points that coincide (in each night the seeing is the same for several different times). **(B)** Madeira. We here combine Figures S3(A) and (B).

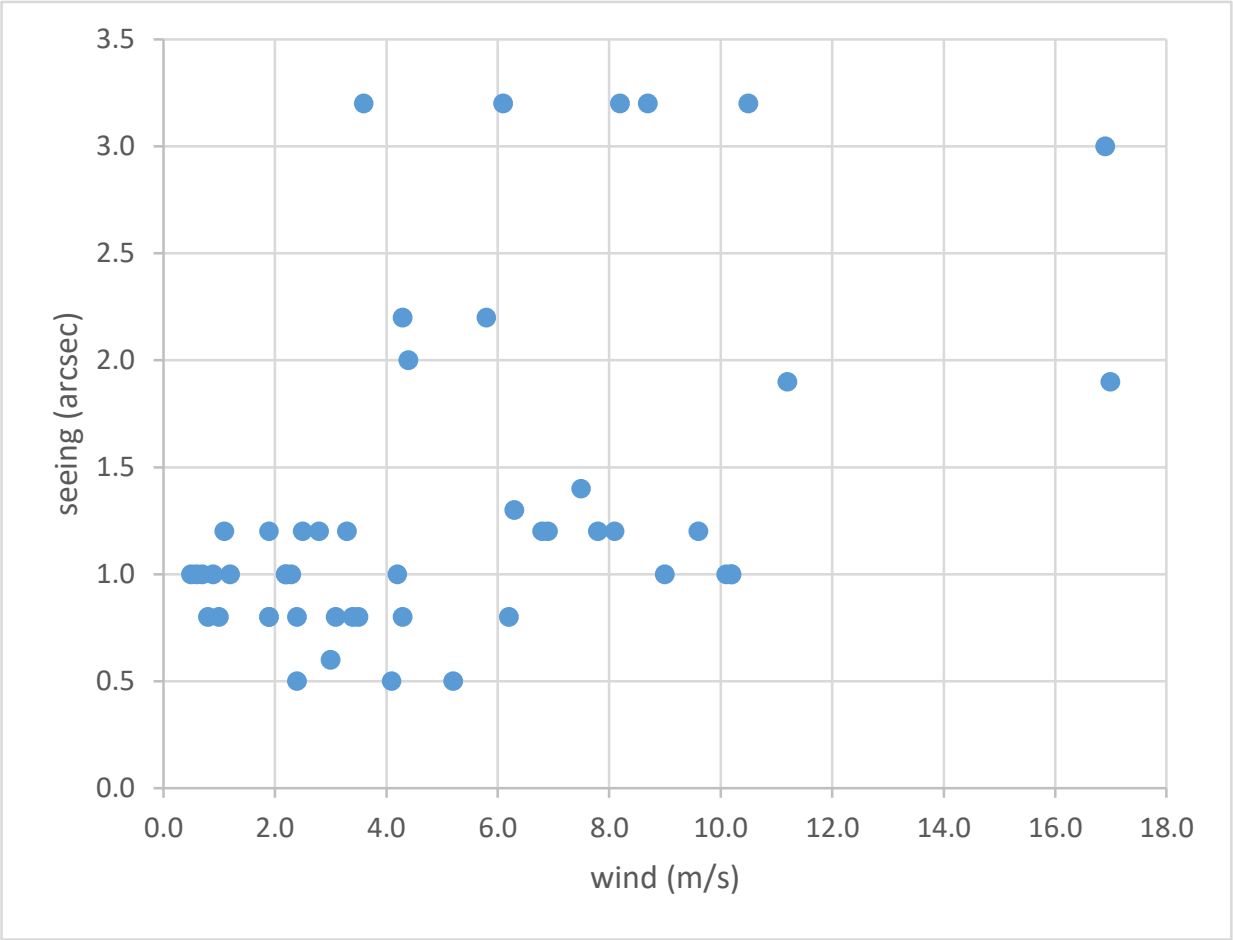


Fig. S7. Correlation between seeing and wind for La Palma. This time we use information for columns 5 and 11 of Table S8.

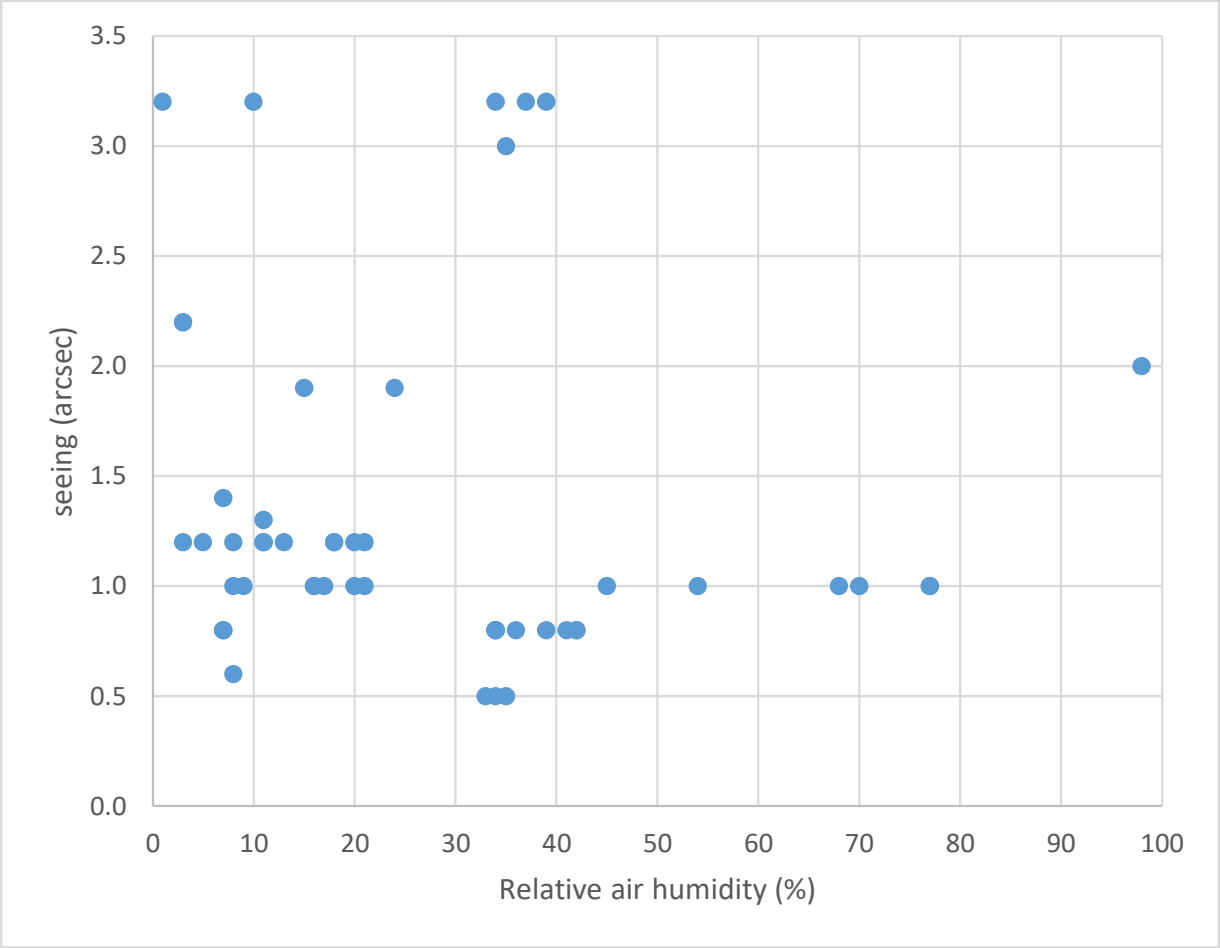


Fig. S8. Correlation between seeing and relative air humidity for La Palma. We here use data from Columns 6 and 11 of Table S8.

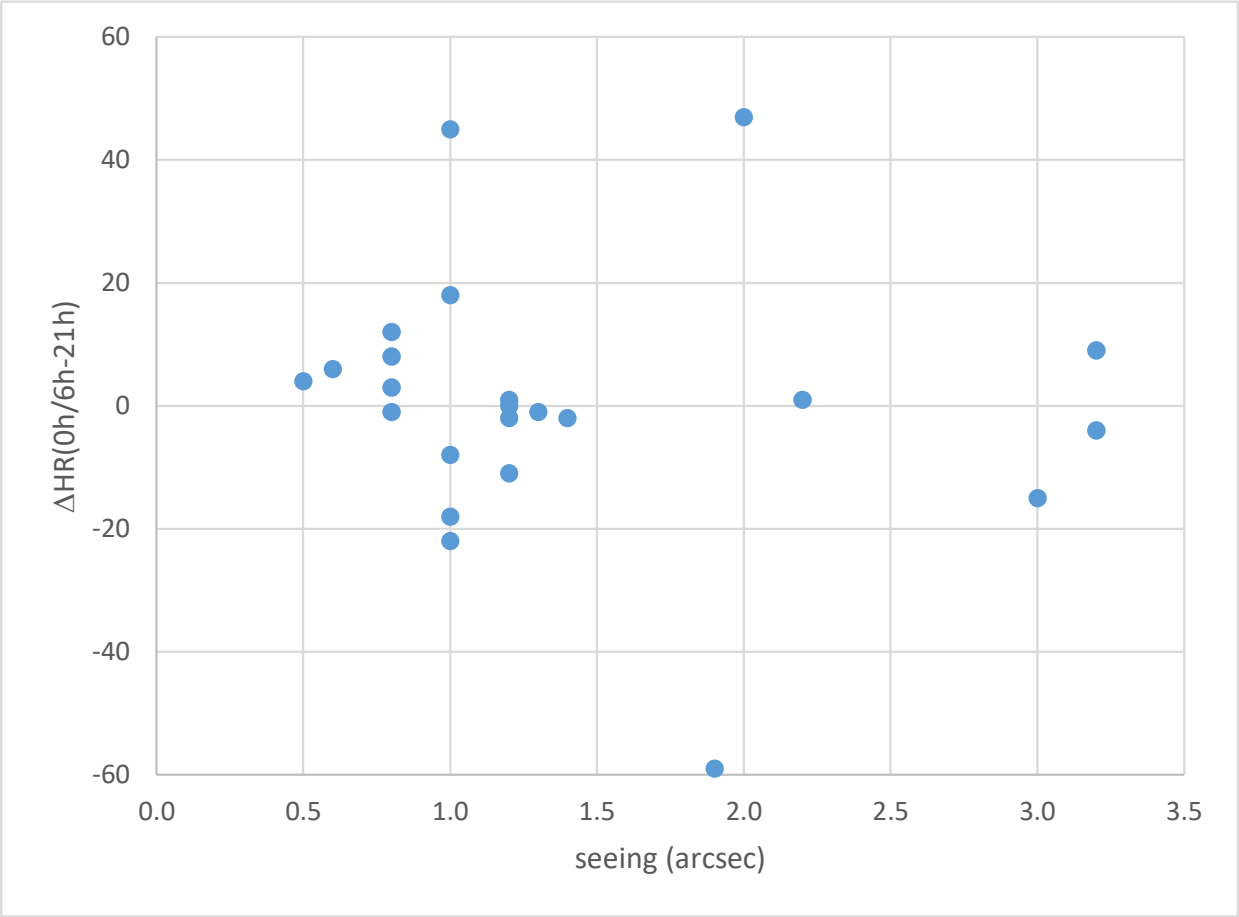


Fig. S9. Correlation of seeing and relative air humidity difference for La Palma. The data were collected from information at the beginning and end of night (Columns 4, 6, and 10 in Table S8). See Table S9.

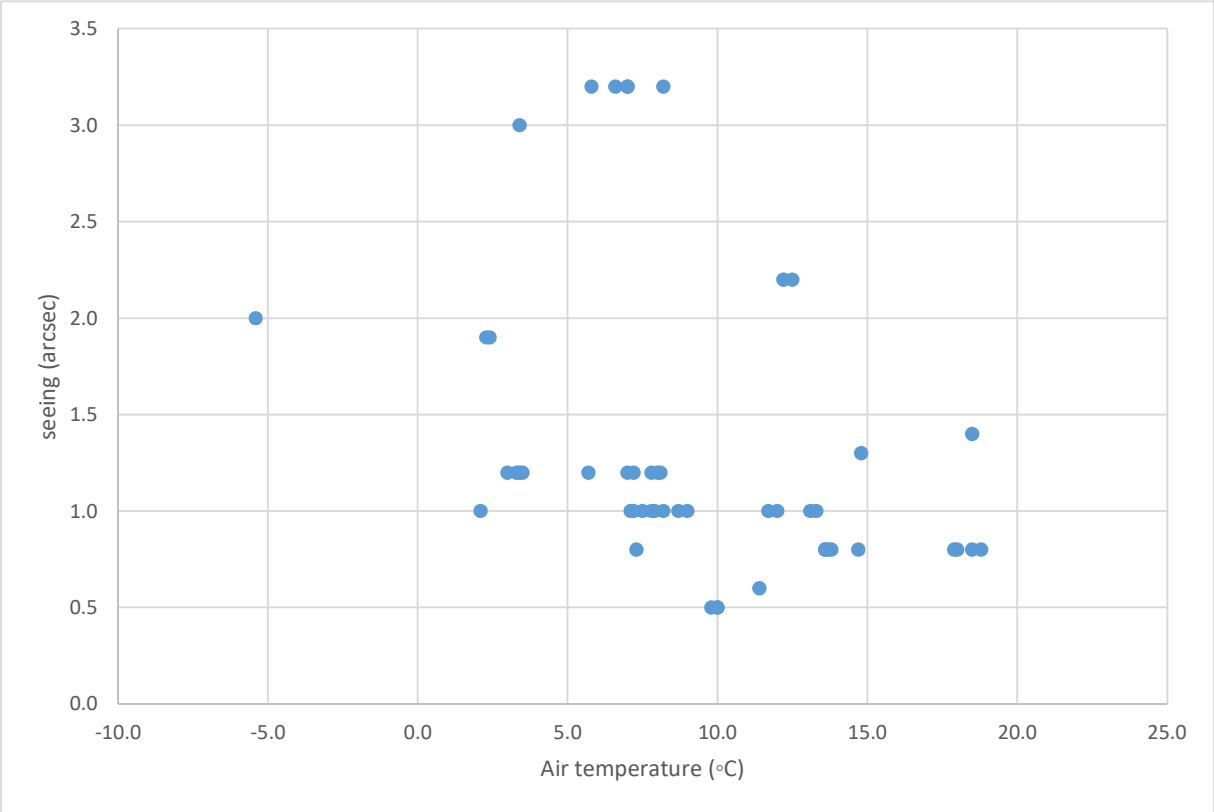


Fig. S10. Correlation of seeing and air temperature for La Palma. This time we use information from Columns 7 and 11 of Table S8.

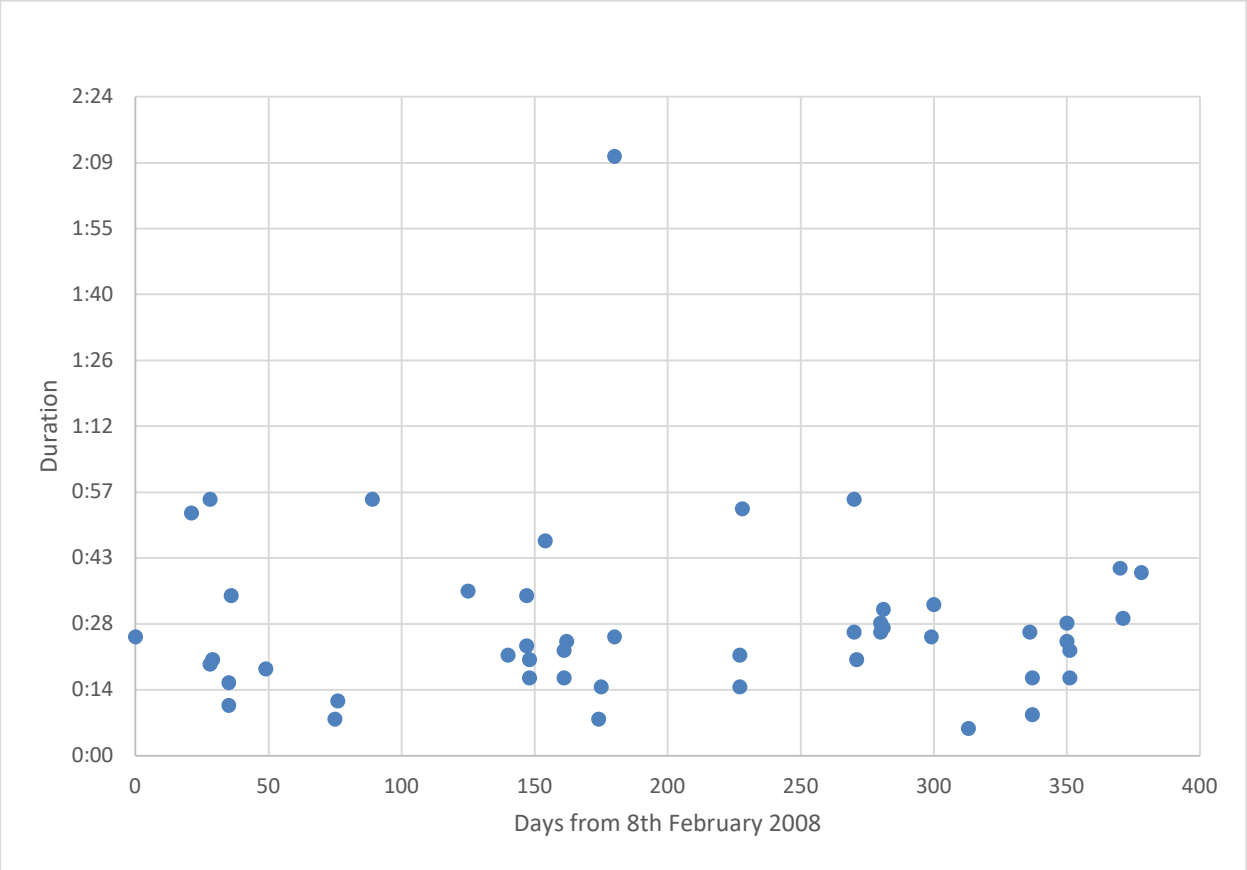


Fig. S11. The duration of the observational setup. The data cover the full period (just over one year), at all sites. The data were obtained from Table 2, the horizontal axis from Column 1 and the vertical axis from the difference from Columns 4 to 3.

(A) **(B)** **(C)**

Fig. S12. Detail of the elevatory screws and the lock of M.BASE.MATE. **(A)** When two screws are positioned at the M.BASE.MATE minimum elevation and a lock ("Trinco") is in place no parts move at all during transport since those hold the elevatory section firmly in place. **(B)** The screws elevation can be gauged by a linear scale in millimeters, attached to the relevant extremity of the elevatory section. **(C)** The screws press against a metallic plate firmly attached to the base. See also Figures 1 and 2.

Fig. S13. The 354-litre rucksack (fully loaded). We had to invent this rucksack in order to carry M.BASE.MATE (and other items) on our backs through all sites – see Figure 1.

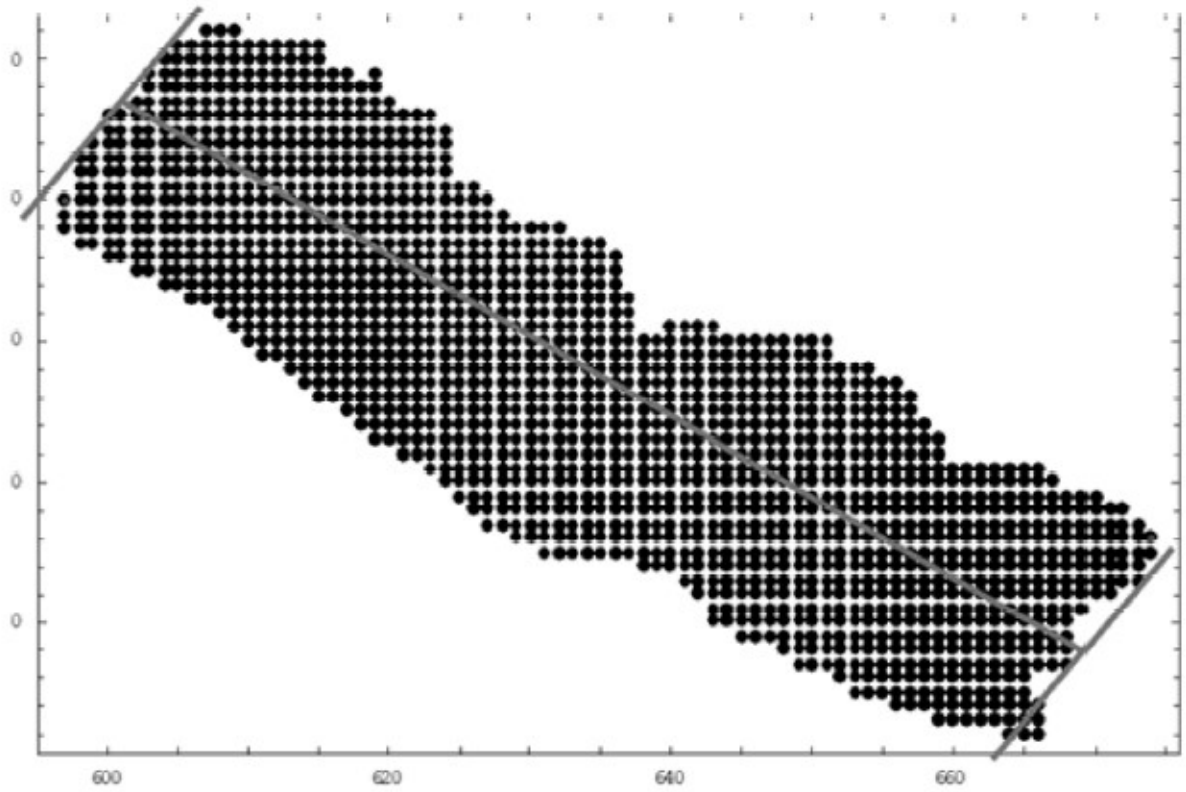


Fig. S14. The view from the top, in order to help choosing the extremities of the path. We pick “middle” points on each side, as regards an orthogonal line to the imaginary central path. The two extreme points should be chosen just outside (two-three pixels) the data range seen.

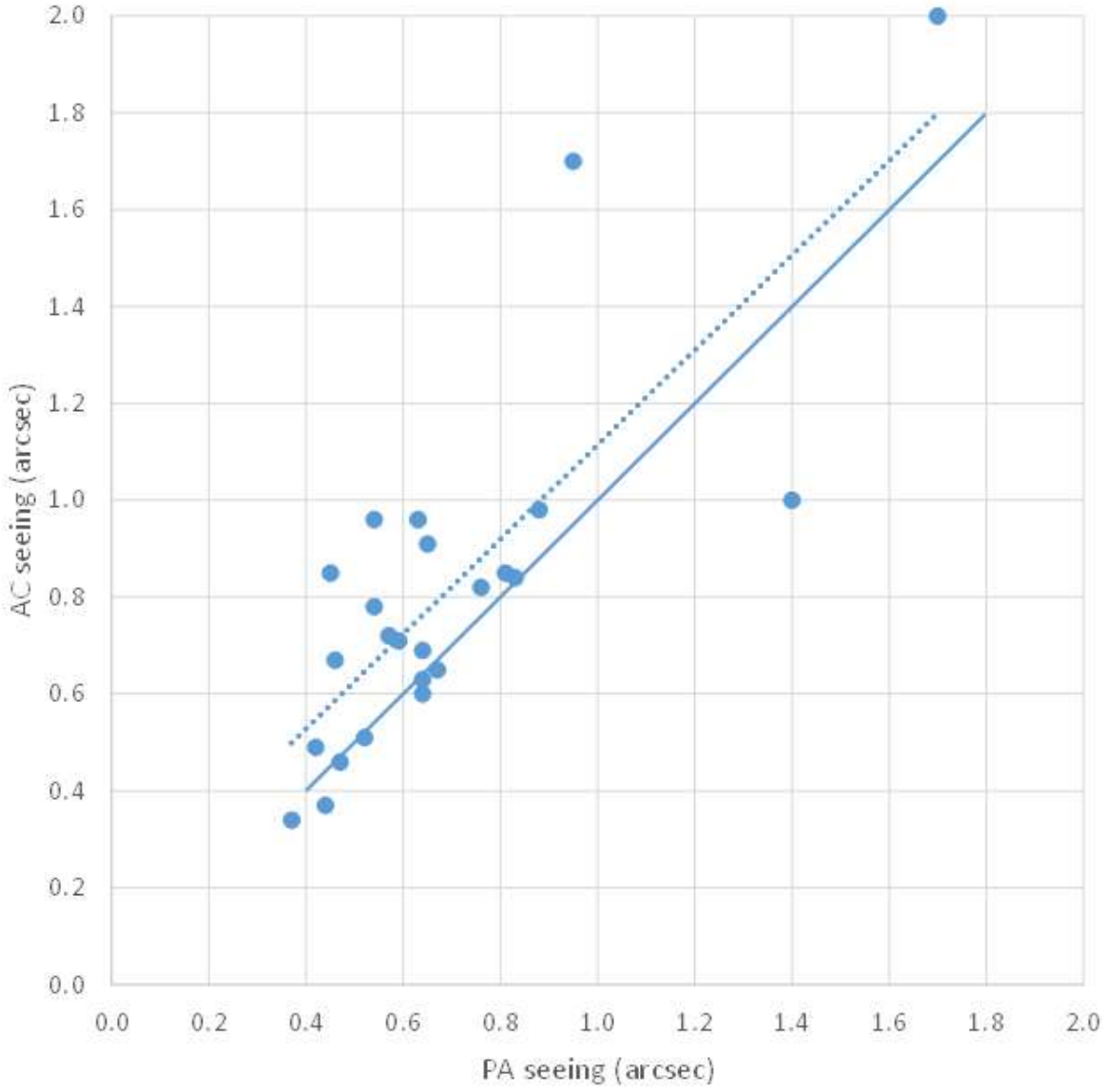


Fig. S15. Seeing obtained by PA and by AC compared. The focus of this plot is, specifically, on the 24 minor difference situations that were identified when the calculated seeing was also different (see Table S14). The x=y equity line is shown (continuous) as well as the line fit to the data (dotted).

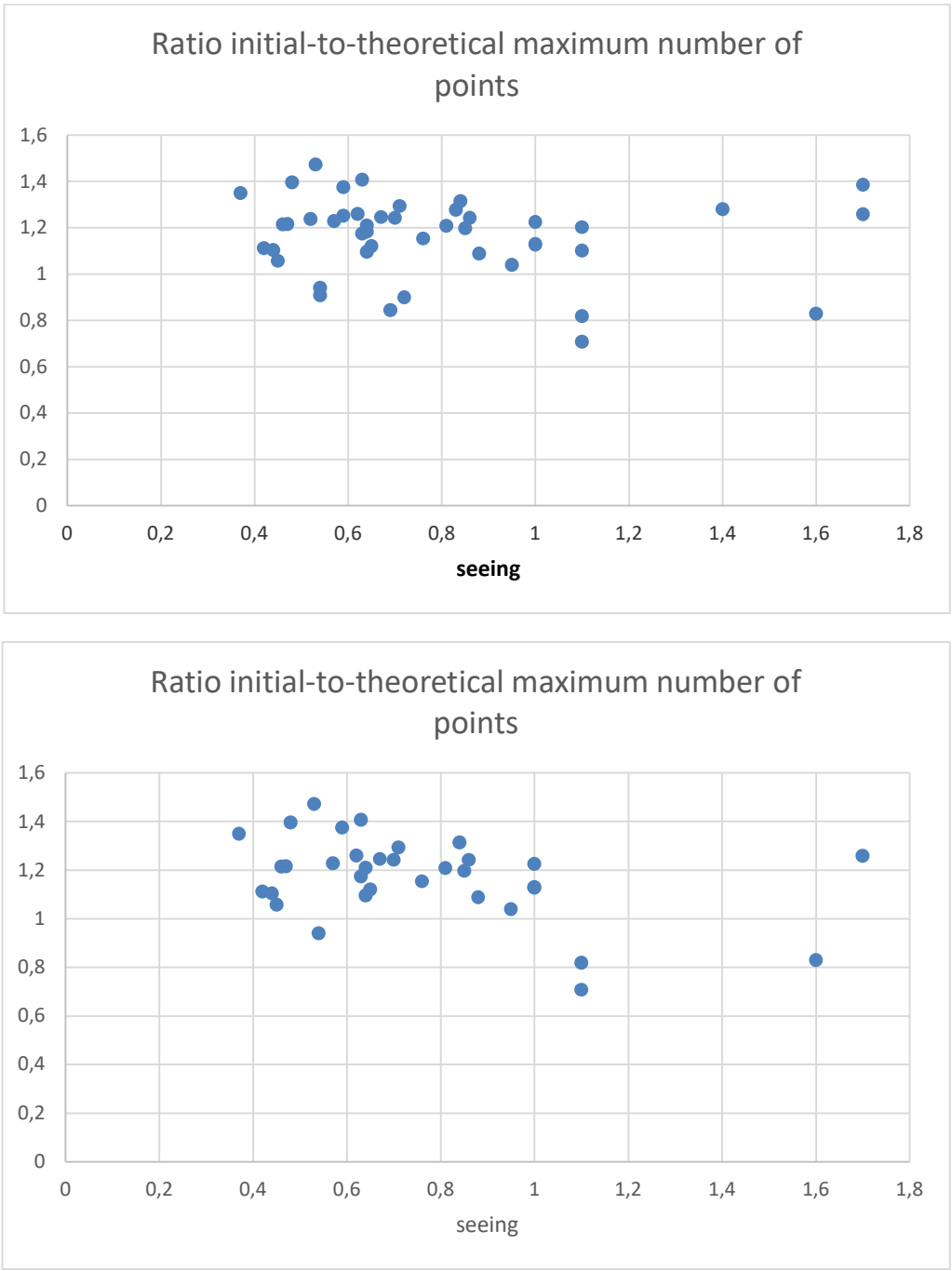


Fig. S16. The ratio of the initial number of points of vector_e to its theoretical maximum number of points. The ratio is presented as a function of *seeing*. *Top*: 45 points were used (excluded were the 14 painted ones of Table 3). *Bottom:* Now 38 points were used, after further removing all data points with discontinuities (and an extra one where a horizontal fit was used for the *seeing* calculation).

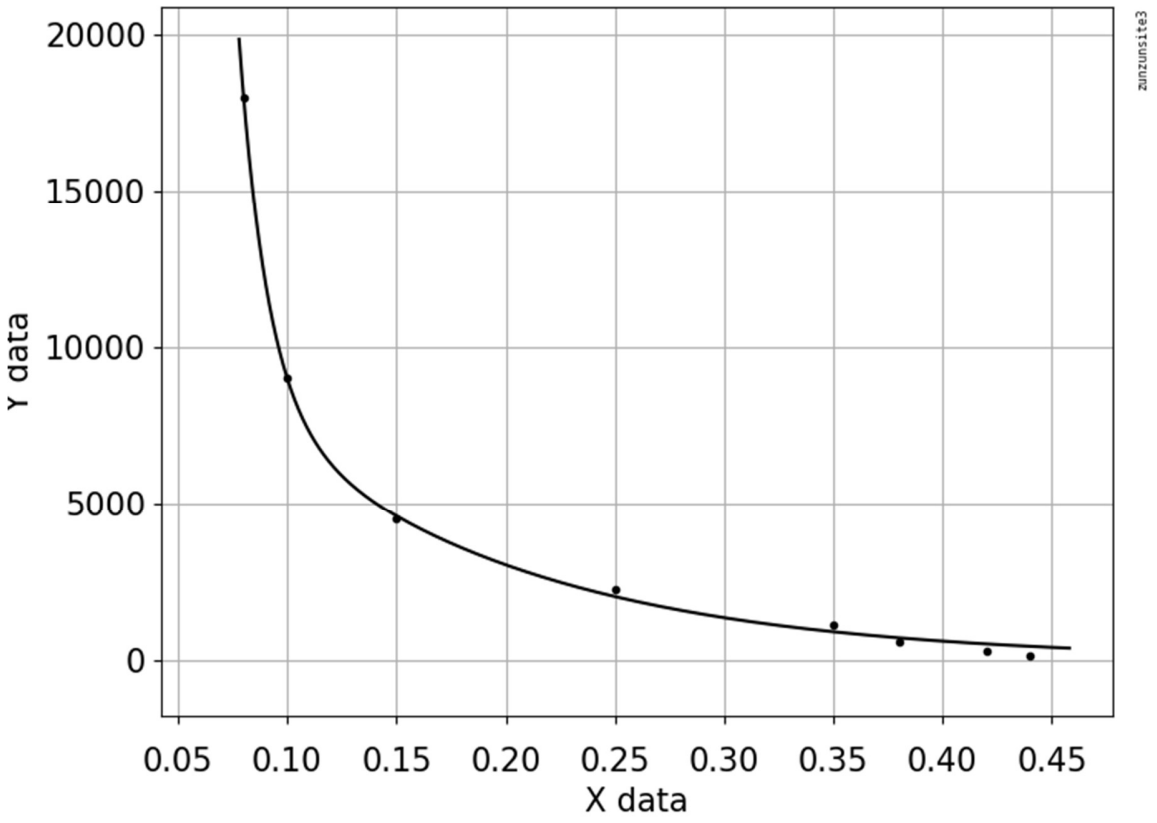


Fig. S17. A double exponential fit. The fit (R^2=0.998, adjusted; mean/median relative errors of 35%/10%) was applied to the 140 m-plus data of Table S16(A), acquired from *(35)*. We used the online routine Zunzun *(51)*.

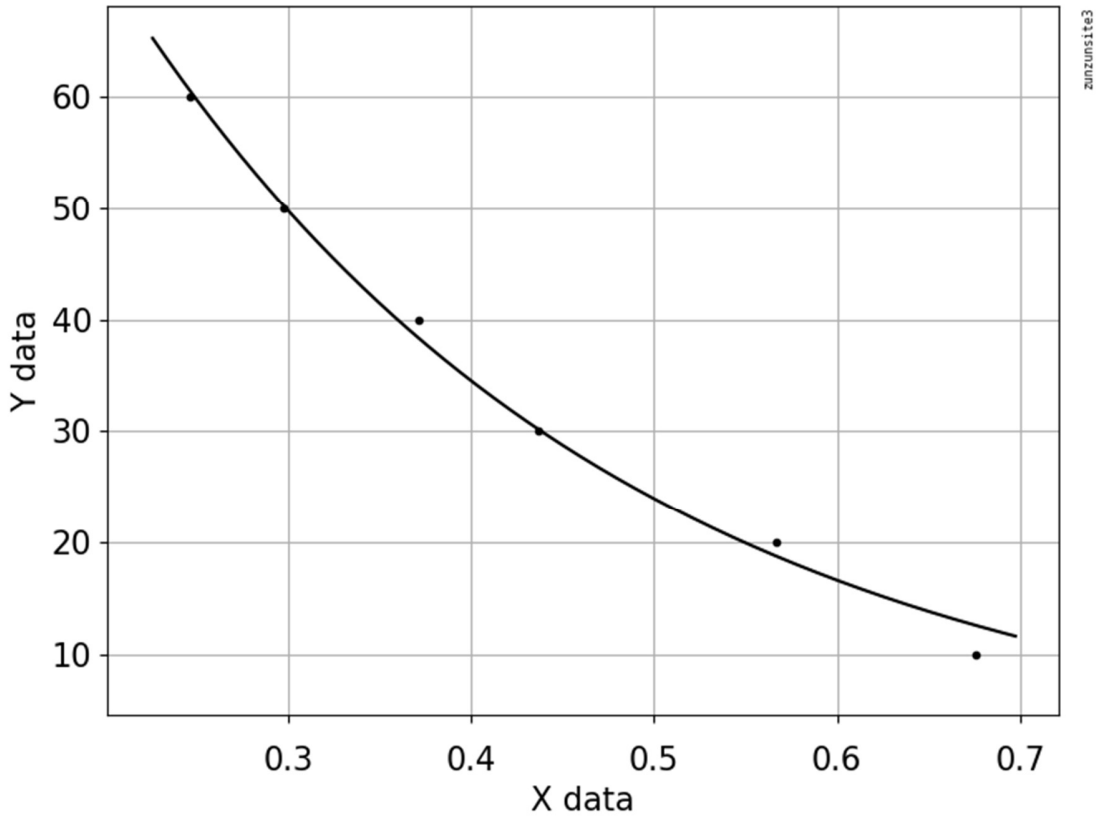


Fig. S18. An exponential fit. The fit (R^2=0.992, adjusted; mean/median relative errors of 3%/0.5%) was applied to the data of Table S16(B) (highest six points), acquired from *(45)*, their Table 2. We used the online routine Zunzun *(51)*.

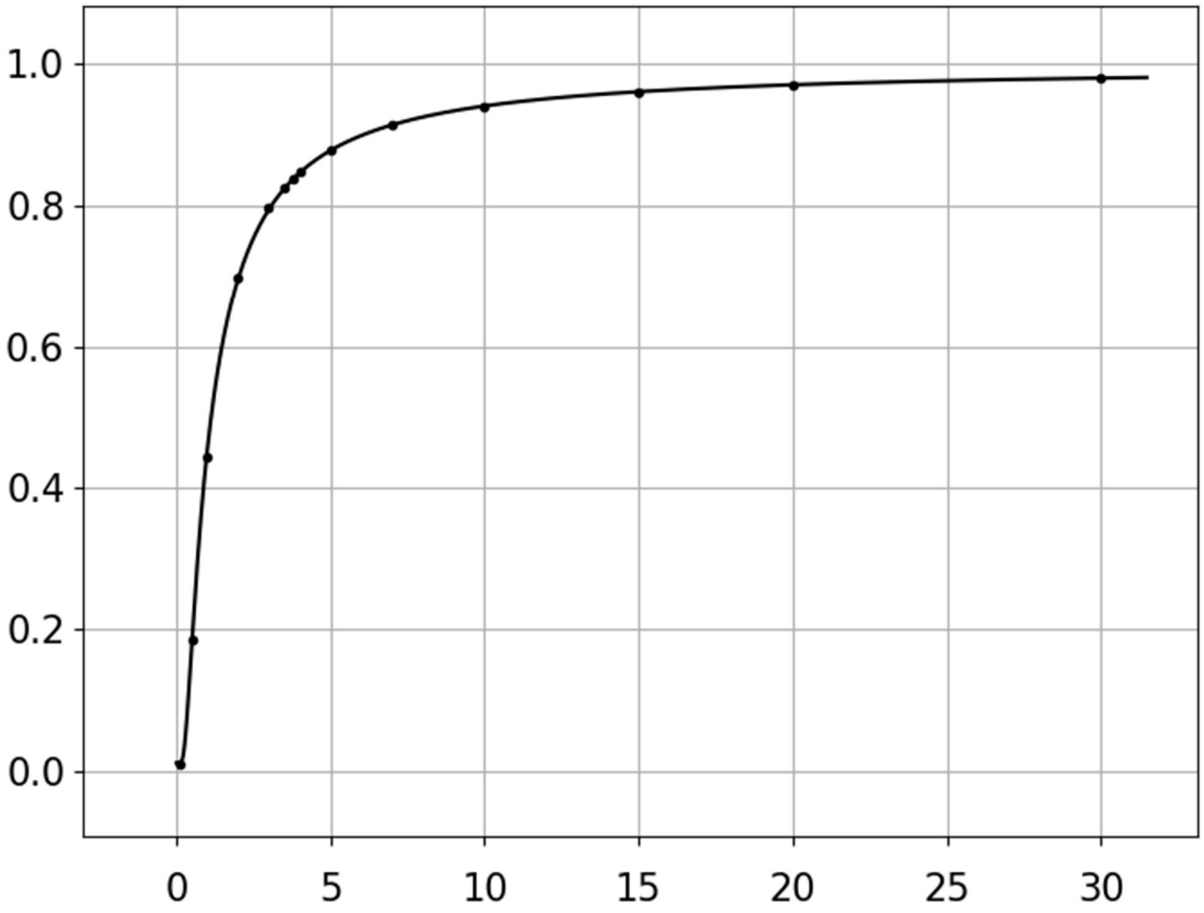


Fig. S19. Dependence of normalized resolution on normalized diameter. Using *(51)* for curve fitting, we here show the dependence of normalized resolution (D_{eff}/r_0) on normalized diameter (D/r_0). This is an R^2=1.000 fit to *(50)* table I data – curve A of Fig.1 of *(50)*.

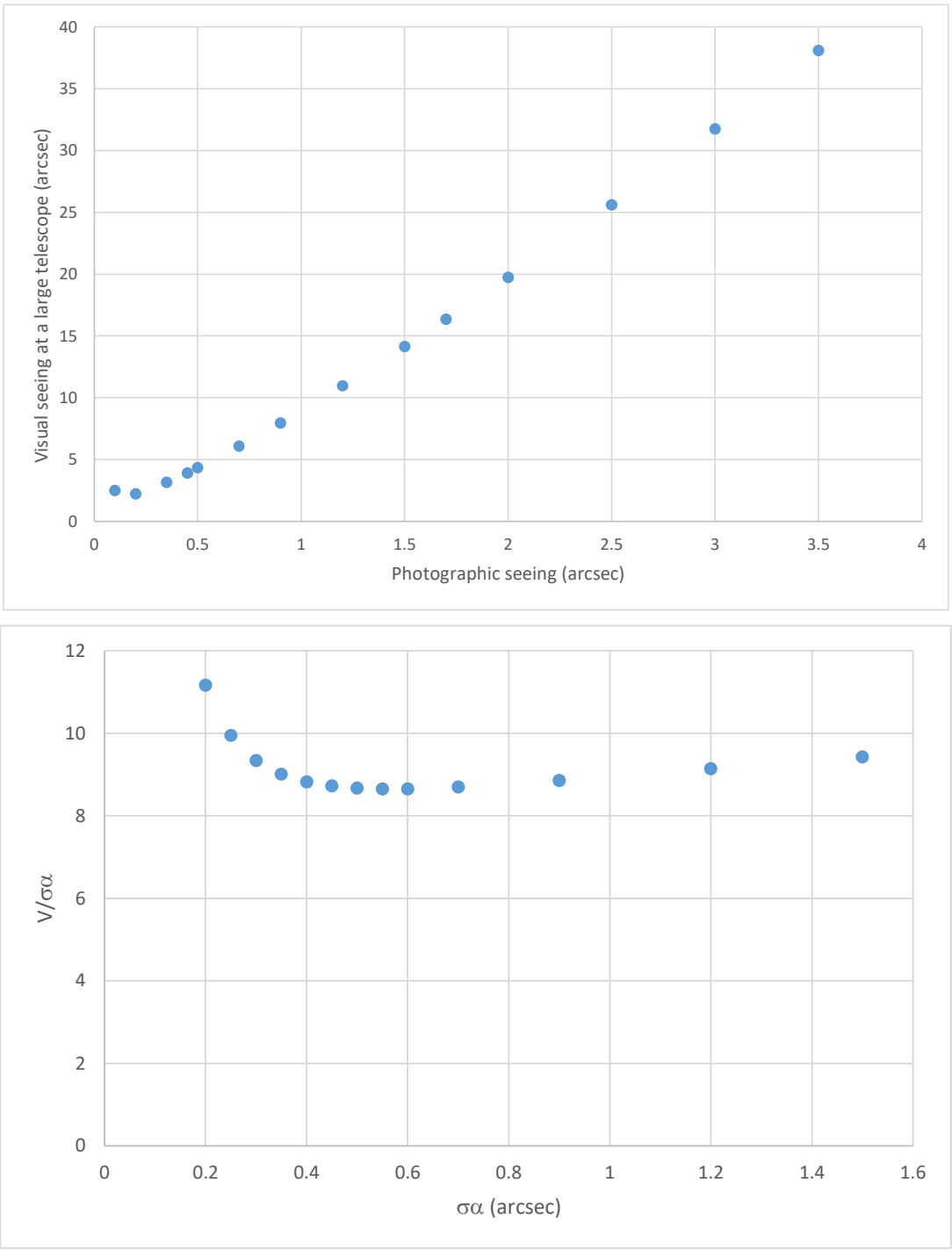


Fig. S20. Visual seeing in a large telescope as a function of photographic seeing. Visual seeing (V) and photographic seeing (σ_α) from *(50)* data (Table I) and a best-fit formula obtained by us. *Top*: the quasilinear relation ($V \sim 10\sigma_\alpha$) is evident, for values $\sigma_\alpha > 0.5''$. *Bottom*: in here we explicitly plot the V/σ_α ratio and detail the σ_α=0.45-0.70″range where a minimum is attained ($V/\sigma_\alpha \sim 8.7\sigma_\alpha$).

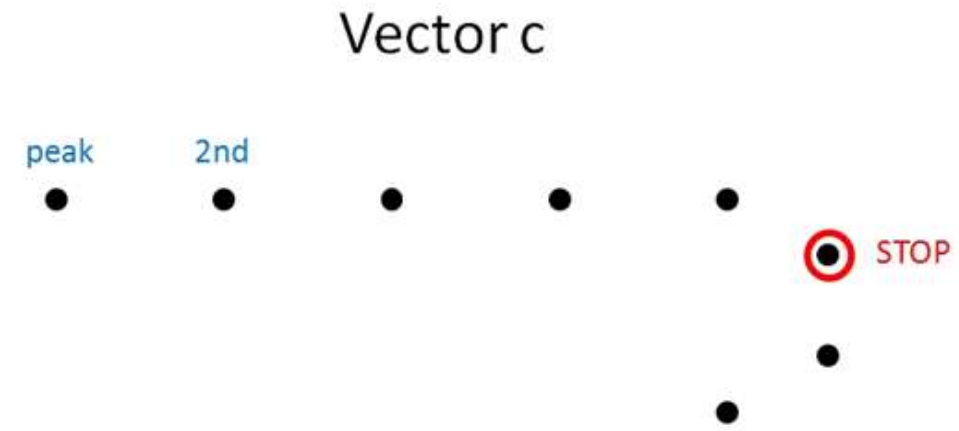
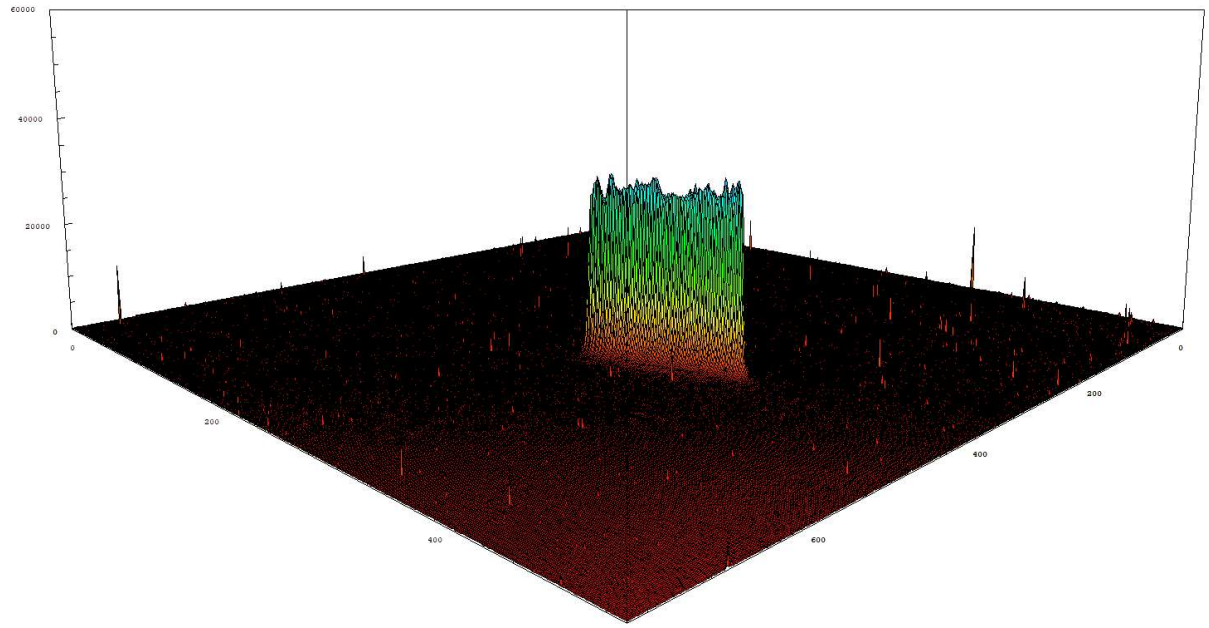
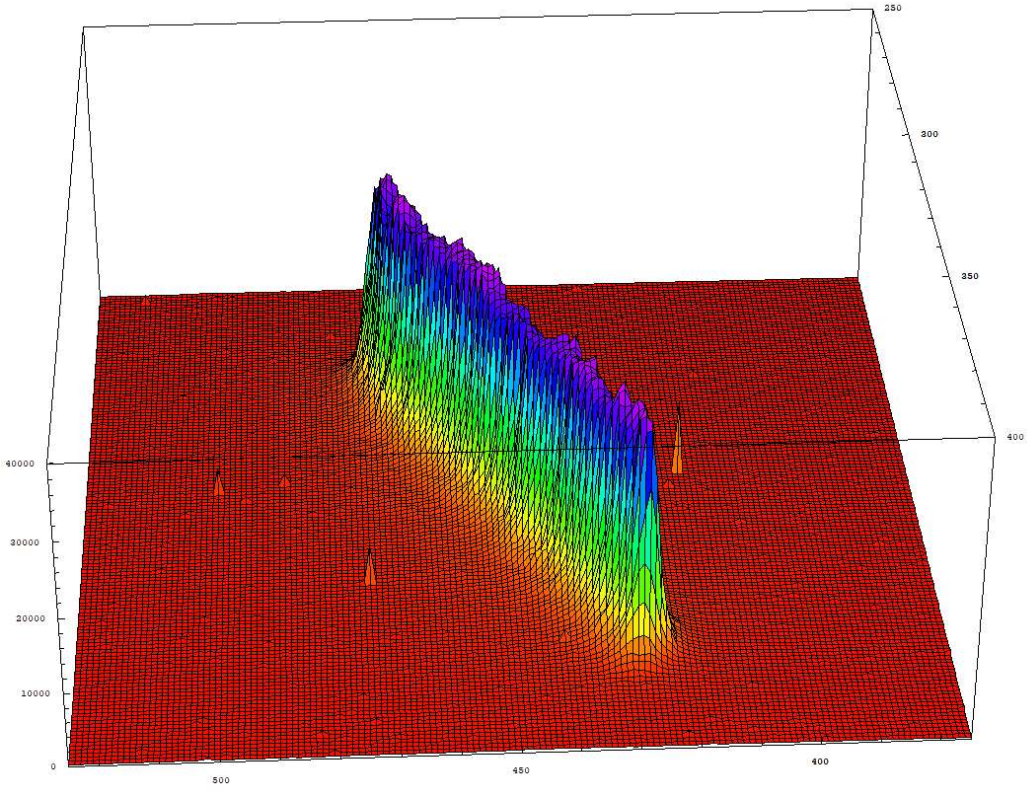


Fig. S21. The "vector-stopping" technique in the RMS method. This is detailed in the Illustrated Examples. The routine finds the Polaris path by following the brightest "ahead" pixel (one of the three, out of the eight, in that direction, coming from a given initial pixel), in succession. However, often the technique fails, with the path bending back, rendering it unphysical. In order to minimize this, we cut the path short (vector_c, in this case), exactly at the point where it starts to bend (as shown in the picture). This typically leads to using the "lobe fitting" technique, to complete the vector on that side.

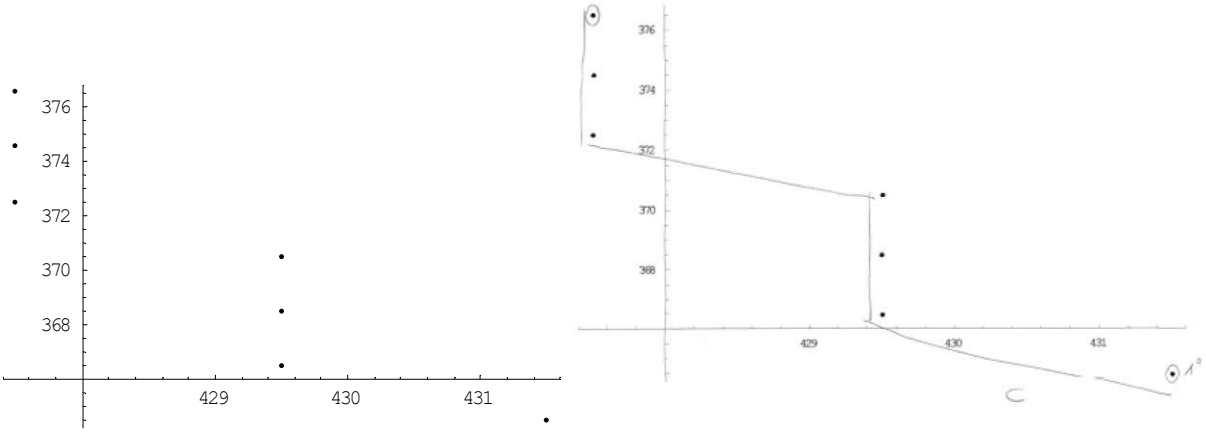


(A)

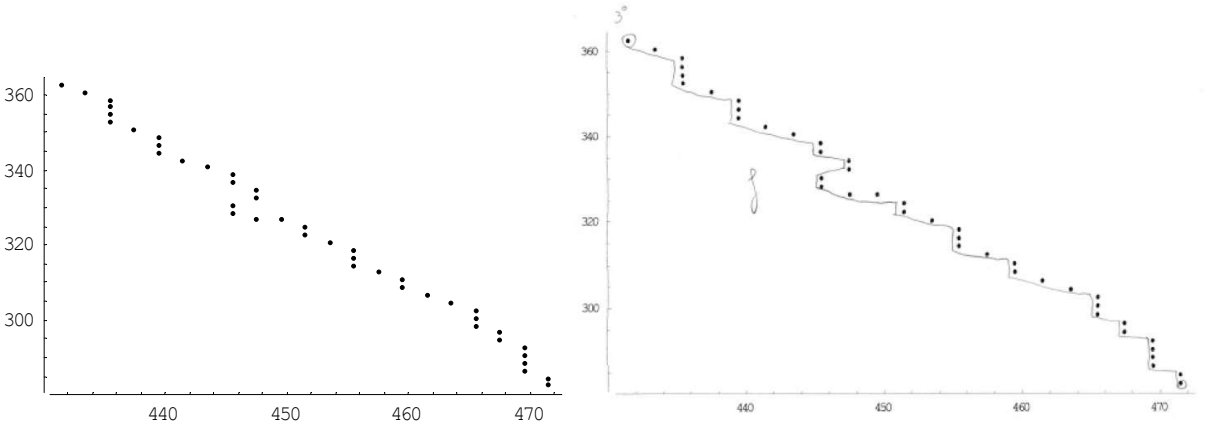
Fig. S22. The illustrated RMS data reduction process without lobe work (040708_A2 data). **(A)** The initial plot in Mathematica of the calibrated data. Note that the full CCD pixel matrix is presented (765×510) with vertical axis the ADU response of each pixel. We can easily see the Polaris path. **(B)** After an iterative process starting with (A) (Routine 2 –Data S1), we find the best viewing angle and (Δx, Δy) to clearly see the Polaris trail. Note that, in this case, Δx = Δy = 150. **(C)** *Left*: vector_c (Mathematica output). *Right*: vector_c (print out with the path, peak (the 2nd peak immediately follows, on the path), and last points hand marked). **(D)** *Left*: vector_f (Mathematica output). *Right*: vector_f (print out with the path, 1st (3rd peak), and last points hand marked). Bearing in mind the scales, note that the summation of vectors c and f (reversed = vector_g) defines the final path of Polaris (vector_h). **(E)** 1x1 pixel data, viewed from top… **(F)** …with the Polaris path superposed. **(G)** 2x2 pixel data, viewed from top… **(H)** …with the Polaris path superposed. **(I)** The intensity profile (in ADUs) of vector_h. **(J)** Vector_h (cf. (C,D)). We note that the 1st point (last in vector_c) was actually removed. **(K)** The arc of circle that best fits vector_h (the default '+' version is shown here... **(L)** … and here the '-' version). **(M, N)** The arcs of circle fitted, now seen superposed on vector_h ('+' and '-', respectively)… **(O, P)** …and upon the full calibrated data ('+' and '-', respectively). **(Q)** The fitting of a parabola to vector_h – only the curve… **(R)** …and the fit to vector_h… **(S)** …and upon the calibrated data.


250
300
350
400
40000
30000
20000
10000
0
500
450
400

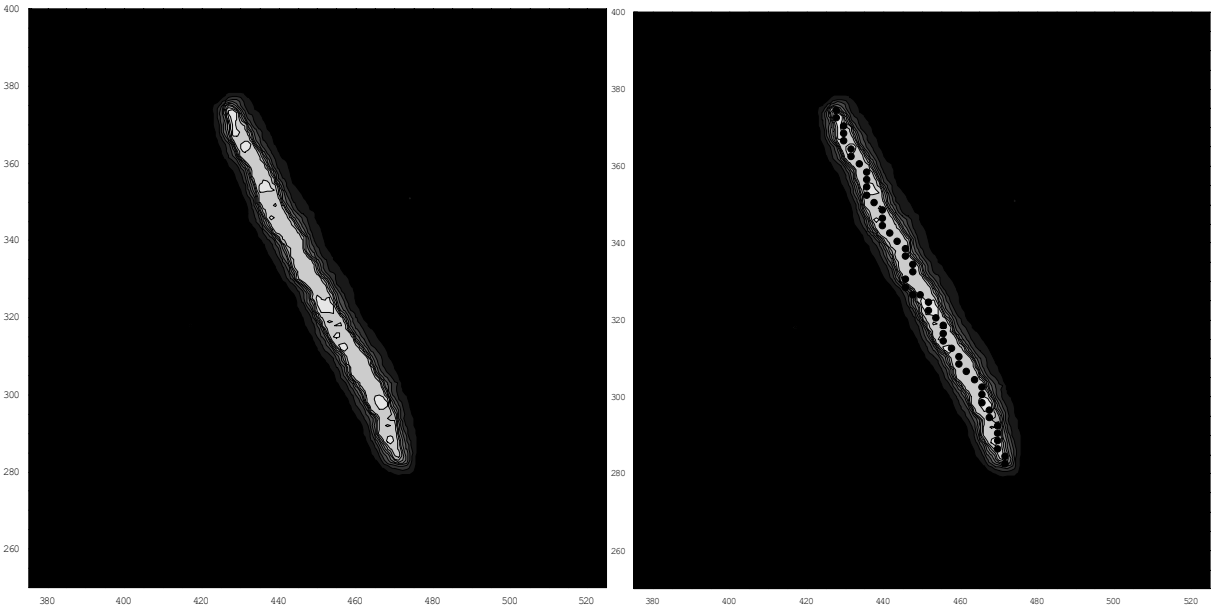
(B)


376
374
372
370
368
429
430
431

(C)


360
340
320
300
440
450
460
470

(D)


400
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360
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320
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280
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380
400
420
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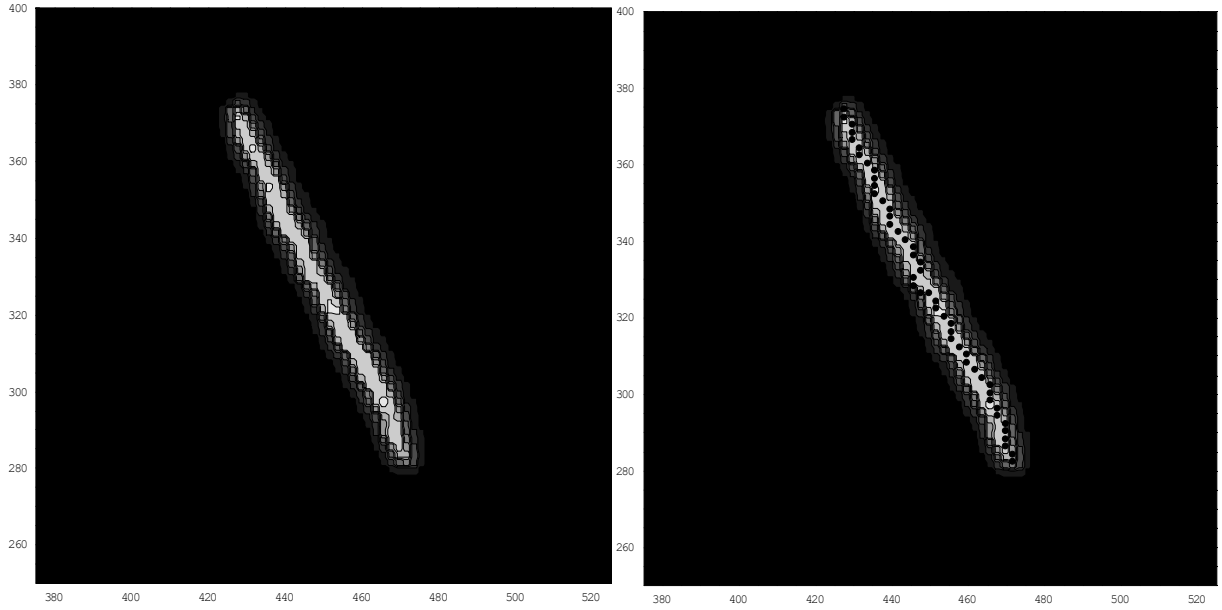
460
480
500
520

(E) **(F)**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380
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420
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460
480
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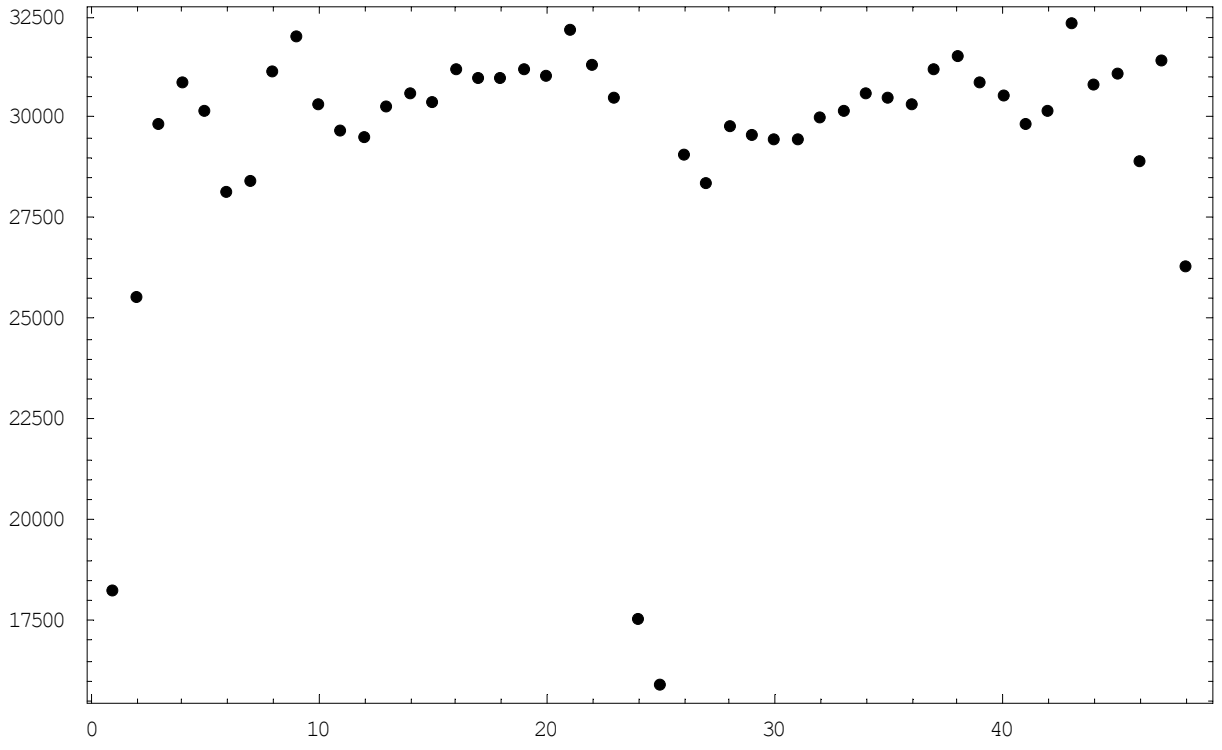
520

(G) **(H)**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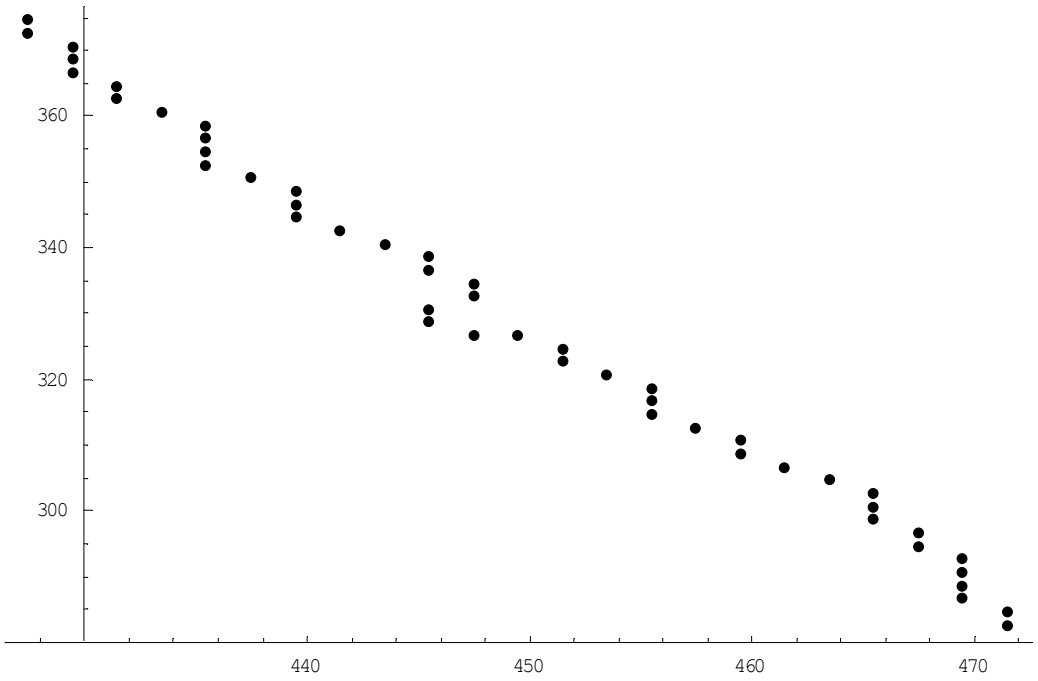
30000
27500
25000
22500
20000
17500
0
10
20
30
40

(I)


360
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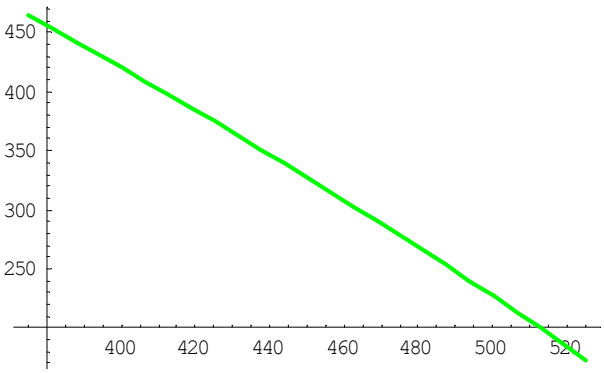
(J)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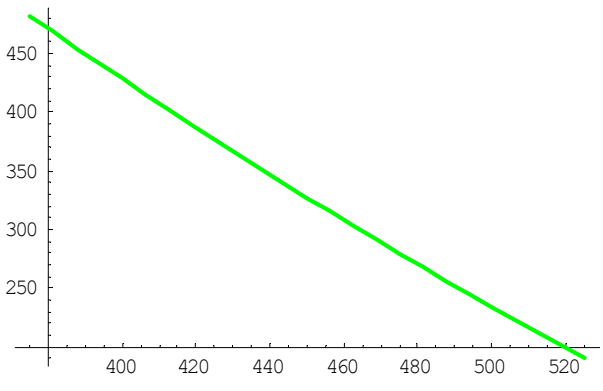
520

(K)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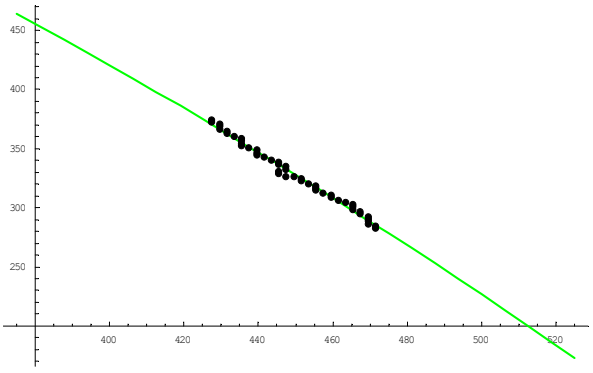
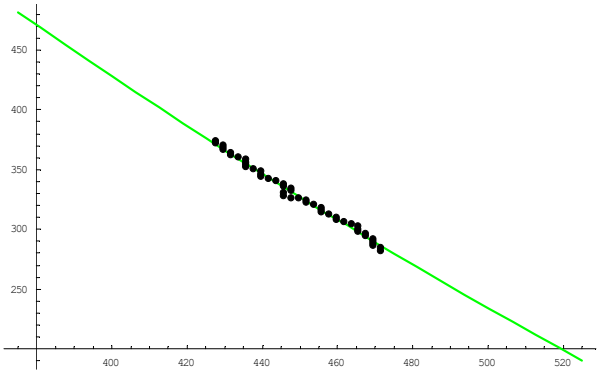
520

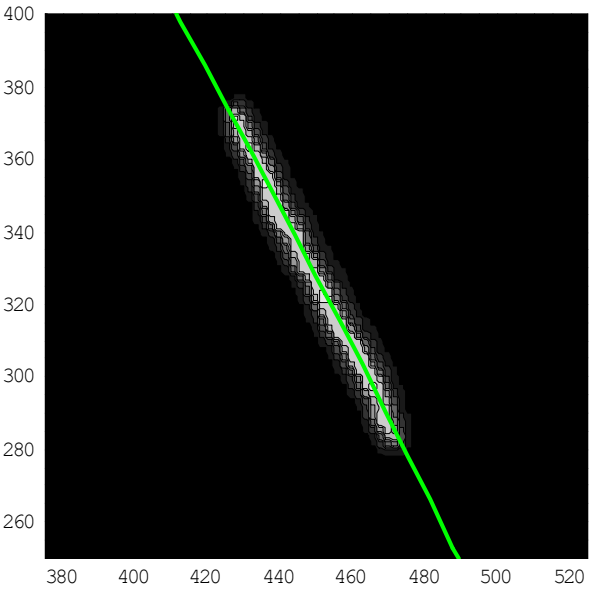
(L)



(M)



(N)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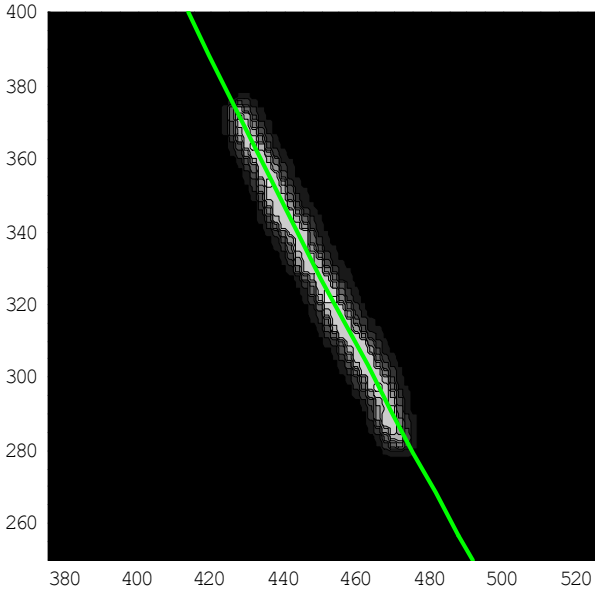
(O)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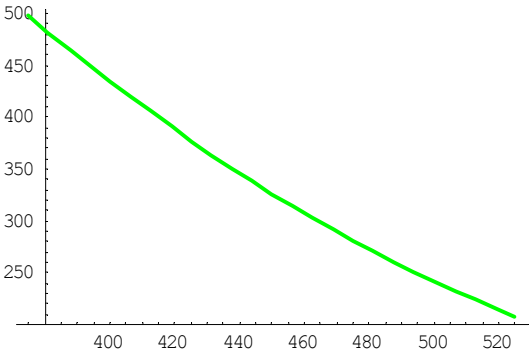
380 400 420 440 460 480 500 520

(P)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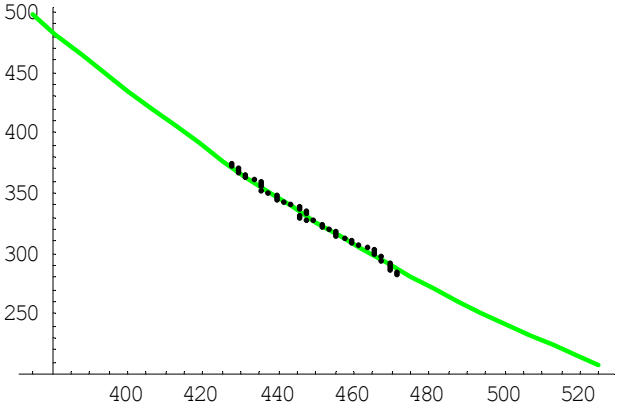
400 420 440 460 480 500 520

(Q)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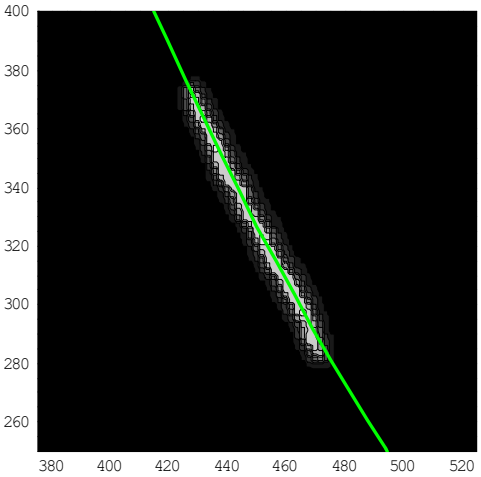
(R)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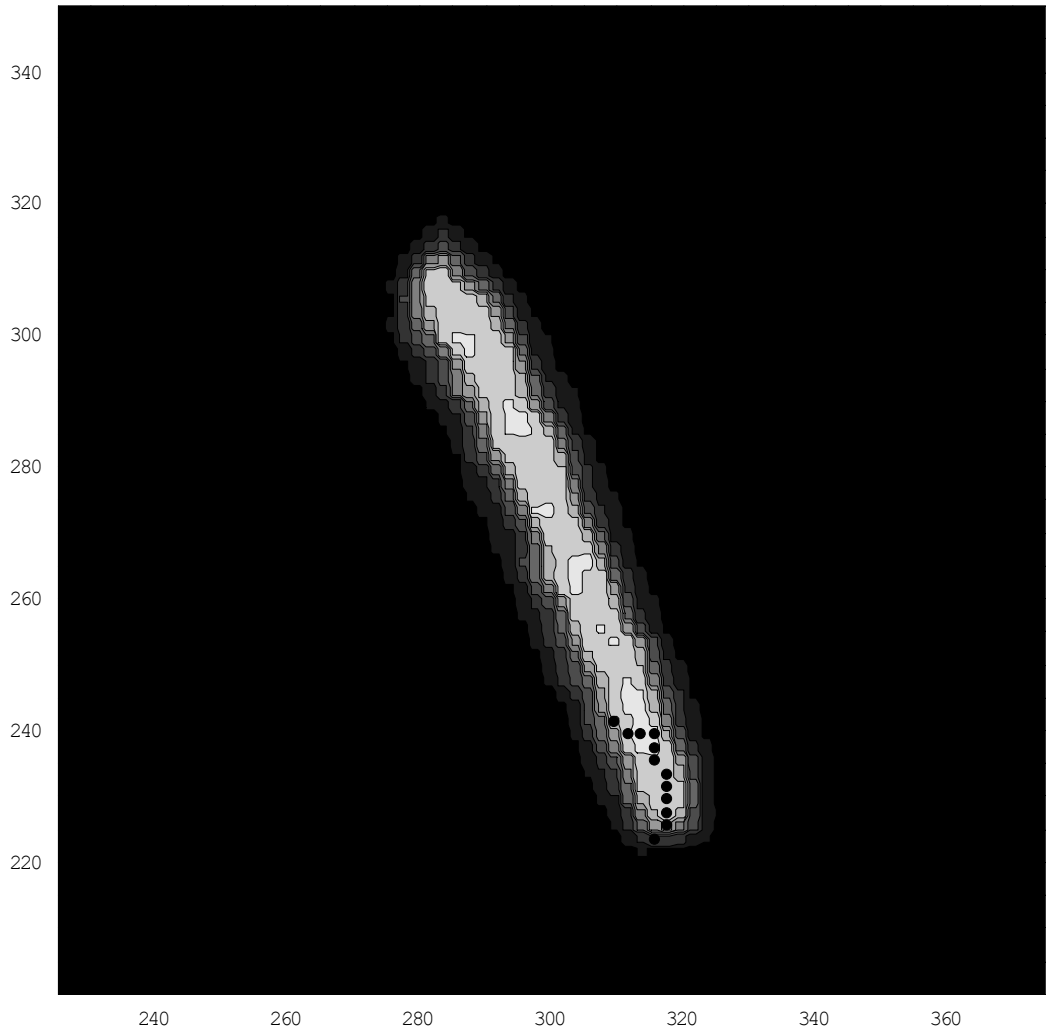
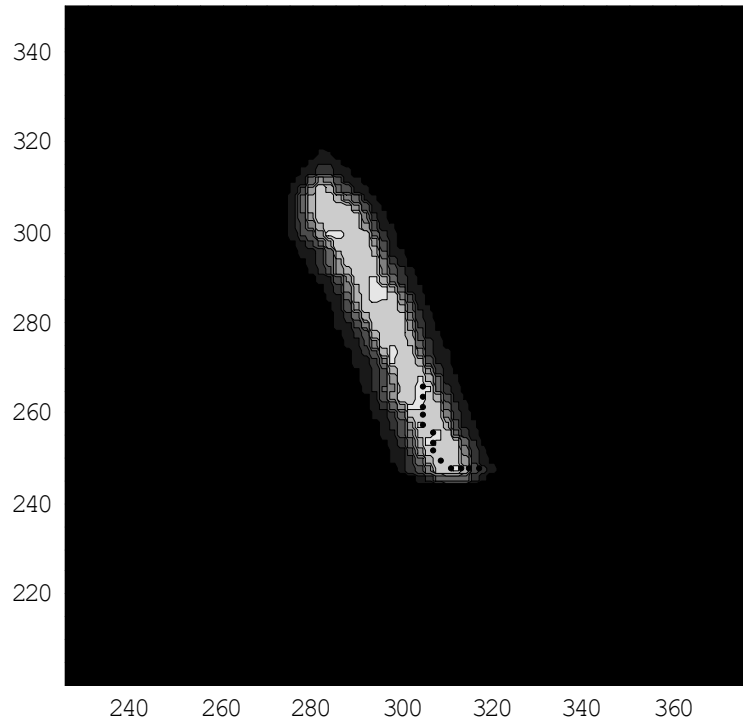
(S)



(A)

Fig. S23. The illustrated RMS data reduction process with lobe work (310708_A2 data). (A) The initial run on the 310708_A2 data gave a very short vector_h (=h1), much less than two-thirds of the total path (the 4×4 pixel plot is presented here). This is an obvious example of a lobe work candidate. Otherwise, the data would have to be discarded (as so happened with the data points in the red lines of Table S15). **(B)** After removing vector_h1, we end up with a new vector_h (called h2) in the middle of the Polaris track but that is still quite short: h1+h2 are still not enough to reach two-thirds of the track length (4×4 pixel truncated plot). **(C)** Vector_h2 in the 1×1 pixel full plot (so that we better see its relative position in relation to the track – cf. (A)). **(D)** After h1+h2 being removed, yet another run produces vector_h4, here presented in the 4×4 pixel truncated plot. **(E)** The 1×1 pixel full plot of vector_h4, where we clearly see its relative position to the track. **(F)** 1×1 pixel full plot of vector_h=h1+h2+h4 which, finally, reaches over two-thirds of the track.. **(G)** 4×4 pixel full plot of vector_h. **(H)** The intensity profile (in ADUs) of vector_h. **(I)** Vector_h=h1+h2+h4.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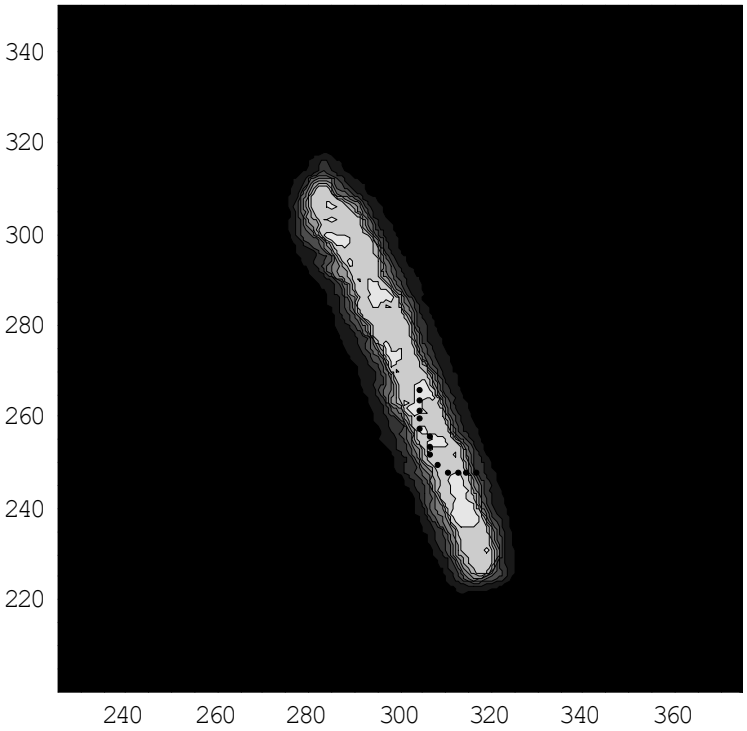
(B)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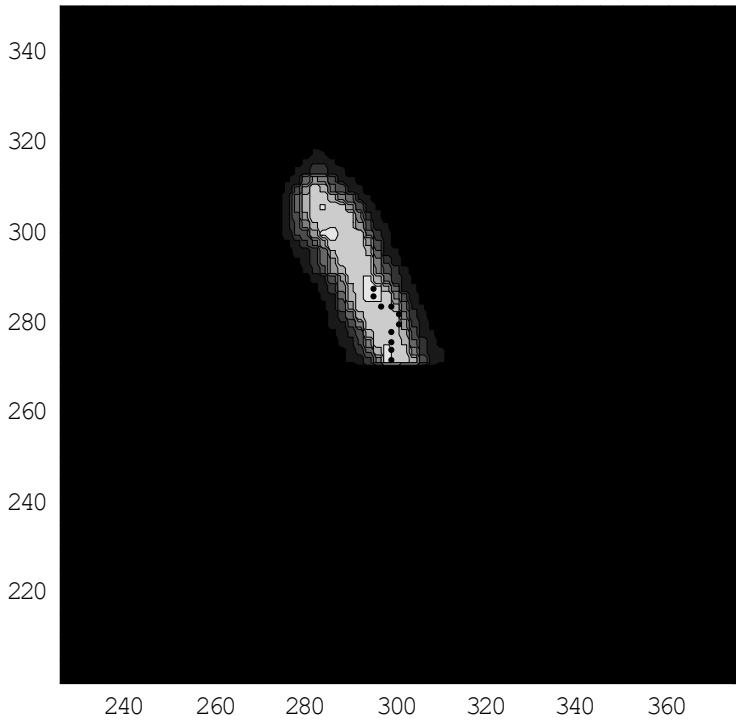
(C)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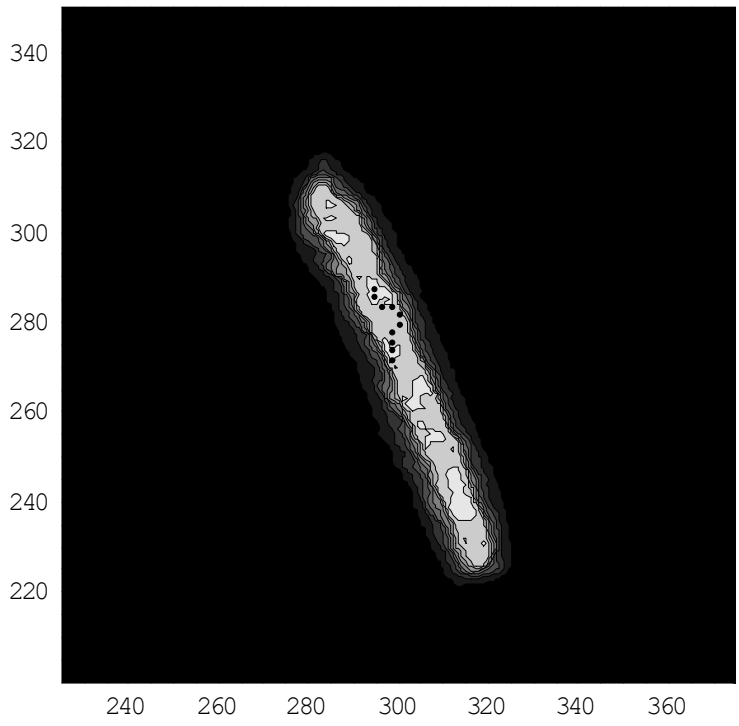
340
360

(D)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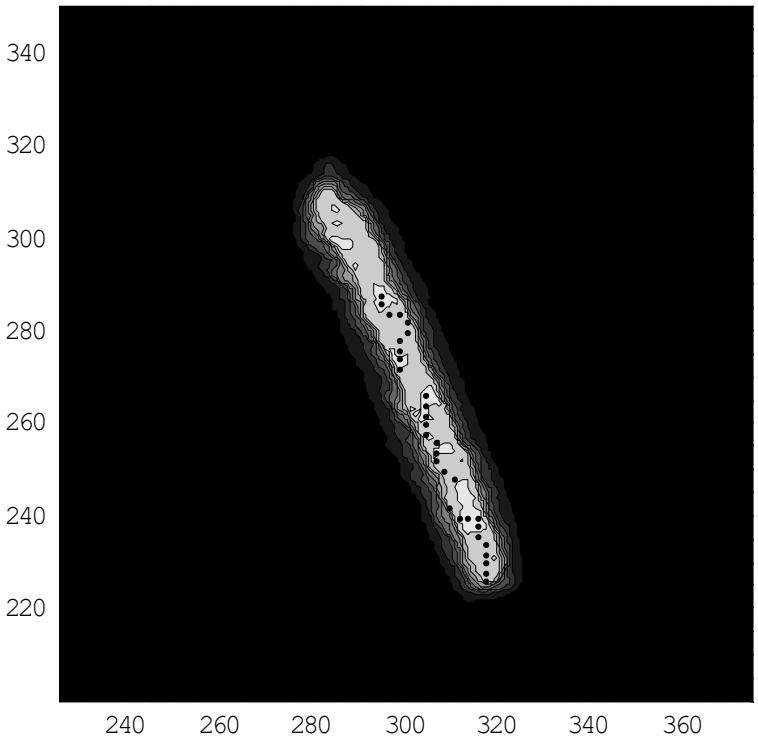
340
360

(E)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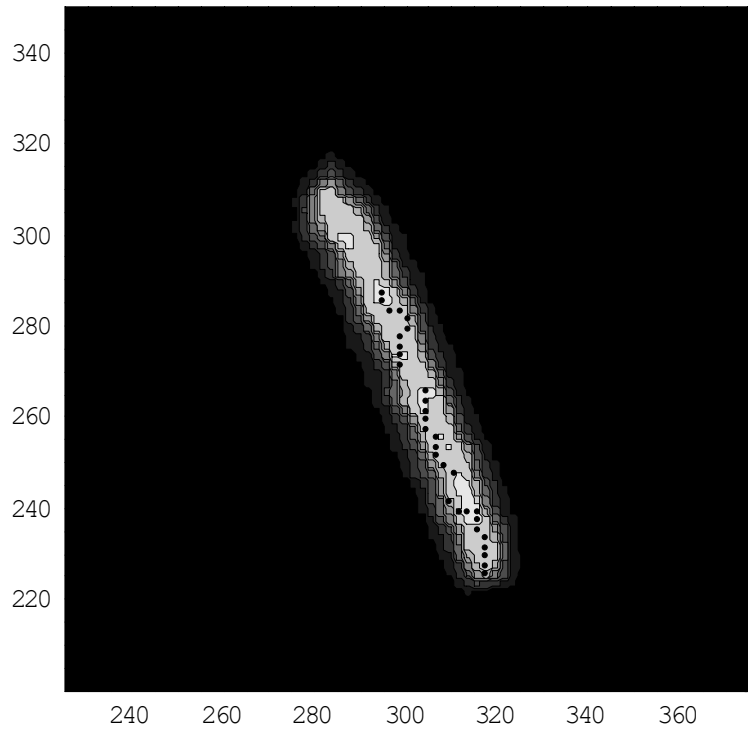
(F)


340
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300
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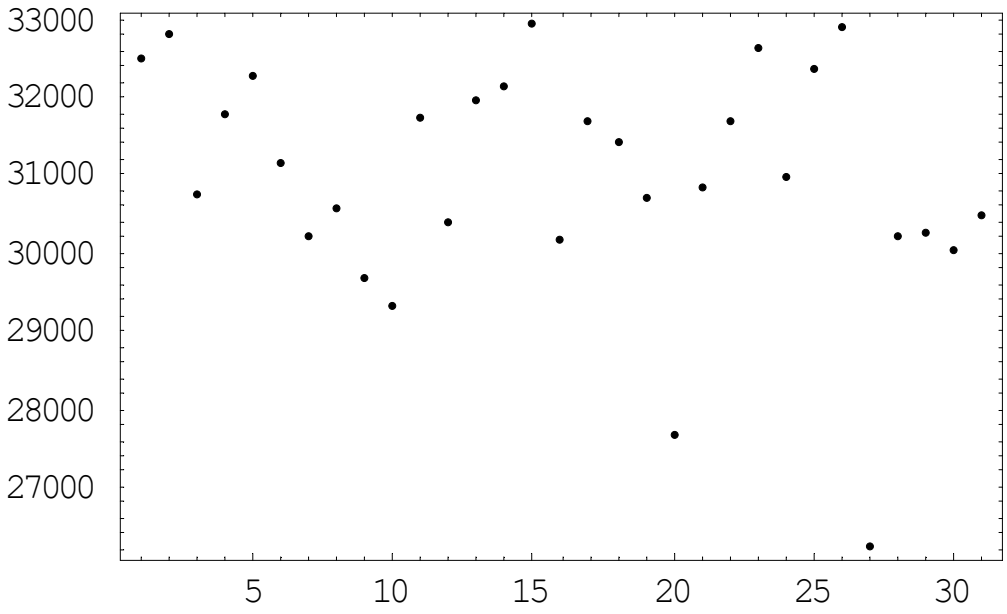
320
340
360

(G)


33000
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30000
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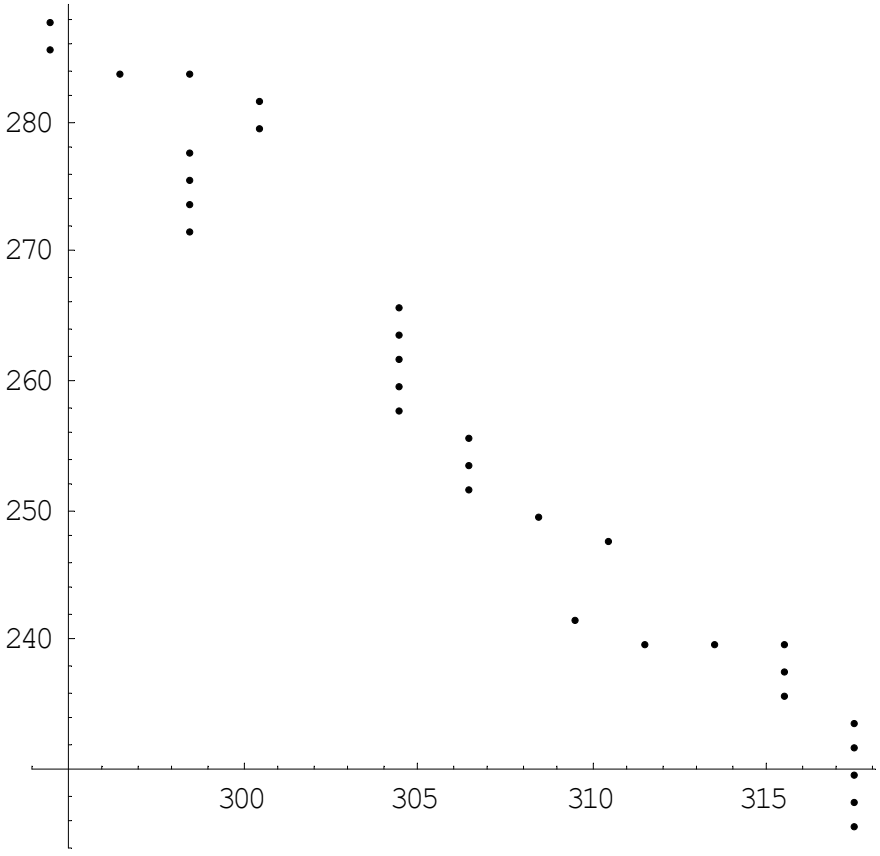
28000
27000
5
10
15
20
25
30

(H)


280
270
260
250
240
300
305
310
315

(I)

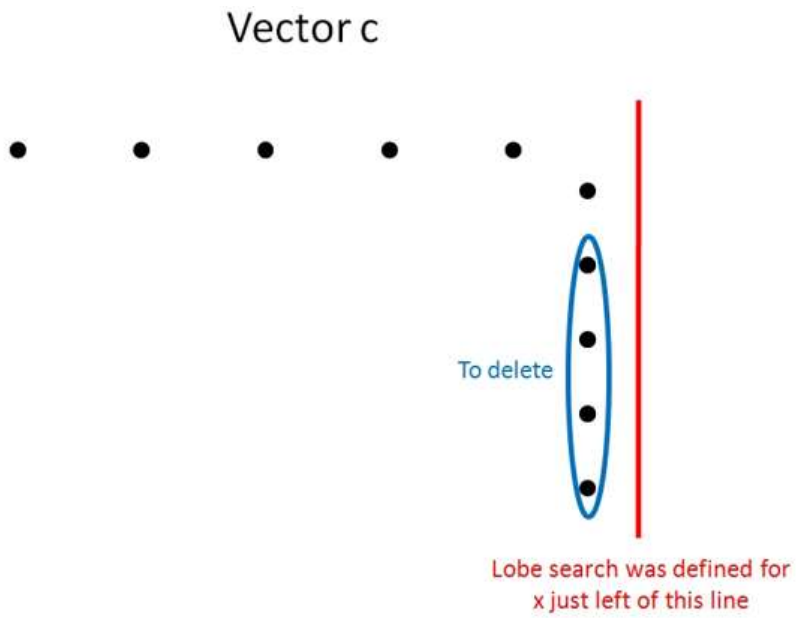


Fig. S24. The identification of points to remove in the RMS method (lobe work). When "lobe work" was performed, several points usually accumulate close to the border (where a new limit was defined): these must be removed.

Table S1. Summary of the seeing results per site, for the final 50 data points used. Columns: (1) Site code. (2) Date of observations, chronologically ordered and corresponding… (3) …observations times… (4) …weights… (5)… and seeing (in arc seconds). (6) Weighted seeing (in arc seconds), per site. (7) Number of data points used for the seeing calculation. (8) Actual initial number of observations available… (9) … and reasons for rejecting the ones missing in Column 7, if applicable: w: weight <0.70; r: "red" colour in Table 3 (rejected data points).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Site	**Dates**	**Observation times**	**weight**	**seeing (˝)**	**weighted seeing (˝)**	**n**	**n_{start}**	**reason**
A1	29/02/2008,07/03/2008,14/03/2008, 12/06/2008,27/06/2008,04/07/2008, 11/07/2008,18/07/2008,06/08/2008, 22/09/2008,04/11/2008,14/11/2008, 03/12/2008,17/12/2008,09/01/2009, 23/01/2009	21h23,21h05,20h56,21h16, 21h22,21h13,21h22,21h12, 20h51,20h55,20h17,20h49, 20h41,20h51,20h47,20h24, 21h41	0.94,0.86,0.91,0.85,0.79, 0.71,0.80,0.82,0.85,0.95, 0.90,0.88,0.71,0.93,0.94, 0.80,0.73	1.7,0.64,0.81,0.95,0.54,0.50, 0.83,0.59,0.67,0.57,0.76,1.7, 2.3,0.64,0.46,1.1,1.0	0.92	17	20	w(2), r(1)
A2	08/02/2008,07/03/2008,14/03/2008, 29/03/2008,23/04/2008,04/07/2008, 18/07/2008,31/07/2008,06/08/2008, 22/09/2008,23/01/2009	21h56,22h56,22h16,00h09, 22h58,22h34,22h38,22h18, 23h56,22h17,21h40	0.76,0.77,0.87,0.80,0.73, 0.98,0.93,0.96,0.92,0.88, 0.90	0.69,1.1,1.0,1.1,0.72,0.53,1.4, 0.37,0.47,0.64,0.70	0.78	11	13	r
B1	15/03/2008,24/04/2008,07/05/2008, 05/07/2008,01/08/2008,04/11/2008	00h40,01h17,23h11,01h02, 01h00,23h56	0.81,0.75,0.82,0.90,0.81, 0.98	1.6,1.1,0.88,0.44,0.42,0.59	0.82	6	8	r
B2	05/07/2008,13/02/2009	03h16,01h00	0.92,0.88	0.48,1.1	0.78	2	3	r
B3	05/07/2008,19/07/2008,05/11/2008, 04/12/2008	05h30,03h20,02h21,00h58	1.0,0.87,0.90,0.92	0.63,0.65,0.83,0.71	0.70	4	4	---
C1	23/09/2008,14/11/2008,10/01/2009, 20/02/2009	01h27,23h42,00h39,23h00	0.96,0.89,0.90,0.97	0.62,0.85,0.63,0.84	0.73	4	5	w
C2	08/03/2008,15/11/2008,24/01/2009	03h36,01h37,00h53	0.91,0.81,0.91	0.86,0.45,1.0	0.78	3	3	---
C3	15/11/2008,10/01/2009,24/01/2009	03h28,02h22,02h22	0.91,0.84,0.79	1.0,0.52,0.54	0.70	3	3	---

Table S2. The seven worst sky coverage identified when Polaris was observed. In all remaining situations the sky was <33% covered all the time. Columns: (1) Date. (2) Site code. (3)-(4) UT times of the first (at the beginning of the observation set up) and last (while Polaris was being exposed on the CCD) sky cover measurements. (5)-(6) Sky cover at those two moments. (7) The seeing measured.

(1) Date	(2) Site	(3) Obs. Time (UT) 1st	(4) last	(5) Cloud cover 1st	(6) last	(7) seeing (arcsec)
08/02/2008	A2	21:30	21:56	<33%	>66%	0.69
14/03/2008	A1	20:45	20:56	33-66%	33-66%	0.81
14/03/2008	A2	22:00	22:16	33-66%	33-66%	1.0
15/03/2008	B1	00:05	00:40	>66%	>66%	1.6
07/05/2008	B1	22:15	23:11	>66%	<33%	0.88
04/11/2008	B1	23:00	23:56	>66%	<33%	0.59
10/01/2009	C1	00:30	00:39	>66%	33-66%	0.63

Table S3. Astronomical classification of 23 nights, based on sites where the seeing was measured (50 data points). We here show the results for the 50 points which are used in the data analysis and discussion (weights ≥ 0.70 and not "red" in Table 3). Columns: (1) Date(s) of a single night. (2) Codes of the sites visited in the single night of Column 1. (3)-(4) UT times of the first (at the beginning of the observation set up at the first site) and last (while Polaris was being exposed on the CCD at the last site) meteorological observations made. (5) Over the full night of Column 1, the time interval between the very first observation and the last one (difference between Columns 4 and 3). (6) Combined results from Column 21 of Table 2: the most common classification was assumed as representing the "night" classification. In case of a tie, the worst outcome would be chosen (from '---', to 'Sp', to 'Ph', in order); Ph – photometric; Sp – spectroscopic; '---' neither Ph nor Sp (non-usable conditions).

(1)	(2)	(3)	(4)	(5)	(6)
Date	Sites	Obs. Time (UT)			
		1st	last	duration	night
8-feb-2008	A2	21:30	21:56	00:26	---
29-feb-2008	A1	20:30	21:23	00:53	Ph
7-8-mar-2008	A1,A2,C2	20:45	03:36	06:51	Ph
14-15-mar-2008	A1,A2,B1	20:45	00:40	03:55	Sp
29-mar-2008	A2	23:50	00:09	00:19	Ph
23-24-apr-2008	A2,B1	22:50	01:17	02:27	Ph
7-may-2008	B1	22:15	23:11	00:56	Ph
12-jun-2008	A1	20:40	21:16	00:36	Ph
27-jun-2008	A1	21:00	21:22	00:22	Ph
4-5-jul-2008	A1,A2,B1,B2,B3	20:38	05:15	08:37	Ph
11-jul-2008	A1	20:35	21:22	00:47	Ph
18-19-jul-2008	A1,A2,B3	20:55	03:20	06:25	Ph
31-jul-1-aug-2008	A2,B1	22:10	01:00	02:50	Ph
6-aug-2008	A1,A2	20:25	23:56	03:31	Ph
22-23-sep-2008	A1,A2,C1	20:40	01:27	04:47	---
4-5-nov-2008	A1,B1,B3	19:50	02:21	06:31	Ph
14-15-nov-2008	A1,C1,C2,C3	20:20	03:28	07:08	Ph
3-4-dec-2008	A1,B3	20:15	00:58	04:43	Ph
17-dec-2008	A1	20:45	20:51	00:06	---
9-10-jan-2009	A1,C1,C3	20:20	02:22	06:02	---
23-24-jan-2009	A1,A2,C2,C3	19:55	02:22	06:27	Ph
12-13-feb-2009	A1,B2	21:00	01:00	04:00	Ph
20-feb-2009	C1	22:20	23:00	00:40	Ph

Table S4. The weather measurements for sites/nights where the seeing was *not* measured (typically due to weather). The vast majority of the measurements were made from the road, not at the site (marked '*' in Column 2). See Table S5. Thus, observations were only conducted once, qualitatively (Columns 4-5) or quantitatively (2 m high). In grey lines we show the two nights when we did not move out from Funchal due to a full island wind orange alert. Columns: (1): Date. (2) Site code ('*' means that the measurements were not made at the actual site but at the nearest road access). (3) UT time when the meteorological observations were made. (4) Rain (1= no rain; 2= light rain; 3= heavy rain). (5) Cloud Cover (1= less than 33% of the sky covered; 2= 33-66% sky coverage; 3= more than 66% sky coverage). (6) Wind speed (from the maximum gust recorded), in meters per second, 2 m high. (7) Relative air humidity (HR), in percentage, 2 m high. (8) Air temperature (T), in degrees centigrade, 2 m high. (9) Classification of the observation according to sky and environment conditions: Ph – photometric; Sp – spectroscopic; '---' neither Ph nor Sp (non-usable conditions); UPh – the night could be photometric at the actual site (unknown).

(1) Date	(2) Site	(3) Obs. Time (UT)	(4) Rain	(5) Cloud Cover	(6) v (m/s) 2 m	(7) HR (%) 2 m	(8) T (°C) 2 m	(9) night
01/02/2008	A2*	21:15	1	1	0.0	90.4	0.5	---
01/02/2008	B1*	22:50	2	3	4.1	89.9	1.8	---
01/02/2008	B2*	23:35	—	3	—	—	—	---
01/02/2008	B3*	23:35	—	3	—	—	—	---
08/02/2008	A1*	21:00	1	2	20.6	17.8	8.3	---
09/02/2008	C1*	01:50	1	3	7.7	26.0	9.7	---
09/02/2008	C2*	02:00	1	3	10.3	27.2	8.1	---
09/02/2008	C3*	02:10	1	3	5.2	24.3	9.0	---
15/02/2008	A1*	20:40	2	3	14.0	100.0	6.1	---
15/02/2008	A2*	21:00	2	3	15.1	100.0	7.6	---
15/02/2008	B1*	22:17	3	3	9.6	100.0	7.4	---
15/02/2008	B2*	22:30	—	3	—	—	—	---
15/02/2008	B3*	22:30	—	3	—	—	—	---
22/02/2008	A1*	21:05	3	3	3.7	75.0	5.0	---
22/02/2008	A2*	21:10	1	3	0.9	72.4	4.7	---
22/02/2008	C1*	22:30	3	3	3.3	88.0	4.3	---
22/02/2008	C2*	23:00	2	3	3.6	92.0	3.2	---
22/02/2008	C3*	23:20	1	3	4.6	93.7	3.1	---
08/03/2008	C3*	04:30	1	1	0.0	6.4	6.6	Ph
15/03/2008	B3*	03:15	2	3	2.6	90.3	5.9	---
20/03/2008	A1*	19:45	2	3	8.7	80.0	3.0	---
20/03/2008	A2*	20:05	3	3	6.1	84.0	4.6	---
20/03/2008	C1*	21:35	2	3	11.7	90.9	3.7	---
20/03/2008	C2*	21:50	3	3	15.5	91.5	3.8	---
20/03/2008	C3*	22:05	1	3	8.5	94.3	3.3	---
29/03/2008	B2*	02:45	—	1	—	—	—	UPh
29/03/2008	B3*	02:45	—	1	—	—	—	UPh
04/04/2008	A1	20:30	2	3	14.7	87.5	6.2	---
04/04/2008	A2*	21:05	1	3	9.8	91.6	5.7	---
04/04/2008	C2*	23:40	2	3	14.6	86.8	6.3	---
04/04/2008	C3*	23:50	1	3	15.8	92.9	5.6	---

(1) Date	(2) Site	(3) Obs. Time (UT)	(4) Rain	(5) Cloud Cover	(6) v (m/s) 2 m	(7) HR (%) 2 m	(8) T (°C) 2 m	(9) night
08/04/2008	wind orange alert (for the whole island)							
18/04/2008	A1	20:15	1	3	0.0	84.3	3.7	---
18/04/2008	C1*	23:45	1	3	9.8	85.1	4.7	---
19/04/2008	C2*	00:00	2	3	10.1	91.4	4.1	---
19/04/2008	C3*	00:10	2	3	9.3	91.2	4.3	---
24/04/2008	B2*	02:30	—	1	—	—	—	UPh
24/04/2008	B3*	02:30	—	1	—	—	—	UPh
02/05/2008	A1	21:35	1	3	14.0	37.5	8.7	---
02/05/2008	A2*	22:05	1	2	10.0	63.3	9.3	Sp
02/05/2008	C1*	23:35	1	3	5.1	91.6	10.5	---
02/05/2008	C2*	23:50	1	3	10.2	90.7	8.6	---
03/05/2008	C3*	00:00	2	3	15.3	92.7	8.9	---
07/05/2008	A1	20:35	1	3	5.3	88.0	7.2	---
07/05/2008	A2	21:45	1	3	3.1	78.8	8.2	---
08/05/2008	B2*	00:30	—	3	—	—	—	---
08/05/2008	B3*	00:30	—	3	—	—	—	---
14/05/2008	A1	21:35	1	3	9.9	66.0	6.9	---
14/05/2008	A2*	22:05	1	3	2.9	63.2	8.6	---
14/05/2008	C1*	23:40	1	3	5.0	65.9	7.8	---
14/05/2008	C2*	23:55	1	3	2.5	74.7	6.2	---
15/05/2008	C3*	00:10	1	3	10.5	77.2	5.9	---
23/05/2008	A1*	20:30	2	3	8.3	90.0	5.9	---
23/05/2008	A2	21:40	1	3	7.2	86.4	7.3	---
23/05/2008	B1*	23:20	1	3	13.7	92.7	6.5	---
23/05/2008	B2*	23:30	—	3	—	—	—	---
23/05/2008	B3*	23:30	—	3	—	—	—	---
02/06/2008	A1*	20:40	2	3	5.7	89.1	9.4	---
02/06/2008	A2*	20:50	2	3	4.2	89.7	10.7	---
02/06/2008	C1*	22:10	2	3	8.2	88.9	11.1	---
02/06/2008	C2*	22:30	2	3	7.1	89.1	10.6	---
02/06/2008	C3*	22:40	3	3	5.1	93.6	9.9	---
06/06/2008	A2*	23:35	1	3	6.2	91.8	7.4	---
07/06/2008	B1*	01:00	2	3	11.3	93.8	7.3	---
07/06/2008	B2*	01:10	—	3	—	—	—	---
07/06/2008	B3*	01:10	—	3	—	—	—	---
13/06/2008	C1*	02:55	1	1	1.9	24.5	9.7	Ph
13/06/2008	C2*	03:05	1	1	2.3	24.1	8.1	Ph
13/06/2008	C3*	03:20	1	1	0.9	21.6	11.1	Ph
18/06/2008	A2*	23:40	1	1	0.6	20.4	9.4	Ph
19/06/2008	B1*	00:50	1	1	1.9	9.3	13.1	Ph
19/06/2008	B2*	01:00	—	1	—	—	—	UPh
19/06/2008	B3*	01:00	—	1	—	—	—	UPh
28/06/2008	C1*	02:15	1	1	0.0	15.6	16.1	Ph
28/06/2008	C2*	02:30	1	1	0.0	8.0	18.3	Ph
28/06/2008	C3*	02:35	1	1	1.4	4.9	18.5	Ph
12/07/2008	C1*	02:30	2	3	7.3	94.6	13.1	---
12/07/2008	C2*	02:20	2	3	2.5	93.6	12.1	---

(1) Date	(2) Site	(3) Obs. Time (UT)	(4) Rain	(5) Cloud Cover	(6) v (m/s) 2 m	(7) HR (%) 2 m	(8) T (°C) 2 m	(9) night
12/07/2008	C3*	02:30	2	3	6.1	93.8	12.3	---
25/07/2008	A2*	23:25	1	1	0.0	32.3	15.3	Ph
26/07/2008	C1*	00:50	1	1	1.4	39.8	12.9	Ph
26/07/2008	C2*	01:00	1	1	1.5	39.5	13.6	Ph
26/07/2008	C3*	01:15	1	1	1.5	33.4	15.6	Ph
07/08/2008	C2*	04:30	1	1	2.6	13.6	15.1	Ph
07/08/2008	C3*	04:40	1	1	2.8	16.9	13.4	Ph
15/08/2008	A1	22:25	1	1	6.3	10.1	17.1	Ph
15/08/2008	A2	23:15	1	1	6.4	37.3	15.3	Ph
16/08/2008	B1	00:45	1	1	1.8	58.8	15.2	Ph
16/08/2008	B3*	01:00	—	1	—	—	—	UPh
22/08/2008	A1*	21:55	1	3	14	85.8	11.5	---
22/08/2008	A2*	22:10	1	3	3.7	95.0	11.8	---
22/08/2008	C1	23:45	1	1	10.3	61.0	14.2	Ph
23/08/2008	C2*	00:30	1	3	2	93.4	11.3	---
23/08/2008	C3*	00:45	1	3	8	95.2	11.1	---
29/08/2008	A1	21:50	1	1	4.1	70.4	9.8	Ph
29/08/2008	A2	22:45	1	1	2.1	80.4	9.8	Ph
30/08/2008	B1	00:25	1	1	8.8	86.2	9.8	Ph
30/08/2008	B2*	00:40	—	1	—	—	—	UPh
05/09/2008	A1*	21:40	1	3	3.2	93.7	12.2	---
05/09/2008	A2	22:05	1	3	1.7	95.0	12.8	---
05/09/2008	C1*	23:50	2	3	3.8	94.4	14.4	---
06/09/2008	C2*	00:10	2	3	4	96.6	13.4	---
06/09/2008	C3*	00:30	2	3	3.7	96.0	12.8	---
12/09/2008	A1*	21:20	1	3	9.9	93.7	6.9	---
12/09/2008	A2*	21:30	1	3	14.6	97.0	8.6	---
12/09/2008	B1*	22:35	1	3	4	96.8	7.1	---
12/09/2008	B3*	22:40	—	3	—	—	—	---
23/09/2008	C3*	05:40	1	1	0.0	95.8	8.4	---
26/09/2008	A1*	20:50	2	3	0.0	90.8	10.7	---
26/09/2008	A2*	21:10	3	3	0.0	90.4	10.4	---
26/09/2008	B2*	23:30	—	3	—	—	—	---
03/10/2008	A1*	20:15	2	3	12.1	94.3	6.9	---
03/10/2008	A2*	20:30	2	3	14.1	94.4	8.6	---
03/10/2008	C1	22:25	2	3	2.1	80.5	9.4	---
03/10/2008	C2*	22:55	2	3	8.4	95.8	8.7	---
03/10/2008	C3*	23:05	1	3	11.4	97.3	8.1	---
10/10/2008	A1*	20:05	1	2	28.4	94.1	4.9	---
10/10/2008	A2	20:25	1	3	10.8	99.2	6.2	---
10/10/2008	B1*	21:45	1	3	12.2	100.0	7.9	---
10/10/2008	B3*	22:00	1	3	---	---	---	---
17/10/2008	A1*	20:25	2	3	5.0	100.0	10.1	---
17/10/2008	A2*	20:45	2	3	2.1	95.0	11.8	---
17/10/2008	C1*	22:30	2	3	7.8	100.0	11.5	---
17/10/2008	C2*	23:15	1	3	1.5	100.0	10.6	---
17/10/2008	C3*	23:25	1	3	7.4	100.0	10.6	---

(1) Date	(2) Site	(3) Obs. Time (UT)	(4) Rain	(5) Cloud Cover	(6) v (m/s) 2 m	(7) HR (%) 2 m	(8) T (°C) 2 m	(9) night
22/10/2008	A1*	21:25	1	3	18.0	98.5	2.8	---
22/10/2008	A2*	21:40	1	3	13.9	100.0	5.0	---
22/10/2008	B1*	22:45	2	3	10.0	100.0	5.1	---
22/10/2008	B2*	23:00	2	3	---	---	---	---
31/10/2008	wind orange alert (for the whole island)							
14/11/2008	A2*	21:30	1	3	2.3	100.0	4.2	---
18/11/2008	A1	20:40	1	3	12.8	100.0	4.1	---
18/11/2008	A2*	21:00	1	3	5.0	100.0	8.0	---
18/11/2008	B1*	22:05	1	3	4.7	100.0	5.5	---
18/11/2008	B2*	22:20	1	3	---	---	---	---
29/11/2008	C2	03:25	1	3	7.9	100.0	3.1	---
29/11/2008	C3*	03:55	2	3	8.0	100.0	3.9	---
03/12/2008	A2	21:30	1	3	7.1	100.0	1.6	---
03/12/2008	B1*	22:55	1	3	4.3	100.0	2.2	---
12/12/2008	A1*	20:20	1	3	11.0	100.0	0.2	---
12/12/2008	A2*	20:35	1	3	9.1	100.0	2.1	---
12/12/2008	C1	22:15	1	3	14.2	100.0	2.9	---
12/12/2008	C2*	22:35	1	3	12.4	100.0	2.7	---
12/12/2008	C3*	22:45	1	3	12.8	100.0	2.6	---
17/12/2008	A2	22:05	2	3	5.2	100.0	3.6	---
17/12/2008	B1*	23:15	2	3	1.6	100.0	4.1	---
17/12/2008	B2*	23:30	---	3	---	---	---	---
26/12/2008	A1*	20:20	3	3	9.2	80.5	2.4	---
26/12/2008	A2*	20:35	3	3	4.3	100.0	4.6	---
26/12/2008	C1*	22:00	2	3	5.0	82.4	6.8	---
26/12/2008	C2*	22:18	2	3	11.4	100.0	4.3	---
26/12/2008	C3*	22:30	2	3	11.2	100.0	4.6	---
05/01/2009	A1*	20:15	2	3	11.1	100.0	2.6	---
05/01/2009	A2*	20:25	2	3	5.4	100.0	4.1	---
05/01/2009	B1*	21:25	2	3	12.3	100.0	4.3	---
05/01/2009	B3*	21:40	2	3	---	---	---	---
10/01/2009	C2*	01:30	1	3	1.3	95.8	4.2	---
19/01/2009	A1*	20:20	3	3	21.3	100.0	6.1	---
19/01/2009	A2*	20:30	2	3	2.6	100.0	7.7	---
19/01/2009	B1*	21:30	2	3	18.6	100.0	5.1	---
19/01/2009	B2*	21:45	3	3	---	---	---	---
30/01/2009	A1*	20:20	4	3	2.2	92.2	-1.7	---
30/01/2009	A2*	20:40	4	3	7.2	91.9	-0.2	---
30/01/2009	B1*	21:45	1	3	11.0	100.0	-0.3	---
30/01/2009	B3*	22:00	1	3	---	---	---	---
06/02/2009	C1*	23:05	2	3	11.0	97.4	2.1	---
06/02/2009	C2*	23:20	2	3	9.8	100.0	1.4	---
06/02/2009	C3*	23:30	2	3	10.4	100.0	1.2	---
12/02/2009	A2*	22:15	2	3	1.4	92.9	2.7	---
12/02/2009	B1*	23:20	1	3	4.5	100.0	2.3	---
20/02/2009	A1*	20:25	2	3	1.9	82.3	0.6	---

(1) Date	(2) Site	(3) Obs. Time (UT)	(4) Rain	(5) Cloud Cover	(6) v (m/s) 2 m	(7) HR (%) 2 m	(8) T (°C) 2 m	(9) night
20/02/2009	A2*	20:40	2	3	1.1	85.0	1.4	---
21/02/2009	C3*	03:00	1	1	3.1	96.5	0.1	---
27/02/2009	A1*	21:35	2	3	4.5	92.5	3.2	---
27/02/2009	A2*	21:45	2	3	2.1	93.8	4.3	---
27/02/2009	B1*	23:05	2	3	5.1	94.6	4.4	---
27/02/2009	B3*	23:20	---	3	---	---	---	---
05/03/2009	A1*	20:45	2	3	12.2	94.4	0.9	---
05/03/2009	A2*	20:55	2	3	8.9	98.5	2.3	---
05/03/2009	C1*	22:10	2	3	13.5	100.0	4.1	---
05/03/2009	C2*	22:35	2	3	13.5	100.0	2.9	---
05/03/2009	C3*	22:45	1	3	15.2	100.0	2.4	---

Table S5. The weather results for sites/nights where the seeing was *not* measured or calculated due to unforeseen circumstances. The seeing was either actually not calculated (outside the 50 data points used in the data analysis and discussion) or everything was ready for the Polaris exposure but some circumstance prevented it (technical or weather). The data were all gathered at the actual sites. See Table S4. Up to four observations were conducted of each meteorological variable, two upon arrival at the site ("1st"; ground level and 2m high) and two "last" ones (ground level and 2m high) when the seeing exposure was supposed to be made (but it was not). Columns: (1): Date. (2) Site code. (3)-(4) UT times of the first (at the beginning of the observation set up) and last (when Polaris was supposed to be exposed on the CCD) meteorological observations made. (5)-(6) Rain (1= no rain; 2= light rain; 3= heavy rain). (7)-(8) Cloud Cover (1= less than 33% of the sky covered; 2= 33-66% sky coverage; 3= more than 66% sky coverage). (9)-(12) Wind speed values (from the maximum gust recorded), in meters per second. (13)-(16) Relative air humidity (HR), in percentage. (17)-(20) Air temperature (T), in degrees centigrade. (21) Classification of the observation according to sky and environment conditions: Ph – photometric; Sp – spectroscopic; '---' neither Ph nor Sp (unusable conditions). (22) The reason why seeing was not measured (see Methods): T-PC – technical problem: PC battery ran out; T-CCD – technical problem: CCD blockage; T-cond – technical problem: condensation; T-soft – technical problem: software failure; T-USB – technical problem: cable failure; C – weather: clouds; C+R – weather: clouds and rain; w – data reduction: weight < 0.70; r – data reduction: "red" in Table 3.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		Obs. Time		Rain		Cloud Cover		Maximum gust (m/s)				Relative air humidity (%)				Air temperature (°C)					
								1st		last		1st		last		1st		last			
Date	Site	UT																		night	reason
		1st	last	1st	last	1st	last	ground	2m	ground	2m	ground	2m	ground	2m	ground	2m	ground	2m		
01/02/2008	A1	20:30	20:45	1	1	1	1	0.9	2.3	7.5	7.8	43.1	40.5	44.0	41.7	3.4	3.7	2.5	3.5	Ph	T-PC
08/03/2008	C1	01:15	01:30	1	1	1	1	1.0	1.9	0.8	2.1	19.2	10.9	23.9	14.6	6.0	7.6	4.2	7.3	Ph	w
15/03/2008	B2	01:35	—	1	—	3	—	3.8	5.9	—	—	87.2	88.2	—	—	5.4	5.1	—	—	---	C
28/03/2008	A1	21:50	22:44	1	1	1	1	2.8	7.2	4.6	8.9	27.0	23.0	29.7	24.1	5.4	6.3	5.7	6.8	Ph	r
29/03/2008	B1	02:29	—	1	—	1	—	1.9	4.1	—	—	30.1	21.1	—	—	4.4	6.3	—	—	Ph	T-CCD
04/04/2008	C1	23:00	—	2	—	3	—	1.7	4.1	—	—	92.3	92.6	—	—	6.4	6.3	—	—	---	C
18/04/2008	A2	21:15	—	1	—	2	—	4.2	6.6	—	—	91.0	91.8	—	—	3.4	4.2	—	—	---	T-cond
23/04/2008	A1	22:34	—	1	—	2	—	8.3	10.7	—	—	65.4	66.7	—	—	6.7	6.4	—	—	Sp	T-CCD
06/06/2008	A1	22:00	—	1	—	1	—	14.9	17.7	—	—	36.3	36.6	—	—	10.3	10.2	—	—	---	C
12/06/2008	A2	23:30	—	1	—	1	—	0.9	2.7	—	—	49.0	42.6	—	—	9.3	10.4	—	—	Ph	T-soft
18/06/2008	A1	21:25	—	1	—	1	—	4.5	6.5	—	—	11.9	5.9	—	—	11.4	11.5	—	—	Ph	T-soft
27/06/2008	A2	23:30	—	1	—	1	—	3.7	4.2	—	—	10.1	3.2	—	—	18.2	21.6	—	—	Ph	T-bat
11/07/2008	A2	23:35	—	1	—	3	—	3.2	4.6	—	—	90.9	92.4	—	—	11.2	11.2	—	—	---	C
19/07/2008	B1	01:35	02:05	1	1	1	1	3	4.9	3.3	7.3	67.4	64.4	71.0	58.9	11.7	12.3	10.9	13.4	Ph	r
25/07/2008	A1	21:50	22:45	1	1	1	1	1.5	2.6	3.6	4.9	36.2	29.6	37.1	30.6	15.0	16.7	13.5	16.2	Ph	T-CCD
31/07/2008	A1	21:40	22:10	1	1	1	1	2.2	5.2	2.2	4.8	30.5	25.4	33.7	22.9	12.4	14.1	10.7	14.7	Ph	w
01/08/2008	B2	03:30	04:04	1	1	1	1	4.3	7.9	4.8	6.8	27.2	19.5	24.6	16.9	12.4	14.8	12.6	15.4	Ph	r
07/08/2008	C1	03:10	—	1	—	1	—	3.1	6.5	—	—	18.5	14.7	—	—	16.6	17.2	—	—	Ph	T-CCD
23/09/2008	C2	03:45	—	1	—	1	—	1.8	3.6	—	—	95.9	84.3	—	—	8.0	10.0	—	—	---	T-USB
26/09/2008	B1	22:45	23:16	1	1	1	2	2.4	6.8	1.5	2.4	91.5	89.1	95.4	94.0	10.4	10.6	9.6	10.4	---	r
04/11/2008	A2	21:10	---	1	---	3	---	4.4	6.8	---	---	99.4	100.0	---	---	3.2	3.9	---	---	---	C
28/11/2008	A1	20:55	---	1	1	1	1	6.7	14.3	7.7	11.3	86.0	100.0	100.0	100.0	1.4	1.3	0.6	0.9	---	w

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		Obs. Time		Rain		Cloud Cover		Maximum gust (m/s)				Relative air humidity (%)				Air temperature (°C)					
								1st		last		1st		last		1st		last			
Date	Site	UT																		night	reason
		1st	last	1st	last	1st	last	ground	2m	ground	2m	ground	2m	ground	2m	ground	2m	ground	2m		
28/11/2008	A2	22:30	---	1	1	1	1	2.3	6.4	14.3	14.3	100.0	100.0	100.0	100.0	0.8	1.9	1.5	2.4	---	r
29/11/2008	C1	01:20	---	2	---	3	---	3.8	8.5	---	---	100.0	100.0	---	---	4.7	4.3	---	---	---	C+R
09/01/2009	A2	21:35	---	1	1	1	3	0.0	2.3	1.2	2.4	89.9	84.6	94.2	94.0	2.9	3.6	3.1	3.5	---	r
23/01/2009	C1	23:35	---	1	---	3	---	6.4	13.4	---	---	92.2	94.1	---	---	7.1	7.5	---	---	---	C
06/02/2009	A1	20:30	---	1	1	1	3	4.1	7.7	7.5	12.6	86.4	89.1	91.6	91.9	0.2	0.9	0.3	0.5	---	C
06/02/2009	A2	21:25	---	1	---	3	---	0.0	1.8	---	---	94.1	94.8	---	---	0.2	0.4	---	---	---	C
21/02/2009	C2	00:45	---	1	---	1	---	0.0	4.5	---	---	89.0	92.0	---	---	1.4	0.6	---	---	---	T-CCD

Table S6. Astronomical classification of nights based on sites where the seeing was *not* measured. This table is, thus, a *complement* to Table S3, as regards individual sites. We here compile the values of Columns 9 and 21 of Tables S4 and S5, respectively). In grey lines we show the two nights when we did not move out from Funchal due to a full island wind orange alert. Columns: (1) Date(s) of a single night. (2) Codes of the sites visited in the single night of Column 1. (3)-(4) UT times of the first (at the beginning of the observation set up at the first site) and last (while Polaris was supposed to be exposed on the CCD at the last site) meteorological observations made. (5) Over the full night of Column 1, the time interval between the very first observation and the last one (difference between Columns 4 and 3). (6) Combined results from Column 9 of Table S4 and Column 21 of Table S5: the most common classification was assumed as representing the "night" classification. In case of a tie, the worst outcome would be chosen (from '---', to UPh, to 'Sp', to 'Ph', in order). We mark with 't' a night classification where we used information from Table S3 to untie it; Ph – photometric; Sp – spectroscopic; UPh – the night could be photometric at the actual site (unknown); '---' neither of the three situations (non-usable conditions).

(1) Date	(2) Sites	(3) Obs. Time (UT) 1st	(4) last	(5) duration	(6) night
1-feb-2008	A1,A2,B1,B2,B3	20:30	23:35	03:05	---
8-9-feb-2008	A1,C1,C2,C3	21:00	02:10	05:10	---
15-feb-2008	A1,A2,B1,B2,B3	20:40	22:30	01:50	---
22-feb-2008	A1,A2,C1,C2,C3	21:05	23:20	02:15	---
8-mar-2008	C1,C3	01:15	04:30	03:15	Ph
15-mar-2008	B2,B3	01:35	03:15	01:40	---
20-mar-2008	A1,A2,C1,C2,C3	19:45	22:05	02:20	---
28-29-mar-2008	A1,B1,B2,B3	21:50	02:45	04:55	Ph^{t}
4-apr-2008	A1,A2,C1,C2,C3	20:30	23:50	03:20	---
8-apr-2008	wind orange alert (for the whole island)				
18-19-apr-2008	A1,A2,C1,C2,C3	20:15	00:10	03:55	---
23-24-apr-2008	A1,B2,B3	22:34	02:30	03:56	UPh
2-3-may-2008	A1,A2,C1,C2,C3	21:35	00:00	02:25	---
7-8-may-2008	A1,A2,B2,B3	20:35	00:30	03:55	---
14-15-may-2008	A1,A2,C1,C2,C3	21:35	00:10	02:35	---
23-may-2008	A1,A2,C1,C2,C3	20:30	23:30	03:00	---
2-jun-2008	A1,A2,C1,C2,C3	20:40	22:40	02:00	---
6-7-jun-2008	A1,A2,B1,B2,B3	22:00	01:10	03:10	---
12-13-jun-2008	A2,C1,C2,C3	23:30	03:20	03:50	Ph
18-19-jun-2008	A1,A2,B1,B2,B3	21:25	01:00	03:35	Ph
27-28-jun-2008	A2,C1,C2,C3	23:30	02:35	03:05	Ph
11-12-jul-2008	A2,C1,C2,C3	23:35	02:30	02:55	---
19-jul-2008	B1	01:35	02:05	00:30	Ph
25-26-jul-2008	A1,A2,C1,C2,C3	21:50	01:15	03:25	Ph
31-jul-1-aug-2008	A1,B2,B3	21:40	04:04	06:24	Ph
7-aug-2008	C1,C2,C3	03:10	04:40	01:30	Ph
15-16-aug-2008	A1,A2,B1,B3	22:25	01:00	02:35	Ph
22-23-aug-2008	A1,A2,C1,C2,C3	21:55	00:45	02:50	---

(1) Date	(2) Sites	(3) Obs. Time (UT) 1st	(4) last	(5) duration	(6) night
29-30-aug-2008	A1,A2,B1,B2	21:50	00:40	02:50	Ph
5-6-sep-2008	A1,A2,C1,C2,C3	21:40	00:30	02:50	---
12-sep-2008	A1,A2,B1,B3	21:20	22:40	01:20	---
23-sep-2008	C2,C3	03:45	05:40	01:55	---
26-sep-2008	A1,A2,B1,B2	20:50	23:30	02:40	---
3-oct-2008	A1,A2,C1,C2,C3	20:15	23:05	02:50	---
10-oct-2008	A1,A2,B1,B3	20:05	22:00	01:55	---
17-oct-2008	A1,A2,C1,C2,C3	20:25	23:25	03:00	---
22-oct-2008	A1,A2,B1,B2	21:25	23:00	01:35	---
31-oct-2008	wind orange alert (for the whole island)				
4-nov-2008	A2	21:10	---	---	---
14-nov-2008	A2	21:30	---	---	---
18-nov-2008	A1,A2,B1,B2	20:40	22:20	01:40	---
28-29-nov-2008	A1,A2,C1,C2,C3	20:55	03:55	07:00	---
3-dec-2008	A2,B1	21:30	22:55	01:25	---
12-dec-2008	A1,A2,C1,C2,C3	20:20	22:45	02:25	---
17-dec-2008	A2,B1,B2	22:05	23:30	01:25	---
26-dec-2008	A1,A2,C1,C2,C3	20:20	22:30	02:10	---
5-jan-2009	A1,A2,B1,B3	20:15	21:40	01:25	---
9-10-jan-2009	A2,C2	21:35	01:30	03:55	---
19-jan-2009	A1,A2,B1,B2	20:20	21:45	01:25	---
23-jan-2009	C1	23:35	---	---	---
30-jan-2009	A1,A2,B1,B3	20:20	22:00	01:40	---
6-feb-2009	A1,A2,C1,C2,C3	20:30	23:30	03:00	---
12-feb-2009	A2,B1	22:15	23:20	01:05	---
20-21-feb-2009	A1,A2,C2,C3	20:25	03:00	06:35	---
27-feb-2009	A1,A2,B1,B3	21:35	23:20	01:45	---
5-mar-2009	A1,A2,C1,C2,C3	20:45	22:45	02:00	---

Table S7. The 21 common nights between Tables S3 and S6. Columns: (1) the date(s) for the night definition here came from both Table S3 and S6. (2) Site codes where the seeing was measured (from Table S3). (3) Site codes where the seeing was *not* measured (from Table S6). (4) Geographical Madeira zones, from Columns 2-3 (see Figure 4). (5) Night classification from Table S3. (6) Night classification from Table S6. (7) Final classification, given the most common situation at the sites (from information of Tables 2, S4, and S5): the usual rule of "worst result" to untie situations was used (see caption of Table S6). The grey lines on Columns 4-7 enhance the nights for which the final classification of Columns 5-6 does not coincide.

(1) Date	(2) Sites (with seeing)	(3) Sites (no seeing)	(4) zones	(5) night (with seeing)	(6) night (no seeing)	(7) Final classification
8-9-feb-2008	A2	A1,C1,C2,C3	A + C	---	---	---
7-8-mar-2008	A1,A2,C2	C1,C3	A + C	Ph	Ph	Ph
14-15-mar-2008	A1,A2,B1	B2,B3	A + B	Sp	---	---
28-29-mar-2008	A2	A1,B1,B2,B3	A + B	Ph	Ph	Ph
23-24-apr-2008	A2,B1	A1,B2,B3	A + B	Ph	UPh	Ph
7-8-may-2008	B1	A1,A2,B2,B3	A + B	Ph	---	---
12-13-jun-2008	A1	A2,C1,C2,C3	A + C	Ph	Ph	Ph
27-28-jun-2008	A1	A2,C1,C2,C3	A + C	Ph	Ph	Ph
11-12-jul-2008	A1	A2,C1,C2,C3	A + C	Ph	---	---
18-19-jul-2008	A1,A2,B3	B1	A + B	Ph	Ph	Ph
31-jul-1-aug-2008	A2,B1	A1,B2,B3	A + B	Ph	Ph	Ph
6-7-aug-2008	A1,A2	C1,C2,C3	A + C	Ph	Ph	Ph
22-23-sep-2008	A1,A2,C1	C2,C3	A + C	---	---	---
4-5-nov-2008	A1,B1,B3	A2	A + B	Ph	---	---
14-15-nov-2008	A1,C1,C2,C3	A2	A + C	Ph	---	Ph
3-4-dec-2008	A1,B3	A2,B1	A + B	Ph	---	---
17-dec-2008	A1	A2,B1,B2	A + B	---	---	---
9-10-jan-2009	A1,C1,C3	A2,C2	A + C	---	---	---
23-24-jan-2009	A1,A2,C2,C3	C1	A + C	Ph	---	Ph
12-13-feb-2009	A1,B2	A2,B1	A + B	Ph	---	---
20-21-feb-2009	C1	A1,A2,C2,C3	A + C	Ph	---	---

Table S8. Meteorology and seeing data for La Palma and Madeira (compared). We show the Madeira observations date and time (Columns 1 and 3) and the actual date and time in La Palma (Columns 2 and 4), since not on every day was there seeing available (in this case, the nearest day found and chosen is painted grey). For times (Column 4), the observation log at La Palma goes every hour and we chose the nearest hour to the Madeira observation. Further columns: (5) wind speed. (6) Relative air humidity. (7) Air temperature. (8) Night classification: by default, we classified the observation as photometric (Ph), unless a stormy or cloudy night was mentioned (poor night: '---'); when haze/dust was present we classified it as spectroscopic (Sp). Otherwise, we used the wind and humidity data (Columns 5-6) to classify it as either '---' or 'Ph'. (9) La Palma seeing, as registred on the log. Three situations (painted in grey) had only limits; for these we had to estimate the seeing value in Column 11. (10) La Palma log comments, relevant for the seeing and night conditions interpretation. We also add relative air humidity information at relevant hours, when not in column 6. (11) Our final adopted value of seeing for La Palma: usually the single value of Column 9 or an average value of the interval given, eventually weighted by the description of Column 10.

(1) Date Madeira	(2) Date La Palma	(3) UT Madeira	(4) UT La Palma	(5) v(m/s)	(6) RH (%)	(7) T (°C)	(8) type	(9) seeing (") log	(10) Comments	(11) seeing (") final
08/02/2008	07/02/2008	21:56	22:00	16.9	35	3.4	---	2.5-3.5	snow storm (8th Feb); highly variable seeing; RH(21h)=28%; RH(0h)=43%	3.0
29/02/2008	29/02/2008	21:23	21:00	6.2	36	7.3	Ph	<=1	RH(6h)=37%	0.8
07/03/2008	06/03/2008	21:05	21:00	10.5	34	7.0	Ph	2.5-4	fine (7th Mar) but no seeing info; clear weather on the 6th Mar; RH(6h)=38%	3.2
07/03/2008	06/03/2008	22:56	23:00	8.2	37	6.6	Ph			3.2
08/03/2008	07/03/2008	03:36	04:00	3.6	39	5.8	Ph			3.2
14/03/2008	13/03/2008	20:56	21:00	8.1	18	7.0	Ph	0.7-1.7	no seeing info (14th Mar); clear weather on the 13th Mar; RH(6h)=18%	1.2
14/03/2008	13/03/2008	22:16	22:00	7.8	18	7.2	Ph			1.2
15/03/2008	14/03/2008	00:40	01:00	6.9	20	5.7	Ph			1.2
29/03/2008	29/03/2008	00:09	00:00	4.2	68	2.1	Ph	1	clear weather; RH(21h)=17%; RH(6h)=35%	1.0
23/04/2008	23/04/2008	22:58	23:00	5.8	3	12.2	Ph	1.5-3	clear weather; RH(21h)=4%; RH(6h)=3%	2.2
24/04/2008	24/04/2008	01:17	01:00	4.3	3	12.5	Ph			2.2
07/05/2008	05/05/2008	23:11	23:00	0.9	9	11.7	---	1	no seeing info (6th-8th May); 70% cloud cover (5th May); RH(21h)=30%; RH(6h)=12%	1.0
12/06/2008	11/06/2008	21:16	21:00	3.0	8	11.4	Ph	0.5-0.8	photometric (12th Jun) but no seeing info; clear weather (11th Jun); RH(6h)=2%	0.6
27/06/2008	26/06/2008	21:22	21:00	7.5	7	18.5	Ph	1.3-1.6	no seeing info (27th Jun); RH(6h)=9%	1.4
04/07/2008	04/07/2008	21:13	21:00	3.5	39	14.7	Ph	0.6-0.9	clear weather and photometric; RH(6h)=31%	0.8
04/07/2008	04/07/2008	22:34	23:00	3.4	41	13.6	Ph			0.8
05/07/2008	05/07/2008	01:02	01:00	3.1	42	13.8	Ph			0.8
05/07/2008	05/07/2008	03:16	03:00	1.9	42	13.6	Ph			0.8
05/07/2008	05/07/2008	05:15	05:00	0.8	34	13.7	Ph			0.8
11/07/2008	11/07/2008	21:22	21:00	6.3	11	14.8	Ph	0.8-1.8	clear weather; RH(6h)=12%	1.3
18/07/2008	18/07/2008	21:12	21:00	0.6	54	12.0	Ph	1	clear weather; RH(6h)=9%	1.0
18/07/2008	18/07/2008	22:38	23:00	2.2	16	13.1	Ph			1.0
19/07/2008	19/07/2008	03:20	03:00	2.3	8	13.3	Ph			1.0
31/07/2008	30/07/2008	22:18	22:00	2.4	7	17.9	Sp	0.8	haze, dust, intermitent cloud, no seeing info (31st Jul); RH(21h)=16%; RH(6h)=13%	0.8
01/08/2008	31/07/2008	01:00	01:00	4.3	7	18.5	Sp			0.8
06/08/2008	06/08/2008	20:51	21:00	1.0	34	18.8	Sp	0.5-1	dusty but mostly ok; RH(6h)=22%	0.8
06/08/2008	07/08/2008	23:56	00:00	1.9	34	18.0	Sp			0.8
22/09/2008	22/09/2008	20:55	21:00	2.4	34	10.0	Ph	<=0.8	RH(6h)=30%	0.5
22/09/2008	22/09/2008	22:17	22:00	4.1	35	10.0	Ph			0.5
23/09/2008	23/09/2008	01:27	01:00	5.2	33	9.8	Ph			0.5
04/11/2008	06/11/2008	20:17	20:00	2.8	11	8.1	Ph	1.2	Thick high cloud, occasionally impossible to observe (4th Nov), wet-clear-wet-clear (3rd Nov), very cloudy all night (5th Nov), wet (2nd Nov), clear (6th Nov); RH(21h)=10%; RH(6h)=12%	1.2
04/11/2008	07/11/2008	23:56	00:00	1.9	11	8.0	Ph			1.2
05/11/2008	07/11/2008	02:21	02:00	1.1	13	7.8	Ph			1.2
14/11/2008	13/11/2008	20:49	21:00	0.5	17	7.2	---	1	Clouds at the end of the night (14th Nov), clouds at the beginning of the night (13th Nov); RH(6h)=25%	1.0
14/11/2008	14/11/2008	23:42	00:00	1.2	16	7.8	Ph			1.0
15/11/2008	14/11/2008	01:37	02:00	2.2	20	7.1	Ph			1.0
15/11/2008	14/11/2008	03:28	03:00	0.7	21	7.5	Ph			1.0

(1) Date Madeira	(2) Date La Palma	(3) UT Madeira	(4) UT La Palma	(5) v(m/s)	(6) RH (%)	(7) T (°C)	(8) type	(9) seeing (") log	(10) Comments	(11) seeing (") final
03/12/2008	03/12/2008	20:41	21:00	6.1	10	7.0	Ph	1.5-5	Poor and variable seeing; RH(6h)=1%	3.2
04/12/2008	04/12/2008	00:58	01:00	8.7	1	8.2	Ph			3.2
17/12/2008	17/12/2008	20:51	21:00	9.6	21	3.3	Ph	0.8-1.5	clear; RH(6h)=32%	1.2
09/01/2009	04/01/2009	20:47	21:00	2.5	8	3.4	Ph	1-1.3	bad, cloudy, rain, 100% cover (9th Jan), high humidity, bad seeing, cloud cover (8th Jan), clear, thin cirrus, high humidity from 4am (10th Jan), high humidity all night, icy road at 23:30, left telescope (7th Jan), poor – high humidity, then thick cloud at beginning and end of night (11th Jan), high humidity all night (6th Jan), cirrus over much of sky all night (12th Jan), high humidity all night (5th Jan), some light cirrus (13th Jan), clear but wind rising later in night (4th Jan); RH(6h)=7%	1.2
10/01/2009	05/01/2009	00:39	01:00	6.8	3	3.5	Ph			1.2
10/01/2009	05/01/2009	02:22	02:00	3.3	5	3.0	Ph			1.2
23/01/2009	23/01/2009	20:24	20:00	9.0	45	8.7	Ph	1	RH(21h)=65%; RH(6h)=83%	1.0
23/01/2009	23/01/2009	21:40	22:00	10.1	70	9.0	Ph			1.0
24/01/2009	24/01/2009	00:53	01:00	10.2	77	7.9	Ph			1.0
24/01/2009	24/01/2009	02:22	02:00	10.2	77	8.2	Ph			1.0
12/02/2009	13/02/2009	21:41	22:00	17.0	15	2.4	---	1.2-1.5 (half); >2 (half)	no seeing info (11, 12th Feb), Clear but gradually degrading, humidity rising from 04:00, had to close 06:10 (13th Feb); RH(21h)=7%; RH(6h)=66%	1.9
13/02/2009	14/02/2009	01:00	01:00	11.2	24	2.3	Ph			1.9
20/02/2009	20/02/2009	23:00	23:00	4.4	98	-5.4	---	2	first half cloudy; variable conditions; RH(21h)=99%; RH(6h)=52%	2.0

Table S9. The relative air humidity at La Palma. Columns: (1) Dates of the observing night. (2) Seeing in arc seconds. (3) Relative air humidity at 21h00 (from column 6 or 10 of Table S8). (4) Relative air humidity at 6h00 (in one situation the night was stopped earlier: 7-8-feb-08 (0h00)), from Column 10 of Table S8. (5) The difference between columns 4 and 3. See Figure S9.

(1) Dates	(2) Seeing (")	(3) Hum 21h (%)	(4) Hum 6h/0h (%)	(5) ΔHR
7-8-feb-08	3.0	28	43	-15
20-feb-1-mar-08	0.8	36	37	-1
6-7-mar-08	3.2	34	38	-4
13-14-mar-08	1.2	18	18	0
28-29-mar-08	1.0	17	39	-22
23-24-apr-08	2.2	4	3	1
5-6-may-08	1.0	30	12	18
11-12-jun-08	0.6	8	2	6
26-27-jun-08	1.4	7	9	-2
4-5-jul-08	0.8	39	31	8
11-12-jul-08	1.3	11	12	-1
18-19-jul-08	1.0	54	9	45
30-31-jul-08	0.8	16	13	3
6-7-aug-08	0.8	34	22	12
22-23-sep-08	0.5	34	30	4
6-7-nov-08	1.2	10	12	-2
13-14-nov-08	1.0	17	25	-8
3-4-dec-08	3.2	10	1	9
17-18-dec-08	1.2	21	32	-11
4-5-jan-08	1.2	8	7	1
23-24-jan-08	1.0	65	83	-18
13-14-feb-08	1.9	7	66	-59
20-21-feb-08	2.0	99	52	47

Table S10. The dark library. In this table we summarise all nine darks used for data reduction, consisting of five-minute exposures (to match each Polaris observation exposure duration) taken at CCD temperatures ranging from about -30ºC to 10ºC at roughly 5ºC intervals. (1) Place where the exposure was made (see Table 1). (2) Date. (3) Universal Time when the exposure started. (4) CCD temperature. (5) Filename (see Data S5). Note that to reach the lowest temperatures a particularly cold night was necessary (at A2), while for the remaining the lab (T) was enough.

(1) Place	(2) Date	(3) UT	(4) T (°C)	(5) filename
A2	08/02/2008	22h55	-30.22	T-30p22.ST7
A2	08/02/2008	23h18	-25.40	T-25p40.ST7
A2	08/02/2008	23h58	-19.98	T-19p98.ST7
T	08/11/2007	19h05	-13.12	T-13p12.ST7
T	23/11/2007	19h34	-10.20	T-10p20.ST7
T	23/11/2007	19h18	-5.23	T-5p23.ST7
T	23/11/2007	18h58	0.19	T0p19C.ST7
T	23/11/2007	18h16	4.89	T4p89.ST7
T	23/11/2007	17h47	10.24	T10p24.ST7

Table S11. Detail of the five relevant Master Flats. Five master flats were composed after individual flat observations obtained in the summer field trips, weather permitting, at Juncal (A1), the first site of the night round. At this time of year there was still dusk light adequate for the production of flats when we arrived. Columns: (1) Date. (2) Time period of the flat exposures. (3) Number of flats used to build each Master Flat. (4) Exposure range (in seconds) of the individual flats, obviously increasing as the night was arriving.

(1) Date	(2) Time period	(3) Number	(4) Exposure range (sec)
04/07/2008	21h04 – 21h34	49	0.8-20
11/07/2008	20h53 – 21h33	61	0.5-25
18/07/2008	21h08 – 21h36	52	1 - 60
31/07/2008	20h46 – 21h25	77	0.5-50
06/08/2008	20h47 – 21h23	72	0.7-90

Table S12. The main data collection and initial calibration table. The table is organized as follows: columns (1)-(5) [raw data collection details]; (6)-(7) [dark frame details – see Table S10]; we picked the dark frame from the library that is closest in temperature to the CCD temperature during the Polaris exposure (Column 6 cf. Column 4); (8)-(9) [Master flats used – see Table S11]; (10) [calibrated data]. In detail: (1) Place where the exposure was made (see Table 1), chronologically ordered; (2) Date; (3) Universal Time when the five-minute exposure started; (4) CCD temperature; (5) Raw data filename (Data S3); (6) Dark frame CCD temperature; (7) Dark frame date; (8) Master flat used by IA in its data reduction process *(58)*; (9) the same, as used by PL; (10) final calibrated filename (Data S2).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		RAW DATA			DARK FRAME		Master IA	Master PL	Calibrated
Place	Date	UT	T (°C)	filename	T (°C)	Date	Date	Date	filename
A2	08/02/2008	21h56	-30.22	080208_A2.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	080208_A2.txt
A1	29/02/2008	21h23	-26.81	290208_A1.ST7	-25.40	08/02/2008	18/04/2008	06/08/2008	290208_A1.txt
A1	07/03/2008	21h05	-29.72	070308_A1.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	070308_A1.txt
A2	07/03/2008	22h56	-29.23	070308_A2.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	070308_A2.txt
C1	08/03/2008	01h30	-31.74	080308_C1.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	080308_C1.txt
C2	08/03/2008	03h36	-30.22	080308_C2.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	080308_C2.txt
A1	14/03/2008	20h56	-30.22	140308_A1.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	140308_A1.txt
A2	14/03/2008	22h16	-31.74	140308_A2.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	140308_A2.txt
B1	15/03/2008	00h40	-31.23	150308_B1.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	150308_B1.txt
A1	28/03/2008	22h44	-31.74	280308_A1.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	280308_A1.txt
A2	29/03/2008	00h09	-28.74	290308_A2.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	290308_A2.txt
A2	23/04/2008	22h58	-29.23	230408_A2.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	230408_A2.txt
B1	24/04/2008	01h17	-29.72	240408_B1.ST7	-30.22	08/02/2008	18/04/2008	06/08/2008	240408_B1.txt
B1	07/05/2008	23h11	-26.81	070508_B1.ST7	-25.40	08/02/2008	14/05/2008	06/08/2008	070508_B1.txt
A1	12/06/2008	21h16	-23.10	120608_A1.ST7	-25.40	08/02/2008	18/06/2008	06/08/2008	120608_A1.txt
A1	27/06/2008	21h22	-15.66	270608_A1.ST7	-13.12	08/11/2007	27/06/2008	06/08/2008	270608_A1.txt
A1	04/07/2008	21h13	-24.47	040708_A1.ST7	-25.40	08/02/2008	04/07/2008	06/08/2008	040708_A1.txt
A2	04/07/2008	22h34	-6.89	040708_A2.ST7	-5.23	23/11/2007	04/07/2008	06/08/2008	040708_A2.txt
B1	05/07/2008	01h02	-24.94	050708_B1.ST7	-25.40	08/02/2008	04/07/2008	06/08/2008	050708_B1.txt
B2	05/07/2008	03h16	-22.65	050708_B2.ST7	-25.40	08/02/2008	04/07/2008	06/08/2008	050708_B2.txt
B3	05/07/2008	05h30	-23.10	050708_B3.ST7	-25.40	08/02/2008	04/07/2008	06/08/2008	050708_B3.txt
A1	11/07/2008	21h22	-22.20	110708_A1.ST7	-19.98	08/02/2008	11/07/2008	06/08/2008	110708_A1.txt
A1	18/07/2008	21h12	-23.10	180708_A1.ST7	-25.40	08/02/2008	18/07/2008	06/08/2008	180708_A1.txt
A2	18/07/2008	22h38	-20.42	180708_A2.ST7	-19.98	08/02/2008	18/07/2008	06/08/2008	180708_A2.txt
B1	19/07/2008	01h05	-22.20	190708_B1.ST7	-19.98	08/02/2008	18/07/2008	06/08/2008	190708_B1.txt
B3	19/07/2008	03h20	-21.75	190708_B3.ST7	-19.98	08/02/2008	18/07/2008	06/08/2008	190708_B3.txt
A1	31/07/2008	21h10	-19.54	310708_A1.ST7	-19.98	08/02/2008	31/07/2008	06/08/2008	310708_A1.txt
A2	31/07/2008	22h18	-20.86	310708_A2.ST7	-19.98	08/02/2008	31/07/2008	06/08/2008	310708_A2.txt
B1	01/08/2008	01h00	-20.86	310708_B1.ST7	-19.98	08/02/2008	31/07/2008	06/08/2008	010808_B1.txt
B2	01/08/2008	03h04	-21.75	010808_B2.ST7	-19.98	08/02/2008	31/07/2008	06/08/2008	010808_B2.txt
A1	06/08/2008	20h51	-17.37	060808_A1.ST7	-19.98	08/02/2008	06/08/2008	06/08/2008	060808_A1.txt
A2	06/08/2008	23h56	-13.54	060808_A2.ST7	-13.12	08/11/2007	06/08/2008	06/08/2008	060808_A2.txt
A1	22/09/2008	20h55	-21.30	220908_A1.ST7	-19.98	08/02/2008	06/08/2008	06/08/2008	220908_A1.txt
A2	22/09/2008	22h17	-20.86	220908_A2.ST7	-19.98	08/02/2008	06/08/2008	06/08/2008	220908_A2.txt
C1	23/09/2008	01h27	-16.94	230908_C1.ST7	-19.98	08/02/2008	06/08/2008	06/08/2008	230908_C1.txt
B1	26/09/2008	22h16	-22.20	260908_B1.ST7	-19.98	08/02/2008	06/08/2008	06/08/2008	260908_B1.txt
A1	04/11/2008	20h17	-29.23	041108_A1.ST7	-30.22	08/02/2008	---	06/08/2008	041108_A1.txt
B1	04/11/2008	23h56	-27.29	041108_B1.ST7	-25.40	08/02/2008	---	06/08/2008	041108_B1.txt
B3	05/11/2008	02h21	-31.23	051108_B3.ST7	-30.22	08/02/2008	---	06/08/2008	051108_B3.txt

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
		RAW DATA			DARK FRAME		Master IA	Master PL	Calibrated
Place	Date	UT	T (°C)	filename	T (°C)	Date	Date	Date	filename
A1	14/11/2008	20h49	-30.72	141108_A1.ST7	-30.22	08/02/2008	---	06/08/2008	141108_A1.txt
C1	14/11/2008	23h42	-29.72	141108_C1.ST7	-30.22	08/02/2008	---	06/08/2008	141108_C1.txt
C2	15/11/2008	01h37	-24.94	151108_C2.ST7	-25.40	08/02/2008	---	06/08/2008	151108_C2.txt
C3	15/11/2008	03h28	-27.29	151108_C3.ST7	-25.40	08/02/2008	---	06/08/2008	151108_C3.txt
A1	28/11/2008	21h37	-35.99	281108_A1.ST7	-30.22	08/02/2008	---	06/08/2008	281108_A1.txt
A2	28/11/2008	22h58	-34.89	281108_A2.ST7	-30.22	08/02/2008	---	06/08/2008	281108_A2.txt
A1	03/12/2008	20h41	-31.74	031208_A1.ST7	-30.22	08/02/2008	---	06/08/2008	031208_A1.txt
B3	04/12/2008	00h58	-29.23	041208_B3.ST7	-30.22	08/02/2008	---	06/08/2008	041208_B3.txt
A1	17/12/2008	20h51	-30.72	171208_A1.ST7	-30.22	08/02/2008	---	06/08/2008	171208_A1.txt
A1	09/01/2009	20h47	-32.77	090109_A1.ST7	-30.22	08/02/2008	---	06/08/2008	090109_A1.txt
A2	09/01/2009	22h04	-30.22	090109_A2.ST7	-30.22	08/02/2008	---	06/08/2008	090109_A2.txt
C1	10/01/2009	00h39	-27.77	100109_C1.ST7	-25.40	08/02/2008	---	06/08/2008	100109_C1.txt
C3	10/01/2009	02h22	-30.22	100109_C3.ST7	-30.22	08/02/2008	---	06/08/2008	100109_C3.txt
A1	23/01/2009	20h24	-25.40	230109_A1.ST7	-25.40	08/02/2008	---	06/08/2008	230109_A1.txt
A2	23/01/2009	21h40	-24.47	230109_A2.ST7	-25.40	08/02/2008	---	06/08/2008	230109_A2.txt
C2	24/01/2009	00h53	-25.40	240109_C2.ST7	-25.40	08/02/2008	---	06/08/2008	240109_C2.txt
C3	24/01/2009	02h52	-25.40	240109_C3.ST7	-25.40	08/02/2008	---	06/08/2008	240109_C3.txt
A1	12/02/2009	21h41	-24.47	120209_A1.ST7	-25.40	08/02/2008	---	06/08/2008	120209_A1.txt
B2	13/02/2009	01h00	-29.23	130209_B2.ST7	-30.22	08/02/2008	---	06/08/2008	130209_B2.txt
C1	20/02/2009	23h00	-33.29	200209_C1.ST7	-30.22	08/02/2008	---	06/08/2008	200209_C1.txt

Table S13. One-to-one pixel comparison between the "modified vector_e" (FWHM method) and vector_h (RMS method). In grey and across columns 2-8 we show the reason for the many situations in which the comparison was not possible. Columns: (1) Data point. (2-3) Number of points removed from vector_e (h), in order (b: beginning; m: middle; e: end). (4) Vectors e and h final common length (in pixels); in only one case (080308_C1) were there two "lobes" in the comparison. (5-7) Respectively, vector_e to vector_h distance range, in pixels and across their full lengths, average and median distances. (8) Maximum relative error (from Data S7).

(1) data point	(2) removed e (b+m+e)	(3) removed h (b+m+e)	(4) common length (pixels)	(5) e-to-h distance (pixels)	(6) e-to-h <distance> (pixels)	(7) e-to-h $med_{distance}$ (pixels)	(8) max rel.error (%)
080208_A2	1+0+0	0+0+8	23	1 - 1.8	1.3	1.4	22
290208_A1	too different to compare						
070308_A1	2/3 very different (no comparison made)						
070308_A2	0+0+12	2+0+0	21	1 - 3.6	1.9	1.8	44
080308_C1	2+6+7	5+4+2	10+8	0 - 7.0	2.0	1.5	56
080308_C2	0+0+6	0+1+3	33	0 - 4.0	1.7	1.5	35
140308_A1	0+0+11	3+1+9	28	1 - 4.6	2.3	2.0	46
140308_A2	8+0+0	14+0+1	27	0.5 - 4.1	1.7	1.4	34
150308_B1	mostly different (no comparison made)						
280308_A1	too few points (no comparison made)						
290308_A2	1/2 of h is nonsense; too few points (no comparison made)						
230408_A2	too few points superposed properly (no comparison made)						
240408_B1	vector h all over the place (no comparison made)						
070508_B1	0+0+6	2+6+5	24	0 - 4.0	2.3	2.0	51
120608_A1	too different to compare						
270608_A1	0	0+3+0	27	0.5 - 8.0	3.6	2.5	82
040708_A1	too different to compare						
040708_A2	0	0+1+1	46	1 - 3.2	1.4	1.1	16
050708_B1	0+0+2	0+0+1	36	0 - 2.1	0.8	0.5	15
050708_B2	0	0+4+2	40	1 - 3.2	1.4	1.1	18
050708_B3	too different to compare						
110708_A1	3+2+0	0+5+0	33	0 - 6.5	2.3	2.5	45
180708_A1	too different to compare						
180708_A2	0+5+0	2+2+1	36	0 - 7.3	2.3	2.0	47
190708_B1	too different to compare						
190708_B3	too different to compare						
310708_A1	too different to compare						
310708_A2	12+4+0	0+3+0	28	0 - 3.0	1.3	1.2	28
010808_B1	too different to compare						
010808_B2	too different to compare						
060808_A1	0	0+11+0	33	1 - 5.0	1.8	1.4	29
060808_A2	too different to compare						

(1) data point	(2) removed e (b+m+e)	(3) removed h (b+m+e)	(4) common length (pixels)	(5) e-to-h distance (pixels)	(6) e-to-h <distance> (pixels)	(7) e-to-h $med_{distance}$ (pixels)	(8) max rel.error (%)
220908_A1	1+0+0	0+1+1	42	0 - 5.3	1.8	1.7	30
220908_A2	8+0+3	0+2+4	25	1 - 3.6	2.1	2.2	42
230908_C1	0	0	44	0.5 - 5.3	1.6	1.1	24
260908_B1	too few points (no comparison made)						
041108_A1	too different to compare						
041108_B1	0	0+1+0	46	0 - 3.0	1.1	1.0	19
051108_B3	0	1+2+1	38	0 - 2.2	0.7	0.5	13
141108_A1	too different to compare						
141108_C1	1+0+1	3+3+0	35	1 - 4.1	1.6	1.4	26
151108_C2	too different to compare						
151108_C3	0+0+5	0+5+2	34	1 - 5.6	1.8	1.4	30
281108_A1	8+7+0	0+0+3	23	0 - 3.5	1.2	0.5	31
281108_A2	vector e odd; vector h all over the place (no comparison made)						
031208_A1	2/3 very different (no comparison made)						
041208_B3	0	0+3+0	40	0 - 3.6	1.9	1.8	29
171208_A1	2+2+0	0+2+2	37	0 - 3.4	1.7	1.1	27
090109_A1	0+3+0	4+0+0	39	0 - 7.4	1.7	1.1	32
090109_A2	too few points (no comparison made)						
100109_C1	10+0+0	0+1+0	28	1 - 3.6	1.5	1.4	29
100109_C3	0+2+1	0	39	0 - 2.5	1.3	1.5	23
230109_A1	too different to compare						
230109_A2	0+7+0	1+2+1	31	1 - 3.6	1.9	1.4	32
240109_C2	too different to compare						
240109_C3	too different to compare						
120209_A1	0+0+3	2+1+4	35	0.3 - 3.6	1.9	1.8	33
130209_B2	1+0+1	0+5+2	34	0.5 - 5.4	2.6	2.2	47
200209_C1	3+4+7	0+1+0	31	0 - 2.5	1.2	1.0	23

Table S14. Consensus table for the FWHM data reduction by PA and AC. We do not show in this table the 15 data points where the results matched exactly, independently. Columns: (1) Data point. (2)-(4) Major differences and consensus. (5)-(7) Minor differences and consensus. (8) Relevant comments.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Datapoint	major			minor			Comments
	PA	AC	consensus	PA	AC	consensus	
080208_A2					three discontinuous points	remove them	still establishing the correct methodology
290208_A1					red dot outside of data	place it in the final extreme point	still establishing the correct methodology
070308_A1				seeing 0.64	confusion with coordinates of first point; seeing 0.60	seeing 0.64	
070308_A2				discontinuity: 10 points removed	includes "zero points"; discontinuity: 10 points removed	exclude "zero points"; discontinuity: 10 points removed	still establishing the correct methodology
080308_C1				two lobes with some points in between (removed); strictly, it should be rejected - kept	not rejected, although only one lobe kept with less than 1/3 of maximum points	since they are well aligned, the two lobes were kept for seeing fitting (only points in between removed)	still establishing the correct methodology
140308_A1				seeing 0.81	red dots of extremeties in wrong places; seeing 0.85 *(2nd run: 0.84)*	red dots of extremeties properly "ortogonal" to the path; seeing 0.81	still establishing the correct methodology
140308_A2				discontinuities ignored (1+1 points only)	includes "zero points"; discontinuities ignored (1+1 points only)	exclude "zero points"; discontinuities ignored (1+1 points only)	still establishing the correct methodology
280308_A1				two lobes, not aligned; lobe with more points less than 1/3 total; reject data	includes "zero points"; two lobes, not aligned; lobe with more points less than 1/3 total; reject data	exclude "zero points"; two lobes, not aligned; lobe with more points less than 1/3 total; reject data	still establishing the correct methodology
290308_A2				one extra point considered		one extra point considered	same seeing
230408_A2				discontinuity: reject the three initial discontinuous parts	includes "zero points"; discontinuity: reject the three initial discontinuous parts	exclude "zero points"; discontinuity: reject the three initial discontinuous parts	still establishing the correct methodology
240408_B1					two extra points considered	the two extra points were not considered	same seeing
070508_B1				seeing 0.88	two extra points considered in vector e; seeing 0.98	no extra points; seeing 0.88	
120608_A1				seeing 0.95	red dots of extremeties in wrong places; seeing 1.72 *(2nd run: 0.95)*	red dots of extremeties properly "ortogonal" to the path; seeing 0.95	still establishing the correct methodology
270608_A1				seeing 0.54	seven more points; seeing 0.78	no extra points; seeing 0.54	
040708_A1	S-shaped dataset: no sense to fit seeing (must unbend data first)	S-shaped dataset (seeing value meaningless) *[2nd run: reject]*	correct the S-shape by unbending and then fit seeing				still establishing the correct methodology
050708_B1				one extra point considered; seeing 0.44	seeing 0.37	one extra point considered; seeing 0.44	
050708_B3				seeing 0.63	red dots of extremeties in wrong places; seeing 0.96 *(2nd run: 0.77)*	red dots of extremeties properly "ortogonal" to the path; seeing 0.63	still establishing the correct methodology
110708_A1	bean-shaped dataset: no sense to fit seeing (must unbend data first)	funny shaped dataset (seeing value meaningless) *[2nd run: reject]*	correct the bean-shape by unbending and then fit seeing				still establishing the correct methodology
180708_A1	last 12 points in "diagonal" removed	no point in the diagonal was removed *[3rd run: full diagonal removed; 4th run: 13 points]*	last 12 points in "diagonal" removed				still establishing the correct methodology
180708_A2				seeing 1.4	red dots of extremeties in wrong places; seeing 1.0 *(2nd run: 1.4)*	red dots of extremeties properly "ortogonal" to the path; seeing 1.4	still establishing the correct methodology
190708_B3				seeing 0.65	red dots of extremeties in wrong places; seeing 0.91 *(2nd run: 0.65)*	red dots of extremeties properly "ortogonal" to the path; seeing 0.65	still establishing the correct methodology

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Datapoint	major			minor			Comments
	PA	AC	consensus	PA	AC	consensus	
310708_A1	ultra-long diagonal (correct the data by an initial unbending)	ultra-long diagonal (reject data)	initial unbending done, correcting the data; seeing fit				still establishing the correct methodology
310708_A2				seeing 0.37	top of data a bit cut (less two points); seeing 0.34 *(2nd run: 0.35)*	no cut; seeing 0.37	
010808_B1				seeing 0.42	red dot picked in "cluster" of four isolated points; seeing 0.49	ignored the four points and pick the red dot in the extremety of the rest of the data; seeing 0.42	still establishing the correct methodology
010808_B2	routine fails (too many holes); reject	routine works but several discontinuities: lobe with more points still less than 1/3 total; reject data	data rejected				still establishing the correct methodology
060808_A1				one extra point considered; seeing 0.67	seeing 0.65	one extra point considered; seeing 0.67	
060808_A2				seeing 0.47	top of data a bit cut (one point less); seeing 0.46 *[2nd run: 0.46]*	no cut; seeing 0.47	
220908_A1				three extra points considered; seeing 0.57	seeing 0.72	three extra points considered; seeing 0.57	
220908_A2				seeing 0.64	seeing 0.63	seeing 0.64	
260908_B1	reject (fails 1/3 criterion)	not rejected	reject (fails 1/3 criterion)				still establishing the correct methodology
041108_A1				seeing 0.76	one extra point considered; seeing 0.82	seeing 0.76	
041108_B1				circle fit '-' option used; seeing 0.59	parabole fit used; seeing 0.71	circle fit '-' option used; seeing 0.59	still establishing the correct methodology
051108_B3				seeing 0.83	seeing 0.84	seeing 0.83	
141108_A1				remove 14 discontinuous points (not aligned with the data); seeing 1.7	14 discontinuous points not removed; seeing 2.0 *(2nd run: 14 points removed; seeing 1.8; a few points less on the left side)*	removed the 14 discontinuous points; seeing 1.7 (full left side points considered)	still establishing the correct methodology
151108_C2				Followed Mathematica advice and tried another numerical method; seeing 0.45	red dots of extremeties in wrong places (and did not follow Mathematica advice); seeing 0.85 *(2nd run: 0.60)*	red dots of extremeties properly "ortogonal" to the path (and Mathematica advice followed); seeing 0.45	still establishing the correct methodology
151108_C3					two extra points	no extra points	
031208_A1	S-shaped dataset: no sense to fit seeing (must unbend data first)	S-shaped dataset (seeing value meaningless) *[2nd run: reject]*	correct the S-shape by unbending and then fit seeing				still establishing the correct methodology
171208_A1				seeing 0.64	seeing 0.69	seeing 0.64	
090109_A1				seeing 0.46	seeing 0.67 (two extra points)	seeing 0.46 (no extra points)	still establishing the correct methodology
090109_A2	reject (fails 1/3 criterion)	not rejected	reject (fails 1/3 criterion)				still establishing the correct methodology
100109_C3				seeing 0.52	seeing 0.51	seeing 0.52	
230109_A1	could reject (1/3 criterion) but too good data, two lobes with few points	keep as is *(2nd run: reject)*	kept (two lobes)				
240109_C3				seeing 0.54	red dots of extremeties in wrong places; seeing 0.96 *(2nd run: 0.71)*	red dots of extremeties properly "ortogonal" to the path	still establishing the correct methodology
120209_A1	S-shaped dataset: no sense to fit seeing (must unbend data first)	S-shaped dataset (seeing value meaningless) *[2nd run: reject]*	correct the S-shape by unbending and then fit seeing				

Table S15. The final results (seeing and relevant parameters) using the RMS method. The five red lines are data points that we rejected. Columns: (1): Date. (2) Place code. (3) The maximum value of a single pixel across the original CCD matrix (before 4-pixel aggregation). (4-5) The maximum (minimum) value of a 4×4 pixel across the converted CCD matrix. (6) Percentage difference between Columns 4 and 5. (7) Relevant comments from looking at the calibrated data. (8) Indication if "lobe work" was performed or not and some details on it. (9) Detailed description of the data reduction process in each case. Four yellow lines: external factors bent the CCD and, so, the data had to be unbent. (10) The seeing, in arc seconds, when parabola fitting was used; the number of points used is also given: when lobe work was performed (see Columns 8 and 9), this total is actual split into the several components and the separation between these (sep) is also shown. (11) The seeing, in arc seconds, from circle fitting; in a few situations (H) horizontal fitting was used and in one (M), actual "manual" fitting was performed. The number of points are shown in the same format of Column 10. (12) ADU ratio (in percentage) from the peak value to the 2nd peak (vector_c). (13) Similar to Column 12 but this time the ratio is to the last point of vector_c. (14) "Longitudinal" seeing from the brightness fluctuations along the path: median of all consecutive pairs of points along vector_h.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Date	**Local**	**MaxADU 1pixel**	**MaxADU 4pixel**	**MinADU 4pixel**	**% diff**	**Comments (calibrated raw data)**	**Lobe Work (details)**	**Comments (data reduction)**	**CCD seeing (parabole) (#points)**	**CCD seeing (circle) (M, H) (#points)**	**peak-to-2nd (%)**	**peak-to-last (%)**	**long. seeing (%)**
08/02/2008	A2	37606	37168	17253	54	A bit of trail is "lost" in the end.	No	Vectors c an f had both to be stopped at their 16th and 15th point, respectively, for cycling. So, vector h has 31 points.	1.3 (31)	1.7 (31)	27	44	9
29/02/2008	A1	40800	40367	20663	49		No	Vector c stopped at 42 points (cycling) and the same for vector f (4 points). Vector h has, thus, 46 points. This is a case when the parabole fit is much better but clearly unphysical...	1.6 (46)	2.6 (46)	13	21	4
07/03/2008	A1	35388	34316	12480	64		No	Vector c stopped at 40 points (cycling) and f totally ignored (with c would cycle back). So, h=c (40 points).	1.4 (40)	1.6 (40)	0	18	2
07/03/2008	A2	45606	43138	11678	73		Yes (main ignored!)	Main: vector c stopped early (at 7) due to cycling; vector f also stopped at 4 points (h has 11 points). Bottom lobe (chop of main at y>74): vector c stopped at 9 points; vector f fully used (15 points). Looking at the graphs it does not make much sense to combine both, since main is horizontal (no sense) while lobe is vertical (ok). So, we only get seeing from the lobe, totally ignoring the wandering points in the main part. So, h has 24 points. However, last point was removed due to a 48% drop, so 23 points. Circle fit on lobe alone failed (path too vertical). Of the 23 points of vector h, 17 are on the same line(!) and only three are out of it on each side, by the same distance (2 pixels). So, we can actually calculate this manually, which we did!	---	M: 0.9 (23)	---	---	---
08/03/2008	C1	38825	38522	12705	67		Yes	Main + right lobe. Main: vector c stopped early (at 2) due to cycling; vector f also stopped but at 13 points (h has 15 points). Right lobe (x>215): vector c fully used (14 points); vector f would just add a circle to c so it was ignored (h=c has 14 points). So, the global vector h has 15+14=29 points separated by 20 points in the overall fit. The last 3 points of main, although quite below the trend, do not constitute a "cluster" (10% rules) and, so, they were kept.	2.1 (15+14; sep20)	2.7 (15+14; sep20)	64	0	6

(1) Date	(2) Local	(3) MaxADU 1pixel	(4) MaxADU 4pixel	(5) MinADU 4pixel	(6) % diff	(7) Comments (calibrated raw data)	(8) Lobe Work (details)	(9) Comments (data reduction)	(10) CCD seeing (parabole) (#points)	(11) CCD seeing (circle) (M, H) (#points)	(12) peak-to-2nd (%)	(13) peak-to-last (%)	(14) long. seeing (%)
08/03/2008	C2	53549	50243	37086	26	Exposure close to chip border.	No	Vector c in full (38 points) but f only 1st point (would cycle). Last two points were removed in succession (40% and 33% drops, respectively). Thus, h has 37 points.	1.3 (37)	1.5 (37)	9	28	4
14/03/2008	A1	46201	45813	26289	43		No	Vector c had to be stopped at 26 points (cycling) but vector f stopped alone at 16 points. So, vector h has a total of 42 points. But the first point was removed (50% rise), so 41 points total.	1.1 (41)	1.1 (41)	47	16	4
14/03/2008	A2	42483	41706	13498	68		No	Vector c had to be stopped at 34 points for cycling, while f stopped alone with 8 points. So, vector h has 42 points in total.	1.5 (42)	1.5 (42)	77	56	11
15/03/2008	B1	35451	34381	26170	24	Strange turn in the end of the trail.	No	Vector c stopped alone at 24 points and vector f had to be stopped at 7 (h with 31 points). Last point with 46% drop (removed), so 30 points.	1.4 (30)	2.8 (30)	24	12	4
28/03/2008	A1	36512	36248	14567	60	Part of the trail off the chip	Yes	For main, vector was stopped at its 6th point for cycling, while vector f was ignored for cycling with c, so h=c with 6 points. Then a lobe study was tried (y<27) with the rest of the data. Vectors c and f stopped "naturally" but f would go back if together with c so it was ignored. We also have here h=c with a total of 13 points. So, the overall vector h to be fit has a total of 6+13=19 points separated by about 15 points. However, the last five points of the lobe must be removed since they clearly have a "border effect". So, only 14 points total (separated by another 15). Less than 1/3 of the maximum number of points among all data so this dataset was ignored	---	---	---	---	---
29/03/2008	A2	31906	31226	19796	37	Something terrible happened? Telescope moved? Low "bumps".	Yes	These data are really horrible, possibly the seeing was too bad to make any measurement possible. The peak is in the top "lobe". Most data are not usable, only the top section (y>310). Main data fit was giving no-sense with only 4+9 points in vectors c+f with vector h going horizontally rather than vertically (as it seems the movement of Polaris happened). Lobe fit was attempted (y<346) and it worked: 14 points for c; f was ignored for cycling with c, so h=c. We gave up since only the lobe would be considered and this has less than 1/3 of the points of the maximum number among all datasets.	---	---	---	---	---
23/04/2008	A2	26930	26133	11237	57		Yes (two lobes)	Main: only the first four points of c kept, for cycling. f ignored for cycling with c (so, h=c with 4 points). Lobe work was done (x<649) and a central lobe was defined with only 4 points in c and 6 in f, for cycling. So, h has 10 points here. More lobe work had to be done (left lobe; x<626). The routine stopped alone for both vectors, 13 and 3 points, respectively, giving h with 16 points, but the last two points of f had to be ignored due to the border effect, so h has 14 points. Overall, the fit was made across the two sets, in total of 4+10+14=28 points separated by about 4 and 3 points, respectively.	1.0 (4+10+14; sep4,3)	2.0 (4+10+14; sep4,3)	49	52	17
24/04/2008	B1	36345	36148	23692	34		Yes	Main: vectors c and f had to be stopped for cycling, the first at the 14th point and the second at its 4th. Hence, vector h contains 18 points. Lobe (x>492): c was stopped at the 5th point for cycling and f was ignored for being fully on the border. So, total vector h has 18+5 = 23 points separated by about two points.	2.1 (18+5; sep2)	2.4 (18+5; sep2)	9	28	7
07/05/2008	B1	40669	38847	23966	38		No	Vectors c and f have 35 (stopped for cycling)+3 points, respectively, giving 38 points for vector h. First point removed due to a 63% rise, so 37 points.	1.7 (37)	1.9 (37)	38	29	3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Date	**Local**	**MaxADU 1pixel**	**MaxADU 4pixel**	**MinADU 4pixel**	**% diff**	**Comments (calibrated raw data)**	**Lobe Work (details)**	**Comments (data reduction)**	**CCD seeing (parabole) (#points)**	**CCD seeing (circle) (M, H) (#points)**	**peak-to-2nd (%)**	**peak-to-last (%)**	**long. seeing (%)**
12/06/2008	A1	38950	36906	27612	25		Yes	In effect, two lobes (main is the left one). Although far apart the seeing will become from a fit to the combination. Main (left lobe): vector c stopped at the 11th point (cycle) and vector f at its 3rd point. So, h has 14 points. Right lobe (x>623): vector c stopped at its 3rd point (going backwards afterwards) and vector f on its 4th for cycling back. Vector h has, thus, 7 points on this lobe. The global fit contains 14+7=21 points, although quite far apart, with about 14 points interval between the lobes.	1.9 (14+7; sep14)	2.0 (14+7; sep14)	20	8	7
27/06/2008	A1	22067	21506	12237	43		No	Vector c was stopped at 21 points (cycling) and vector f at 9, for the same reason. So, h has 30 points.	1.2 (30)	1.3 (30)	48	20	6
04/07/2008	A1	33790	32990	25462	23	Bent: telescope moved? Strong wind [maybe]	Yes	We first proceeded 'as usual', despite the big bend. Main: vector c was stopped at 25 points for cycling, same for f but at 3 points. Thus, vector h has 28 points. We then do lobe work (bottom lobe; y<238): vector c had to be truncated since it was cycling (became with 17 points). Vector f only has 2 points. So, vector h has 19 points. However, due to a 51% drop, the last point was removed, so h has 18 points. Combining the data gives a total vector h with 28+18=46 points, separated by about two points. However, we cannot fit a circle or parabole without correcting for the bend. We did this, firstly, by defining the bend: between points (440.5,227.5) and (470.5,252.5), giving the bend 17 points, the 'new' bottom lobe 14 points and the 'new' main 15 points. Using the nearest mid-points to the bend on main (xmain=466.5) and bottom lobe (xbot=436.5) we actually find the total shift of the bend: 30 points. Since the height of the bend is 25 points we find the angle of the bend: 40 deg. So, finally, we artificially bend the 'new' bottom and the 'new' main by 40 deg clockwise (final extra routine written). And, now, we are ready to fit a circle and a parabole to the 46-point 'regular' vector h thus created.	1.9 (28+18; sep2)	2.0 (28+18; sep2)	3	5	2
04/07/2008	A2	33159	32341	15876	51	Too much wobble: telescope moved?	No	Vector c and f stopped alone at, respectively, 7 and 42 points, so vector h has a total of 49 points. A 59% drop removed the last point, so 48.	0.9 (48)	0.9 (48)	48	21	3
05/07/2008	B1	34830	33845	20038	41		No	Vector c stopped at 4 points for cycling. Vector f is in full, with 35 points. So, vector h has 39 points. One point removed on one side (45% rise) and another in the other side (60% drop); so 37 points.	0.7 (37)	0.7 (37)	30	13	5
05/07/2008	B2	42776	40049	22559	44		No	Vector c stopped alone at 47 points. Vector f would make a cycle with c so totally ignored. Hence, h=c (47 points). Last point removed (55% drop) so 46.	1.0 (46)	1.0 (46)	0	54	3
05/07/2008	B3	33930	33376	11160	67		Yes	Main: vector c in full (10 points), vector f truncated (it would make a cycle with c): only the 1st point kept. So, h has 11 points. Lobe (x>325): vector c in full, with 42 points; f ignored because it would make a cycle (h=c). First point in main with 29% rise, so ok. The last two points of the lobe are different enough in ADU not to constitute a cluster. So they mus be kept. So, the overall for contains 53 points (11+42 points, separated by about 4 points in distance).	1.5 (11+42; sep4)	1.6 (11+42; sep4)	38	68	4

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Date	**Local**	**MaxADU 1pixel**	**MaxADU 4pixel**	**MinADU 4pixel**	**% diff**	**Comments (calibrated raw data)**	**Lobe Work (details)**	**Comments (data reduction)**	**CCD seeing (parabole) (#points)**	**CCD seeing (circle) (M, H) (#points)**	**peak-to-2nd (%)**	**peak-to-last (%)**	**long. seeing (%)**
11/07/2008	A1	41417	40942	23180	43	Bent: telescope moved?	Yes	Another situation with a bend. So, we proceed as 'usual'. We first reduce the data as if all was ok. Main: vector c cut at 7 points and the same for f, for cycling (h with 14 points). Lobe (y>95): c stopped alone at 12 points; f had to be stopped at 14 points for cycling. So, h has 26 points, but the last two points had to be removed (border effect). Global h has, thus, 38 points (14+24 points separated by only one point). Now the moment has come to 'unbend' the upper part of the data. We first find the angle: 32 degrees. And now we use a special subroutine to rotate the top part, before fitting a circle (only '-' worked, but with a ridiculous value - path too horizontal) and a parabole; this worked but very unphysical so we made a final check with the horizontal fit.	1.6 (14+24; sep1)	H: 1.7 (14+24; sep1)	3	8	3
18/07/2008	A1	37167	36206	27816	23	Some wobble.	No	Vector c was truncated in its 37th point since it started a cycle afterwards (going back). Vector f became c from its 7th point. The first six points would make a cycle with c. Hence, vector f was fully ignored (h = 37 points). Again, we have a bend, even if slight, so we will 'unbend it' before fitting curves to the path. The correction is a 23 angle counterclockwise.	1.7 (37)	1.9 (37)	14	0	3
18/07/2008	A2	41851	41375	21749	47		Yes	Main: vector c was truncated at its 15th point for cycling while f was fully used (8 points); so, h here has 23 points. Lobe (y<200): vector c fully used (19 points), but vector f had only its first point used since it cycles with c. Thus, h has a total of 23+20=43 points. However, 1st point removed for a 35% rise; last point removed for a 44% drop. So, global vector h has 22+19 = 41 points separated by only about seven points. Regular circle fit failed (too high values) probably because of the arc being too vertical. So, the alternative method was used (horizontal distance of each vector h point to the fitted line) and it worked!	1.0 (22+19; sep7)	H: 1.8 (22+19; sep7)	11	37	4
19/07/2008	B1	45820	42926	19886	54	Exposure close to chip border.	No	Vectors c and f had to be truncated for cycling, at 30 and 15 points, respectively. So, vector h has 45 points. Unfortunately, the circle fit failed but parabole fit worked.	2.1 (45)	---	45	64	9
19/07/2008	B3	34130	33611	18749	44	"Holes" in the trail.	Yes	Main: Vector c was truncated in its 21st point since it started a cycle afterwards (going back). Vector f was stopped at its 9th point for the same reason. Thus, vector h has 30 points. Lobe (y<355): vector c was truncated at its 7th point for cycling back while vector f was used full (6 points). So, global vector h has 30+13=43 points separated by about 7 points.	2.4 (30+13; sep7)	2.4 (30+13; sep7)	37	1	7
31/07/2008	A1	38417	37535	23464	37	Wobbling a bit.	No	Vector c stopped at 3 points (on its own). Vector f was truncated at 39 points (cycling). The last point was deleted for a 40% drop. So, h has 41 points in total.	1.9 (41)	1.9 (41)	8	6	2
31/07/2008	A2	33617	32919	26245	20		Yes (two lobes + main, at the bottom)	Main: vector c was stopped early (at 4 points) due to cycling; vector f fully used, stopped alone at 8 points (total in h: 12 points). Central lobe (y>245): vector f would do a circle with c (ignored). c=h with 13 points (stopped alone). Top lobe (y>270): vector f would do a circle combined with c (ignored). Vector c is full but only ten points (=h). The first point in main was removed for a 60% rise. Due to the "border effect" the same was made to the central lobe (last 3 points). So, global h=11+10+10= 31 points, separated by about two and three points in distance. Finally, the circle fit went ok ('-' fit; the other failed) but the seeing was giving too high values so we used the "horizontal distance" method (besides parabole fit).	1.1 (11+10+10; sep2,3)	H: 1.2 (11+10+10; sep2,3)	21	0	2
01/08/2008	B1	44089	42772	21955	49		Yes	Main: vector c cut at 12 points and vector f at 8 (vector h with 20 points), for cycling. Lobe (y>97): vector c cut at 11 points; f ignored because it would make a cycle (h=c). Although the last four points do constitute a cluster, their average only drops 28% from the previous point, so they are kept. So, the global fit contains 20+11=31 points, separated by about 11 points in distance.	1.3 (20+11; sep11)	1.5 (20+11; sep11)	37	51	6

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Date	**Local**	**MaxADU 1pixel**	**MaxADU 4pixel**	**MinADU 4pixel**	**% diff**	**Comments (calibrated raw data)**	**Lobe Work (details)**	**Comments (data reduction)**	**CCD seeing (parabole) (#points)**	**CCD seeing (circle) (M, H) (#points)**	**peak-to-2nd (%)**	**peak-to-last (%)**	**long. seeing (%)**
01/08/2008	B2	35063	32609	18793	42		No	Vector c was cut into 9 points (cycling). Vector f is full (15 points). Vector h would have 24 points; however, the 1st point was removed for a 37% rise (h=23).	1.7 (23)	1.8 (23)	50	37	14
06/08/2008	A1	39268	35229	21912	38		No	Vector c is in full (15 points). Vector f was truncated in its 30th point since it started a cycle afterwards (going back). Last point removed for a 34% drop. Thus, vector h has 44 points.	1.6 (44)	1.6 (44)	50	45	3
06/08/2008	A2	38547	37461	29735	21		Yes	Main: vector c had to be stopped at the 8th point since it would cycle. Vector f was cycling sooner (with c) so only the first point is considered. Thus, h for main has 9 points. Lobe (y>132): vector c had to be truncated at its 5th point (cycling) but vector f is in full (27 points), so vector h here has 32 points. The last point was removed due to a 36% drop. So, the total is 9+31=40 points, separated by about four points. The circle fit worked but the seeing values were ridiculous; the "horizontal" method and parabole fit worked, though.	1.4 (9+31; sep4)	H: 1.5 (9+31; sep4)	6	16	3
22/09/2008	A1	37715	36892	10535	71		Yes (two lobes)	Main (left lobe): vector c stopped alone at 4 points but f had to be stopped at its 7th point for cycling (h with 11 points) - last point removed for a 49% drop, so h with 10 points. The right lobe (x>212) has a 'clean' vector c with 13 points but f had to be truncated right at its 1st point for cycling with c; so, vector h on this lobe has 14 points. As for the central lobe (249>x>212: we had to do a 'hand' insert on the routine): vector c had to be stopped at its 15th point for cycling; f was stopped at its 5th for the same reason; we thus have 20 points for vector h here. So, final vector h has 10+20+14=44 points separated by about three and two points.	1.2 (10+20+14; sep3,2)	1.2 (10+20+14; sep3,2)	---	---	2
22/09/2008	A2	34538	33763	28923	14		No	Vector c cut at 7 points (cycle) and vector f cut at 24 (h with 31).	1.2 (31)	1.2 (31)	6	17	4
23/09/2008	C1	38068	37686	25743	32		Yes	Main: vectors c and f in full but with only 5 and 2 points each, respectively (h with 7 points). Lobe (x>209): full vector c (23 points) and vector f (17 points)! So, maximum vector h with 40 points. The global fit contains 47 points, separated by about 3 points in distance. However, the first point was removed for a 58% rise, the last point for a 47% drop, and the "connection" point for a 48% rise. So, global h has 6+38=44 points, separated by about 3 points.	1.4 (6+38; sep3)	1.4 (6+38; sep3)	30	13	3
26/09/2008	B1	36312				Very short path (hint of remaining).	No	Vectors c and f were restricted to seven and three points, respectively, for cycling. Thus, vector h only has 10 points. The last point was kept (exactly 33% drop) but the data were negleted: too few points (less than 1/3 of maximum possible).	0.6 (9)	0.6	49	15	6
04/11/2008	A1	42064	40692	23490	42		Yes	Main: Vectors c and f had to be stopped for cycling, respectively, at 22 and 7 points, so h vector has 29 points. Lobe (x<123): both vector c and f stopped alone (at nine and ten points, respetively) but f had to be further restricted for cycling right at the first point; and c had its last point removed for a 49% drop; so, h has 9 points. Global h has, thus, 29+9 = 38 points separated by about 3 points.		1.6 (29+9; sep3)	0	41	4
04/11/2008	B1	34598	34000	20122	41		No	Vector c stopped alone at 29 points and vector f at 19 points, so h has 48 points. However, last point has a 43% drop so it was removed (h=47 points).		1.2 (47)	30	43	3
05/11/2008	B3	32104	31737	12658	60		No	3D: a hole in the middle. Both vectors c and f stopped alone at 26 and 16 points, respectively. So, vector h has 42 points.		1.2 (42)	70	70	3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Date	**Local**	**MaxADU 1pixel**	**MaxADU 4pixel**	**MinADU 4pixel**	**% diff**	**Comments (calibrated raw data)**	**Lobe Work (details)**	**Comments (data reduction)**	**CCD seeing (parabole) (#points)**	**CCD seeing (circle) (M, H) (#points)**	**peak-to-2nd (%)**	**peak-to-last (%)**	**long. seeing (%)**
14/11/2008	A1	41144	39890	13248	67		Yes (two lobes)	3D: half track almost "gone". Main: Vector c had to be stopped at 5 points for cycling while only the 1st point of vector f was considered (for cycling with c). So, h has 6 points. Central lobe (x>213): both vectors c and f stopped alone at 30 points. However, vector c had to be stopped at 13 points for cycling and f at the 1st point, for cycling with c. Thus, vector h has 14 points. Right Lobe (x>242): vector c stopped alone at 5 points. Vector f stopped alone at 30 points. Hence, vector h here has 35 points but the last point had to be removed for a 50% drop. So, finally, h here has 34 points. So, in total, vector h has 6+14+34=54 points separated by about 4 and 3 points, respectively.		1.9 (6+14+34; sep4,3)	9	74	5
14/11/2008	C1	36643	35896	14124	61		No	Both vectors c and f stopped alone at 76 and 11 points, respectively, but c had to be stopped at 30 points for cycling. Thus, vector h has 41 points.		1.8 (41)	73	21	4
15/11/2008	C2	40522	39107	24547	37	black spot; no clouds reported; maybe a CCD "hicup"?	No	3D: a hole in the end of the track. Vector c stopped alone at 19 points but vector f had to be stopped at 25 points for cycling. Hence, vector h has 44 points. However, the first/last points had to be removed for a 39%/43% rise/drop, so h keeps 42 points.		2.3 (42)	45	30	4
15/11/2008	C3	34674	33948	27169	20		No	Vector c was stopped at 40 points for cycling and vector f at the 1st point, for cycling with c. So, vector h has 41 points.		1.8 (41)	19	19	3
28/11/2008	A1	43890	41977	12384	70		Yes	3D: looks a bit bad - irregular and with a hole in the middle. Main: Both vectors c and f stopped alone at 32 and 31 points, respectively. But vector c had to be stopped at 10 points for cycling and vector f ignored, for cycling with c (vector h=c has 10 points). Lobe (x>190): both vectors c and f stopped alone at 15 points but vector f only had its first point considered for cycling with c. Thus, vector h has 16 points and vector h overall has 10+16 = 26 points separated by about 15 points.		2.0 (10+16; sep15)	---	---	5
28/11/2008	A2	21939	21642	10146	53	some fog was causing "ghosts"		3D - looks difficult (two peaks, holes…). Main: Vector c stopped alone at 8 points. Vector f only had its 1st point considered for cycling. So, h has 9 points. Lobe (x>295): vector c stopped (alone) at 7 points and vector f at 3 points (alone); so, h has 10 points here. In total, we would have a global vector h with 9+10 points separated by about 22 points. However, most points are quite weak (below 15000 ADU) and the paths in each lobe make no much sense on being combined (clearly random). So, this dataset has to be ignored.					
03/12/2008	A1	35719	34456	13826	60		Yes	3D: large wobbles… Vector c had to be stopped for cycling at the 4th point. Vector f would cycle with c, so ignored; vector h=c with 4 points. Central lobe (x<507): vector c stopped alone at 11 points; only the 1st point of f was considered, for cycling with c; so, h has 12 points here. Left lobe (x<472): vector c stopped alone at 9 points, but its last five points had to be removed due to the border effect; vector f had to be stopped at its 9th point for cycling; so, vector h has 13 points here. Finally, global vector h has 4+12+13 = 29 points separated by about 15 and one point, respectively. Before fitting a circle for finding the seeing, the last parts on the left and on the right were rotated, coincidently, by the same 32 degrees (extra routine at the end).		2.4 (4+12+13; sep15,1)	45	28	3
04/12/2008	B3	33839	33368	27816	17		Yes	Main: both vectors c and f had to be stopped for cycling at 21 and 6 points, respectively. Vector h would have 27 points but the first point was removed due to a 42% rise (so, h has 26 points). Lobe (y>257): vector c stopped alone at 12 points but vector f had to be stopped for cycling at 7 points. Thus, vector h here has a total of 19 points but the last point was removed for a 51% drop and another point of c for the border effect (h with 17 points). The overall vector h has 26+17=43 points, separated by about 2 points.		1.5 (26+17; sep2)	11	17	3

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Date	**Local**	**MaxADU 1pixel**	**MaxADU 4pixel**	**MinADU 4pixel**	**% diff**	**Comments (calibrated raw data)**	**Lobe Work (details)**	**Comments (data reduction)**	**CCD seeing (parabole) (#points)**	**CCD seeing (circle) (M, H) (#points)**	**peak-to-2nd (%)**	**peak-to-last (%)**	**long. seeing (%)**
17/12/2008	A1	33926	32695	11172	66		Yes	Main: Vectors c and f had to be stopped, for cycling, at 2 and 5 points, respectively (vector h with 7 points). Lobe (x>352): both vectors c and f stopped alone at 29 and 6 points, respectively, so vector h has 35 points; but the last point had to be removed for a 50% drop; so, h keeps 34 points. Total vector h has, thus, 7+34=41 points, separated by about 3 points.		1.4 (7+34; sep3)	4	67	4
09/01/2009	A1	38850	37739	16687	56		Yes (two lobes)	Main: both vector c and vector f had to be stopped for cycling, at 4 and 2 points, respectively, but f would cycle with vector c, so ignored (h=c with 4 points). Left Lobe (x<174): vectors c and f stopped alone at 38 and 42 points but c had to be stopped earlier at 18 points and vector f at its first point, for cycling. Vector h has, thus, 19 points. Right Lobe (x>185): vector c had to be stopped for cycling at 6 points while vector f stopped alone at 18 points but had its last four points removed for the border effect. So, vector h has 20 points. Total vector h has, thus, 4+19+20=43 points, separated by about 4 and 4 points, respectively.		1.9 (4+19+20; sep4,4)	32	57	5
09/01/2009	A2	32820	32118	13188	59	fog arrived during the exposure	---	Vector c stopped at 17 points, vector f at 19 points but it cycles together with c so it was ignored (h=c, so 17 points). Less than 1/3 of the points in the maximum dataset, so data ignored.		0.9 (17)	0	77	3
10/01/2009	C1	33092	32762	22710	31	some clouds	No	Vectors c and f stopped alone at 30 points each but f cycles with c so ignored (h=c with 30 points). Last point of h ignored for a 43% drop, so, finally, vector h has 29 points.		0.9 (29)	0	17	2
10/01/2009	C3	35802	35407	28994	18		Yes	Main: vector c stopped alone with 12 points but was further stopped at its 4th point for cycling. Vector f totally ignored due to cycling with c; so, h has four points. Lobe (y>277): vector c was stopped at 17 points for cycling, while vector f stopped alone at 19 points; so, h here has 36 points; the first point was removed for a 50% rise and, so, h keeps 35 points. So, overall h has 4+35 points separated by about 3 points. Circle fit failed (for giving a too high value for the seeing) but parabole fit worked fine.	1.1 (4+35; sep3)		13	3	3
23/01/2009	A1	35295	34626	14501	58		No	3D: interruption in the middle (hole). Both vectors c and f had to be stopped at 26 and 15 points, respectively, for cycling. Hence, vector h has 41 points.		1.9 (41)	13	27	5
23/01/2009	A2	34558	34059	14635	57		Yes	Main: vectors c and f both stopped alone at 32 points but c was truncated at 15 points for cycling and vector f had only its 1st point considered since it would make a cycle with c. So, h has 16 points. Lobe (y>385): vector c truncated at 10 points for cycling while f is fine (stopped alone with 9 points) so h has 19 points. So, overall vector h has 16+19 points separated by about 8 points.		1.2 (16+19; sep8)	67	5	3
24/01/2009	C2	37567	36496	22879	37		Yes	Main: Both vectors c and f had to be stopped for cycling at 11 and 1 points, respectively. So, vector h has 12 points. Lobe (y>276): both vectors c and f had to be stopped, for cycling, at 4 and 10 points, respectively. So, vector h here has 14 points, but last points removed for a 49% drop. So, overall vector h has 12+13=25 points, separated by about five points. Circle fit is not very convincing (overall path is not so well fit).		2.5 (12+13; sep5)	6	15	5
24/01/2009	C3	39001	38382	28705	25		Yes	Main: Vector c stopped alone with 11 points and vector f, also alone, with 34 points. However, f cycles within itself and also in combination with vector c. So h=c with 11 points bu the last point was removed due to a 34% drop (h with 10 points). Lobe (x<629): vector c cycles (stopped at 15 points) while vector f stopped alone at 9 points. So, this vector h has 24 points while the total vector h 10+24 points, separated by about 5 points.		1.7 (10+24; sep5)	25	12	3

(1) Date	(2) Local	(3) MaxADU 1pixel	(4) MaxADU 4pixel	(5) MinADU 4pixel	(6) % diff	(7) Comments (calibrated raw data)	(8) Lobe Work (details)	(9) Comments (data reduction)	(10) CCD seeing (parabole) (#points)	(11) CCD seeing (circle) (M, H) (#points)	(12) peak-to-2nd (%)	(13) peak-to-last (%)	(14) long. seeing (%)
12/02/2009	A1	37122	36040	30874	14		No	3D: bending a bit. Vector c was stopped at 16 points for cycling while vector f stopped alone at 27 points. So, vector h has 43 points but due to a 39% rise the first point was removed (h with 42 points). Unbending took place here too (extra routine): on the top, by 37 degrees clockwise; on the bottom, 33 degrees, same direction. Circle fit was giving a non-sense seeing value. Parabole fit also failed. Horizontal fit value...		H: 2.7	14	4	4
13/02/2009	B2	36184	35073	20659	41		Yes	Main: both vectors c and f had to be stopped for cycling, the first at 13 points and the second at 9 points. So, vector h has 22 points. Lobe (y<437): vector c had to be stopped at 10 points, for cycling; vector f stopped alone at 29 points but also had to be stopped further at 10 points, for cycling. So, vector h here has 20 points, but the last point had to be removed for a 52% drop. So, the overall vector h has 22+19=41 points, separated by about 3 points.		2.4 (22+19, sep3)	49	10	4
20/02/2009	C1	34643	34186	19473	43		Yes (two lobes)	3D: holes and peaks… Main: both vectors c and f cycle. Vector c was stopped at 3 points but vector f was ignored for cycling with vector c (thus, h=c with only 3 points). Central Lobe (y<391): both vectors c and f stopped alone at 24 and 32 points, respectively. However, vector c had its last five points removed due to the border effect while f was further stopped at 4 points for cycling with vector c . Thus, vector h has a total of 23 points here. South Lobe (y<343): vector c stopped alone at 3 points; while vector f had to be stopped for cycling, also at 3 points. Thus, vector h here has a total of 6 points. So, overall vector h has 3+23+6=32 points separated, approximately, by 2 and 4 points, respectively. Circle fit failed (too high value) but parabole fit worked fine.	1.2 (3+23+6; sep2,4)		18	2	5

Table S16. Seeing as a function of height from the ground. The three values in italic were extrapolated by us, after curve fitting (see Figures S17 and S18). The value in bold was used to test the fitting; see also Table 4. **(A)** Cumulative seeing, as given by the results of *(35)*; strictly, *(35)* shows values from 50 m high and up. **(B)** Median seeing values from Table 2 of *(45)*.

cumulative seeing (")	height (m)
1.27	*0.5*
1.07	*2.5*
0.97	*6*
0.74	**50**
0.44	140
0.42	281
0.38	562
0.35	1125
0.25	2250
0.15	4500
0.10	9000
0.08	18000

(A)

median seeing (")	height (m)
1.56	*0.5*
1.12	*2.5*
0.878	*6*
0.716	**7**
0.676	10
0.567	20
0.437	30
0.371	40
0.297	50
0.246	60

(B)

Table S17. The five master flats compared. The last line in the table shows the overall mean of each of Columns 3-7 (units in this table are analogue-to-digital units (ADUs)) and 13. Columns: (1): The date when each set of flats were produced (and the consequent master flat). (2): Number of flats that were used to produce each master flat. (3)-(7): statistics of each set of flats. (8)-(12): The relative difference (in percentage) between each value of Columns 3-7 and the respective overall mean (last line of the relevant column). (13): Ratio of Columns 5 and 6.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Master Flat	**#**	**peak**	**min**	**mean**	**median**	**S.D.**	**respective percentage differences to the overall mean**					**mean/ median**
04/07/2008	49	10347	3223	8092	8098	64.78	2	8	3	3	15	0.1
11/07/2008	61	10127	3192	8263	8336	82.11	4	9	1	0	8	0.9
18/07/2008	52	11008	3539	8575	8598	76.21	4	0	2	3	1	0.3
31/07/2008	77	10655	3934	8467	8493	72.29	1	12	1	1	5	0.3
06/08/2008	72	10864	3721	8464	8514	83.58	2	6	1	2	10	0.6
overall mean		*10600*	*3522*	*8372*	*8408*	*75.79*						0.4

Table S18. Comparison of IA and PL data calibration procedures using the final calibrated Polaris five-minute exposures. Except the percentages and the number of days, all values are in analogue-to-digital units (ADUs). Columns: (1) Date. (2) Site code. (3) Number of days since 8th February 2008. (4)-(6) Peak values compared (with relative difference). (7)-(9) Median values compared (with relative difference). (10)-(12) Standard deviation values compared (with relative difference). (13)-(16) Maximum, median, mean, and standard deviation of the resulting matrix of absolute values of the pixel-to-pixel subtraction of PL data from IA data. The grey painted cells of 05/07/2003_B3 and 23/09/2008_C1 are special cases discussed in the text.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
			INDIVIDUALLY									DIFFERENCE			
Date	Site	Day	Peak			Median			Standard Deviation						
			IA	PL	%dif	IA	PL	%dif	IA	PL	%dif	max	median	mean	S.D.
08/02/2008	A2	0	32620	37606	15	110	110	0	1069	1168	9	7091	1	11	140
29/02/2008	A1	21	40496	40800	1	105	105	0	1378	1466	6	7261	0	10	129
07/03/2008	A1	28	34309	35388	3	100	100	0	1328	1331	0	4643	0	4	65
07/03/2008	A2	28	42944	45606	6	100	100	0	1475	1540	4	9985	0	11	152
08/03/2008	C1	29	38530	38825	1	102	101	1	1332	1364	2	5197	0	8	94
08/03/2008	C2	29	50041	53549	7	100	100	0	1517	1681	11	15298	0	14	214
14/03/2008	A1	35	47486	46201	3	100	100	0	1724	1790	4	10972	0	11	167
14/03/2008	A2	35	46374	42483	8	110	110	0	1189	1198	1	9645	1	8	112
15/03/2008	B1	36	39767	35459	11	102	102	0	1388	1365	2	8028	0	5	91
28/03/2008	A1	49	33508	36512	9	100	100	0	881	932	6	7495	0	7	95
29/03/2008	A2	50	33821	31906	6	107	107	0	1167	1127	3	5134	0	6	71
23/04/2008	A2	75	30240	26930	11	100	100	0	694	700	1	3931	0	4	47
24/04/2008	B1	76	33439	36345	9	100	100	0	1167	1281	10	6685	0	9	130
08/05/2008	B1	90	37984	40669	7	100	100	0	1240	1244	0	4654	0	3	50
12/06/2008	A1	125	38486	38950	1	100	100	0	1733	1712	1	5779	0	6	83
27/06/2008	A1	140	21834	22067	1	100	100	0	842	852	1	2137	0	2	32
04/07/2008	A1	147	33033	33790	2	140	140	0	1439	1446	0	4344	2	6	58
04/07/2008	A2	147	33691	33159	2	185	185	0	1114	1112	0	4839	4	8	51
05/07/2008	B1	148	33731	34830	3	100	100	0	890	905	2	4073	0	2	38
05/07/2008	B2	148	44824	42776	5	100	100	0	1284	1307	2	6037	0	8	70
05/07/2008	B3	148	34797	33930	2	2121	2138	1	1287	1238	4	4121	99	123	46
11/07/2008	A1	154	40521	41417	2	109	109	0	1568	1633	4	5835	0	7	96
18/07/2008	A1	161	34467	37167	8	137	137	0	1409	1461	4	5751	1	6	79
18/07/2008	A2	161	41046	41851	2	100	100	0	1569	1601	2	8240	0	9	131

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Date	Site	Day	INDIVIDUALLY									DIFFERENCE			
			Peak			Median			Standard Deviation						
			IA	PL	%dif	IA	PL	%dif	IA	PL	%dif	max	median	mean	S.D.
19/07/2008	B1	162	43317	45820	6	102	102	0	1519	1502	1	6091	0	9	105
19/07/2008	B3	162	32521	34130	5	116	116	0	1426	1490	4	5285	1	8	88
31/07/2008	A1	174	35494	38417	8	107	107	0	1401	1481	6	5307	0	6	93
31/07/2008	A2	174	33582	33617	0	102	102	0	1335	1338	0	2477	0	3	37
01/08/2008	B1	175	38933	44089	13	100	100	0	1403	1489	6	8188	0	9	105
01/08/2008	B2	175	33356	35063	5	100	100	0	1156	1201	4	3779	0	7	68
06/08/2008	A1	180	39262	39268	0	164	164	0	1288	1289	0	76	0	0.06	0.5
07/08/2008	A2	181	38550	38547	0	100	100	0	1408	1408	0	51	0	0.03	0.5
22/09/2008	A1	227	37733	37715	0	101	101	0	1354	1354	0	40	0	0.03	0.4
22/09/2008	A2	227	34548	34538	0	100	100	0	1320	1320	0	150	0	0.03	0.5
23/09/2008	C1	228	38068	38068	0	100	102	2	1252	1250	0	4398	2	9	8
26/09/2008	B1	231	36315	36312	0	100	100	0	567	567	0	29	0	0.007	0.2

Table S19. Consensus table for the RMS data reduction by PA and PL. The independent work only applies to the 4th November 2008 – 20th February 2009 period. Before that, IA worked on the data *(53)*. Columns: (1) Data point. (2)-(4) Major differences and consensus. (5)-(7) Minor differences and consensus. (8)-(10) Data presentation (aestetics) differences and consensus. (11) Relevant comments.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Datapoint	**major**			**minor**			**data presentation**			**Comments**
	PA	**PL**	**consensus**	**PA**	**PL**	**consensus**	**PA**	**PL**	**consensus**	
041108_A1				Three extra points in the extremeties	One extra point in the lobe	The four points removed				Fit similar and seeing the same
041108_B1				delete last point	keep last point	delete last point	one final image with the chosen circle fit+raw	two final images with the two circle fits+raw	one final image with the chosen circle fit+raw	still establishing presentation and recipe details
051108_B3				keep last point	delete last point	delete last point				
141108_A1	no loops in path	path with a loop	no loops in path	*[2nd run: two lobes]*	*[2nd run: one lobe]*	*[2nd run: two lobes]*				still establishing the correct methodology (e.g. deciding which data to block for "lobe work"); seeing values very similar, though! (1.8 vs 1.9) *[2nd run: 2.2 vs 1.9]*
141108_C1	42 points considered (seeing 1.7)	38 points considered (seeing 1.4), three neglected for a rise *[2nd run: 39 points, seeing 1.5]*	*[2nd run: 41 points considered (seeing 1.8)]*							still establishing the correct methodology, in particular, the definition of a cluster of initial or final points and when to delete them
151108_C2				delete last point	keep last point	delete last point				
151108_C3				considered 1st point in vector f	considered no points in vector f	considered 1st point in vector f				
281108_A2	keep	discard	discard							
031208_A1	keep (despite the strange circle in main); seeing 3.9	discard (different points in lobe cf. PA); seeing 3.6	*[2nd run: data kept but had to be unbent]*							still establishing the correct methodology, in particular, the lobe work right at the border with main; this is one of the later "unbent" situations
041208_B3				Removed two points for drop	Did not remove them; besides, vector h profile inconsistent with the path	Remove the two points (drop) *[2nd run: and one extra]*				Fits similar, seeing the same (despite obvious differences in the border definition)
171208_A1	two "border effect" points not removed (seeing 1.6)	two extreme points not removed (>33% rise/drop) (seeing 1.4)	correct approach used in both cases (new version of path)							seeing different (still establishing the correct methodology)
090109_A1	*[2nd run: two extra points in one of the lobes; two extra in the other]*	circle in main path in an overall straight dataset *[2nd run: two extra "cluster low" points to remove]*	circle eliminated through more lobe work *[2nd run: PL version, with the two points removed]*							still establishing the correct methodology, in particular, deciding exactly where to stop when vectors c or f "go back"
100109_C1				delete last point	keep last point	delete last point				slightly different fit but exactly the same seeing value
100109_C3	circle fit failed because of a large value	circle fit failed	circle fit failed because of a large value	delete first point	keep first point	delete first point	vector h profile…	… mirror-reversed!	any will do	
230109_A1				one extra point in c and two extra points in f	those three points not considered	those three points not considered				slightly different fit but exactly the same seeing value
230109_A2				two extra points in vector c considered	those two points were not considered	those two points were not considered				fits look the same and seeing is similar (1.2 vs. 1.3)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Datapoint	**major**			**minor**			**data presentation**			**Comments**
	PA	**PL**	**consensus**	**PA**	**PL**	**consensus**	**PA**	**PL**	**consensus**	
240109_C2				One lobe (four extra points)	Two lobes	One lobe, circle fit *[2nd run: horizontal fit worked for one lobe; circle fit/one lobe stays]*				Establishing the correct methodology (1/3 data missing rule for lobe work, vector c "stop point", horizontal fit)
240109_C3	3 extra points considered (lobe) and one extra is…	… different	data without the three extra points							still establishing the correct methodology, in particular, the lobe work right at the border with main; still, seeing values similar (1.8 vs. 1.7)
120209_A1				43-point vector h (last point removed)	44-point vector h (cannot see the profile correctly)	42-point vector h				slight difference in parabole fit (but the seeing value was the same); more relevant here was the correction of procedure - trial and error)
130209_B2	lobe doing circle into main	lobe going straight into main	lobe doing circle into main (points of "circle" removed)							still establishing the correct methodology, in particular, the lobe work right at the border with main; *[2nd run: seeing robust to lobe work cuts on xx or yy (2.5 vs 2.3)]*
200209_C1				Three extra points…	… vs two extra points (different from the three); too low point not removed	PA version				besides the differences, including in data to exclude for lobe fit, gave the same seeing results; still establishing the correct methodology: analyse each vector h separately

Table S20. The weather results for sites and nights where the seeing was measured. We here show the results for the 50 points which are used in the data analysis and discussion (weights ≥ 0.70 and not "red" in Table 3). Four observations were conducted of each meteorological variable, two upon arrival at the site ("1st"; ground level and 2 m high) and two "last" ones (ground level and 2 m high), while the seeing exposure was being made. In a grey line, we show the situation of 050708_B3, where we had to use ground values '1st' in the Discussion (e.g. for seeing correlations) since 'last' does not exist. The data point 070508_B1 has also a few cells in grey since it had no measurements at '1st' and 'ground'. Columns: (1): Date. (2) Site code (see Table 1). (3)-(4) UT times of the first (at the beginning of the observation set up) and last (while Polaris was being exposed on the CCD) meteorological observations made. (5)-(8) Wind speed values (from the maximum gust recorded), in meters per second. (9)-(12) Relative air humidity (HR), in percentage. (13) Difference in HR from 2 m to ground (1st; Columns 9-10). (14) Difference in HR from 2 m to ground (last; Columns 11-12). (15) Difference in HR from last to 1st (ground level; Columns 9, 11). (16)-(19) Air temperature (T), in degrees centigrade. (20) Difference in T from 2 m to ground (last; Columns 18-19). (21) Classification of the observation according to sky and environment conditions, which depend on sky coverage, wind speed, and relative air humidity: Ph – photometric; Sp – spectroscopic; '---' neither Ph nor Sp (non-usable conditions). (22) The seeing that was measured (from Columns 18-19 of Table 3).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		Obs. Time		Maximum gust (m/s)				Relative air humidity (%)							Air temperature (°C)						
Date	Site	UT		1st		last		1st		last		HR^1_{2-g}	HR^l_{2-g}	HR^g_{l-1}	1st		last		T_2-T_0 (last)	night	seeing
		1st	last	ground	2m	ground	2m	ground	2m	ground	2m	ΔHR^1	ΔHR^l	ΔHR^g	ground	2m	ground	2m	ΔT (°C)		
08/02/2008	A2	21:30	21:56	4.4	6.1	3.5	9.7	38.9	35.7	35.2	30.0	-3.2	-5.2	-3.7	6.3	7.3	5.7	7.7	2.0	---	0.69
29/02/2008	A1	20:30	21:23	1.1	2.2	1.1	1.3	24.0	13.0	32.0	25.0	-11.0	-7.0	8.0	7.4	9.2	8.2	9.0	0.8	Ph	1.7
07/03/2008	A1	20:45	21:05	3.0	3.4	1.9	5.4	11.0	8.6	15.3	10.4	-2.4	-4.9	4.3	6.5	6.7	5.2	6.4	1.2	Ph	0.64
07/03/2008	A2	22:00	22:56	2.7	4.0	2.8	5.2	15.9	13.0	14.1	10.0	-2.9	-4.1	-1.8	6.9	6.9	6.1	7.3	1.2	Ph	1.1
08/03/2008	C2	03:15	03:36	2.8	4.1	0.9	1.8	11.3	8.6	15.0	13.0	-2.7	-2.0	3.7	5.6	6.9	4.0	5.8	1.8	Ph	0.86
14/03/2008	A1	20:45	20:56	0.0	3.3	0.0	1.1	85.0	83.7	89.1	89.5	-1.3	0.4	4.1	4.3	4.2	2.4	3.8	1.4	Sp	0.81
14/03/2008	A2	22:00	22:16	0.0	1.9	0.0	0.7	85.9	84.3	86.1	86.7	-1.6	0.6	0.2	4.5	4.9	3.8	4.6	0.8	Sp	1.0
15/03/2008	B1	00:05	00:40	3.8	5.7	3.8	6.9	70.8	64.7	67.1	64.7	-6.1	-2.4	-3.7	5.8	6.6	5.8	6.4	0.6	---	1.6
29/03/2008	A2	23:50	00:09	4.9	5.2	0.6	1.5	31.3	25.8	31.6	28.4	-5.5	-3.2	0.3	5.1	6.3	4.3	5.3	1.0	Ph	1.1
23/04/2008	A2	22:50	22:58	10.8	12.3	6.0	6.9	75.3	74.2	85.4	74.8	-1.1	-10.6	10.1	6.7	6.9	5.8	6.9	1.1	Ph	0.72
24/04/2008	B1	01:05	01:17	2.7	5.8	2.3	3.1	83.8	80.1	84.3	82.4	-3.7	-1.9	0.5	5.6	6.3	5.3	6.4	1.1	Ph	1.1
07/05/2008	B1	22:15	23:11	—	9.5	3.4	5.5	—	88.9	91.2	91.4	—	0.2	—	—	7.2	6.3	6.7	0.4	Ph	0.88
12/06/2008	A1	20:40	21:16	2.2	4.0	2.6	3.7	14.5	10.1	16.7	11.9	-4.4	-4.8	2.2	11.3	12.5	9.7	11.7	2.0	Ph	0.95
27/06/2008	A1	21:00	21:22	5.7	6.7	2.7	4.2	5.1	2.0	4.7	1.7	-3.1	-3.0	-0.4	19.0	21.1	19.5	21.0	1.5	Ph	0.54
04/07/2008	A1	20:38	21:13	8.0	9.7	6.4	8.9	65.6	66.5	65.8	63.8	0.9	-2.0	0.2	12.6	12.7	12.8	13.1	0.3	Ph	0.50
04/07/2008	A2	22:10	22:34	4.3	6.0	3.7	3.7	90.7	91.5	91.0	92.1	0.8	1.1	0.3	11.1	10.8	11.1	11.0	-0.1	---	0.53
05/07/2008	B1	00:45	01:02	3.2	5.3	4.5	6.2	93.1	94.7	94.2	94.6	1.6	0.4	1.1	10.6	10.7	10.9	10.9	0.0	---	0.44
05/07/2008	B2	02:55	03:16	1.1	1.7	1.7	2.6	94.6	63.1	70.0	62.1	-31.5	-7.9	-24.6	10.4	13.3	12.1	13.6	1.5	Ph	0.48
05/07/2008	B3	05:15	—	1.5	5.7	—	—	65.9	63.4	—	—	-2.5	—	—	12.4	12.6	—	—	0.2	Ph	0.63
11/07/2008	A1	20:35	21:22	3.3	4.4	2.5	3.3	58.4	62.1	79.4	60.4	3.7	-19.0	21.0	13.3	13.5	11.3	11.8	0.5	Ph	0.83
18/07/2008	A1	20:55	21:12	5.9	10.4	6.6	10.8	40.7	42.8	42.1	41.3	2.1	-0.8	1.4	14.3	14.8	14.1	14.2	0.1	Ph	0.59
18/07/2008	A2	22:15	22:38	9.1	10.8	4.4	8.3	54.5	48.8	56.4	50.3	-5.7	-6.1	1.9	13.8	14.8	12.8	14.4	1.6	Ph	1.4
19/07/2008	B3	02:55	03:20	6.3	10.1	6.6	8.8	64.5	60.5	64.3	56.6	-4.0	-7.7	-0.2	10.7	11.8	10.6	12.3	1.7	Ph	0.65
31/07/2008	A2	22:10	22:18	3.7	6.7	3.8	6.2	49.5	41.5	39.1	38.6	-8.0	-0.5	-10.4	11.1	13.7	12.8	13.5	0.7	Ph	0.37

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
		Obs. Time		Maximum gust (m/s)				Relative air humidity (%)							Air temperature (°C)						
Date	Site	UT		1st		last		1st		last		HR^1_{2-g}	HR^I_{2-g}	HR^g_{I-1}	1st		last		T_2-T_0 (last)	night	seeing
		1st	last	ground	2m	ground	2m	ground	2m	ground	2m	ΔHR^1	ΔHR^I	ΔHR^g	ground	2m	ground	2m	ΔT (°C)		
01/08/2008	B1	00:45	01:00	2.2	4.7	3.1	7.3	39.4	30.9	39.7	29.4	-8.5	-10.3	0.3	12.1	14.3	11.6	14.7	3.1	Ph	0.42
06/08/2008	A1	20:25	20:51	1.8	3.2	2.8	3.4	18.8	18.5	23.9	9.8	-0.3	-14.1	5.1	16.1	16.8	14.6	17.0	2.4	Ph	0.67
06/08/2008	A2	21:45	23:56	2.5	4.4	3.3	6.4	30.9	24.5	18.1	15.4	-6.4	-2.7	-12.8	14.4	16.7	15.3	17.6	2.3	Ph	0.47
22/09/2008	A1	20:40	20:55	2.1	2.6	1.7	1.7	72.9	78.3	81.5	78.8	5.4	-2.7	8.6	11.1	9.8	8.9	9.6	0.7	Ph	0.57
22/09/2008	A2	21:55	22:17	0.0	1.0	0.0	0.0	87.3	88.5	89.7	93.7	1.2	4.0	2.4	8.0	9.9	5.3	9.3	4.0	---	0.64
23/09/2008	C1	00:33	01:27	0.0	0.9	0.0	1.4	89.7	93.8	93.8	96.6	4.1	2.8	4.1	8.8	9.4	7.7	9.1	1.4	---	0.62
04/11/2008	A1	19:50	20:17	0.0	3.0	1.9	3.2	53.3	54.8	69.7	71.0	1.5	1.3	16.4	4.4	4.2	3.3	3.3	0.0	Ph	0.76
04/11/2008	B1	23:00	23:56	0.0	0.0	0.0	0.0	88.3	87.9	92.9	98.0	-0.4	5.1	4.6	5.4	5.2	1.3	3.6	2.3	Ph	0.59
05/11/2008	B3	02:00	02:21	0.9	3.6	1.9	3.1	100.0	100.0	100.0	100.0	0.0	0.0	0.0	2.7	3.3	2.3	3.1	0.8	---	0.83
14/11/2008	A1	20:20	20:49	1.6	7.4	4.4	5.9	34.7	50.9	68.2	72.4	16.2	4.2	33.5	6.3	5.1	3.0	3.3	0.3	Ph	1.7
14/11/2008	C1	23:15	23:42	0.0	1.4	0.0	0.9	49.9	28.7	74.3	84.2	-21.2	9.9	24.4	1.9	6.4	0.4	5.0	4.6	Ph	0.85
15/11/2008	C2	01:05	01:37	0.0	1.3	0.0	1.6	69.3	45.3	30.7	5.8	-24.0	-24.9	-38.6	0.6	6.9	2.1	9.1	7.0	Ph	0.45
15/11/2008	C3	03:00	03:28	0.0	2.4	1.6	1.9	52.5	37.1	58.2	43.0	-15.4	-15.2	5.7	3.2	8.2	3.1	6.4	3.3	Ph	1.0
03/12/2008	A1	20:15	20:41	7.2	8.7	6.8	10.9	29.7	22.3	36.0	28.3	-7.4	-7.7	6.3	5.5	6.6	4.6	5.6	1.0	Ph	2.3
04/12/2008	B3	00:25	00:58	0.0	3.3	0.0	3.9	46.8	38.4	36.4	29.4	-8.4	-7.0	-10.4	2.1	4.3	3.1	5.1	2.0	Ph	0.71
17/12/2008	A1	20:45	20:51	2.5	4.1	2.3	7.1	100.0	100.0	100.0	100.0	0.0	0.0	0.0	2.1	2.4	2.0	2.4	0.4	---	0.64
09/01/2009	A1	20:20	20:47	4.2	6.3	1.9	3.8	78.7	77.4	89.9	89.7	-1.3	-0.2	11.2	2.8	3.0	1.7	2.3	0.6	Ph	0.46
10/01/2009	C1	00:30	00:39	0.0	1.9	0.0	2.2	89.8	90.0	94.7	95.9	0.2	1.2	4.9	3.8	5.3	3.3	4.4	1.1	Sp	0.63
10/01/2009	C3	02:05	02:22	2.1	2.1	0.6	2.6	95.2	97.5	99.3	100.0	2.3	0.7	4.1	3.0	3.4	2.6	3.5	0.9	---	0.52
23/01/2009	A1	19:55	20:24	2.9	8.3	4.0	8.9	68.1	63.2	68.7	58.1	-4.9	-10.6	0.6	8.9	9.8	8.8	10.7	1.9	Ph	1.1
23/01/2009	A2	21:15	21:40	4.1	6.4	4.5	10.4	61.3	54.5	59.2	54.7	-6.8	-4.5	-2.1	10.7	12.3	10.7	11.5	0.8	Ph	0.7
24/01/2009	C2	00:30	00:53	9.0	12.5	4.8	9.1	19.8	12.5	24.3	17.1	-7.3	-7.2	4.5	9.8	12.2	8.1	11.1	3.0	Ph	1.0
24/01/2009	C3	02:05	02:22	6.6	9.6	7.2	8.3	33.1	15.0	21.6	12.1	-18.1	-9.5	-11.5	7.4	11.7	9.3	12.3	3.0	Ph	0.54
12/02/2009	A1	21:00	21:41	1.9	2.7	1.1	2.3	34.7	17.1	37.9	15.0	-17.6	-22.9	3.2	5.1	7.8	3.3	7.7	4.4	Ph	1.0
13/02/2009	B2	00:30	01:00	0.9	2.1	1.2	2.0	40.4	32.4	41.4	23.4	-8.0	-18.0	1.0	3.7	5.3	1.3	6.8	5.5	Ph	1.1
20/02/2009	C1	22:20	23:00	1.6	3.0	1.9	3.5	85.4	87.2	89.0	80.1	1.8	-8.9	3.6	1.1	1.4	0.2	1.3	1.1	Ph	0.84

Table S21. The final results (seeing and relevant parameters) for the 59 five-minute Polaris exposures. The six red lines are data points that we rejected for having less than one-third of the maximum points of the dataset (97: Column 6). Columns: (1): Date. (2) Site code (see Table 1). (3) The maximum value of a single pixel across the original CCD matrix. (4) The full-width-at-half-maximum, taking as maximum the value of Column 3. (5) Theoretical maximum number of points in the path. If this was linear and horizontal/vertical the number would be 70. The reduction is due to the approximate inclination of the path related to horizontal/vertical. (6) Initial number of points of vector_e (straight from Routine 3 or 4 – Data S1). (7) Number of discontinuities seen in vector_e (can be single-pixel). (8) related to Column 7. If there is only one discontinuity, the number of points removed is obvious (but it can be from one extremity or the other). When there are two or more discontinuities, we give the number of points removed in order (from one extremity to the other). (9) The final number of points in vector_e. In the three lines painted in blue, the total is actually split into two "lobes". (10)-(15) Weights given depending on each data point characteristics (see Section Data Analysis – weights). In particular: (10) weight from the number of points (Column 9) against the maximum possible (maximum in Column 9: 97); (11-12) respectively, for the three situations with blue lines, weight on the lobe balance and distance; (13) weight for the two cases which had horizontal fit (Column 19); (14) weight for the five unbending situations (four in yellow lines: external factors bent the CCD; one in an orange line: too many diagonal points in middle path); (15) total weight (the product of the previous five). (16) Relevant comments from looking at the calibrated data. (17) Detailed description of the data reduction process in each case. (18) The seeing, in arc seconds, when parabola fitting had to be used. (19) The seeing, in arc seconds, from arc circle fitting; in two situations (H) horizontal fitting had to be used (parabola fitting did not work either).

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Date	Place	MaxADU 1pixel	FWHM	max.theo # points	initial #points (vector e)	#discont. (vector e)	#points removed (a+b+c+ … format)	final #points (vector e)	w_n	w_b	w_d	w_h	w_u	w	Comments (calibrated data)	Comments (data reduction)	Seeing (parabola)	Seeing (arccircle) (H)
08/02/2008	A2	37606	18803	62	52	1	3	49	0.8	1	1	1	1	0.76	Lumpy. About half of total data usable	Circle fit gave a nonsense value (too high) so parabola fit was used and worked fine	0.69	---
29/02/2008	A1	40800	20400	68	85	0	0	85	0.9	1	1	1	1	0.94	Waving a bit in the right hand side		---	1.7
07/03/2008	A1	35388	17694	62	68	0	0	68	0.9	1	1	1	1	0.86			---	0.64
07/03/2008	A2	45606	22803	70	77	1	10	67	0.9	1	1	0.9	1	0.77	Some irregularities and large gap	Data too vertical: both circle and parabola fail (horizontal fit worked)	---	H: 1.1
08/03/2008	C1	38825	19413	64	67	3	2+6+1+ +12	46 (27+19)	0.7	0.9	0.3	1	1	0.20	two equal "lobes"	Even picking the lobe with more points, this dataset would fail the 1/3 rule. In order to make something out of it (even if the seeing result must have a lower weight) we removed the last two points of the left lobe, the 6+1 points in "lost" clusters entirely, and the first 12 points of the right lobe. The final circle fit is between lobes with about a 50-point gap	---	0.45
08/03/2008	C2	53549	26775	64	79	0	0	79	0.9	1	1	1	1	0.91			---	0.86
14/03/2008	A1	46201	23101	65	79	0	0	79	0.9	1	1	1	1	0.91			---	0.81
14/03/2008	A2	42483	21242	62	70	0	0	70	0.9	1	1	1	1	0.87		Only two points are missing on vector e (discontinuities). They were ignored. Despite a hole in the data, the routine worked fine.	---	1.0
15/03/2008	B1	35451	17726	70	58	0	0	58	0.8	1	1	1	1	0.81	Some wobbling		---	1.6
28/03/2008	A1	36512	18256	---	38	1	10	28	0.7	---	---	---	---	---		Bad data (only two peaks): 1/3 rule - final #points less than 1/3 of maximum number among all datasets. There is no point here making a "two-lobe" recovery of the data (such as was done with 080308_C1) since the data are nonsense (going all over the place).		
29/03/2008	A2	31906	15953	68	56	0	0	56	0.8	1	1	1	1	0.80	Half of the trail disappered… [clouds?]	Too vertical. Circle fit gave a nonsense value (too high) so parabola fit was used and worked fine	1.1	---
23/04/2008	A2	26930	13465	58	52	3	3+2+5	42	0.7	1	1	1	1	0.73			---	0.72
24/04/2008	B1	36345	18173	65	46	0	0	46	0.7	1	1	1	1	0.75			---	1.1
07/05/2008	B1	40669	20335	56	61	0	0	61	0.8	1	1	1	1	0.82			---	0.88
12/06/2008	A1	38950	19475	64	67	0	0	67	0.9	1	1	1	1	0.85			---	0.95

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Date	Place	MaxADU 1pixel	FWHM	max.theo # points	initial #points (vector e)	#discont. (vector e)	#points removed (a+b+c+ ... format)	final #points (vector e)	w_n	w_b	w_d	w_h	w_u	w	Comments (calibrated data)	Comments (data reduction)	Seeing (parabola)	Seeing (arccircle) (H)
27/06/2008	A1	22067	11034	59	54	0	0	54	0.8	1	1	1	1	0.79			---	0.54
04/07/2008	A1	33790	16895	52	78	0	0	78	0.9	1	1	1	0.8	0.71	S-shaped path	The middle diagonal was inspected and makes sense, with the data. After defining vector e we "unbent" it (in the same way it was done in the "standard" procedure section, picking the points (466,257),(440,231); one 40-degree bent on each side, of a total of 23 and 30 points, respectively). Only afterwards was seeing calculated.	---	0.50
04/07/2008	A2	33159	16580	63	93	0	0	93	1	1	1	1	1	0.98			---	0.53
05/07/2008	B1	34830	17415	69	76	0	0	76	0.9	1	1	1	1	0.90		Only Circle Fit '-' worked	---	0.44
05/07/2008	B2	42776	21388	58	81	0	0	81	0.9	1	1	1	1	0.92			---	0.48
05/07/2008	B3	33930	16965	69	97	0	0	97	1	1	1	1	1	1.00			---	0.63
11/07/2008	A1	41417	20709	69	77	0	0	77	0.9	1	1	1	0.9	0.80	bending	After defining vector e we "unbent" it by 32 degrees (in the same way it was done in the "standard" procedure section, picking the point (393,108), rotating a total of 27 points). Only afterwards was seeing calculated. Circle fit gave a ridiculous value. Parabola fit worked fine.	0.83	---
18/07/2008	A1	37167	18584	57	72	0	0	60	0.8	1	1	1	1	0.82	waving a bit	12 points of diagonal (wrongly placed) were removed from the right end side.	---	0.59
18/07/2008	A2	41851	20926	65	83	1	1	82	0.9	1	1	1	1	0.93			---	1.4
19/07/2008	B1	45820	22910	60	59	2	6+14+13	26	0.6	---	---	---	---	---	Path reaches very close to the chip border. From the top, one can see several "holes" in the data	Fails both 1/3 rules (holes clearly confuse the automatic processing)		
19/07/2008	B3	34130	17065	62	70	0	0	70	0.9	1	1	1	1	0.87			---	0.65
31/07/2008	A1	38416	19208	70	85	0	0	85	0.9	1	1	1	0.7	0.64	waving a bit	Top-down was chosen but this gave a very long diagonal. Left-right (with different seed points, obviously) gives a shorter diagonal in the middle of the path. Not only did this contain 29 of 61 points, but the fact of being in the middle implies that removing it will create a discontinuity. In any case, diagonals like these are "suspect". So, we rotated the dataset by 40 degrees with a subroutine and started all over. It worked, although the (poor) data contains many holes. The path found did not quite manage to go in the middle, although it pretty much reproduces the general waving motion of the path.	---	1.7
31/07/2008	A2	33617	16809	65	88	0	0	88	1	1	1	1	1	0.96		Circle gives a ridiculous value. Parabola fit worked fine.	0.37	---
01/08/2008	B1	44089	22045	53	59	0	0	59	0.8	1	1	1	1	0.81	data a bit "hole-y"	Despite the holes, the routine seems to have found the path correctly. However, not all the time it goes "in the middle" since this is hard to define in a lot of parts of the data. Seeing result must be taken with MUCH care.	---	0.42
01/08/2008	B2	35063	17532	50	66	6	12+6+5+ 15+1+7+ +4	26	0.6	---	---	---	---	---	Path with many holes on half-a-side	In a first version (Ped), the routine failed completely: too many holes got it too confused! However, a different seed left point (Ang), from (180,80) to (173,70), made it work! Fails the 1/3 rule and the data are still too messy and discontinuous to be further considered		
06/08/2008	A1	39268	19634	54	67	0	0	67	0.9	1	1	1	1	0.85			---	0.67
06/08/2008	A2	38547	19274	67	81	0	0	81	0.9	1	1	1	1	0.92		Circle fit failed. Parabola fit worked fine.	0.47	---
22/09/2008	A1	37715	18858	70	86	0	0	86	0.9	1	1	1	1	0.95			---	0.57

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Date	Place	MaxADU 1pixel	FWHM	max.theo # points	initial #points (vector e)	#discont. (vector e)	#points removed (a+b+c+ ... format)	final #points (vector e)	w_n	w_b	w_d	w_h	w_u	w	Comments (calibrated data)	Comments (data reduction)	Seeing (parabola)	Seeing (arccircle) (H)
23/09/2008	C1	38068	19034	70	88	0	0	88	1	1	1	1	1	0.96			---	0.62
26/09/2008	B1	36312	18156	---	16	0	0	16	0.6	---	---	---	---	---	Short trail	Only 16 points (too few, less than 1/3 of maximum number in dataset). Data rejected.		
04/11/2008	A1	42064	21032	66	76	0	0	76	0.9	1	1	1	1	0.90			---	0.76
04/11/2008	B1	34598	17299	67	92	0	0	92	1	1	1	1	1	0.98			---	0.59
05/11/2008	B3	32104	16052	60	77	0	0	77	0.9	1	1	1	1	0.90	1/3 of the data "detached"	Spectacular demonstration of how nicely the routine works, even in "tight neck" situations…	---	0.83
14/11/2008	A1	41144	20572	62	86	2	12+2	72	0.9	1	1	1	1	0.88	1/4 of data discontinuous		---	1.7
14/11/2008	C1	36643	18322	63	75	0	0	75	0.9	1	1	1	1	0.89			---	0.85
15/11/2008	C2	40522	20261	56	59	0	0	59	0.8	1	1	1	1	0.81	Slightly shorter (isolated "peak")	"Single-pixel" peak ignored on defining vector e. Warning in Mathematica: fit LevenbergMarquardt may be poor. So, followed the suggestion and used QuasiNewton instead (the seeing result was actually the same).	---	0.45
15/11/2008	C3	34674	17337	64	79	0	0	79	0.9	1	1	1	1	0.91			---	1.0
28/11/2008	A1	43890	21945	70	77	1	0	77 (42+35)	0.9	1	0.8	1	1	0.68	Two-lobe data	Two almost equal lobes means almost half the points to be removed, so fails 1/3 criterion. In order to make something out of it (even if the seeing result must have a lower weight) we kept all points and considered both lobes (the final circle fit is between lobes with about a 20-point gap)	---	2.3
28/11/2008	A2	21939	10970	70	41	2	3+18	20	0.6	---	---	---	---	---	Two lobes and one central narrow peak	Routine for vector e gets confused on the left lobe, due to its weird shape. In addition, too many points to be removed, 1/3 rule fails. No chance for lobe "combination" since the paths are totally inconsistent		
03/12/2008	A1	35719	17860	68	80	0	0	80	0.9	1	1	1	0.8	0.71	S-shaped	After defining vector e we "unbent" it (in the same way it was done in the "standard" procedure section, picking the points (470,219),(494,219), one 32-degree bent on each side, of a total of 21 and 36 points, respectively). Only afterwards was seeing calculated.	---	2.3
04/12/2008	B3	33839	16920	63	81	0	0	81	0.9	1	1	1	1	0.92			---	0.71
17/12/2008	A1	33926	16963	69	82	0	0	82	0.9	1	1	1	1	0.93			---	0.64
09/01/2009	A1	38850	19425	69	84	0	0	84	0.9	1	1	1	1	0.94			---	0.46
09/01/2009	A2	32820	16410	---	27	0	0	27	0.7	---	---	---	---	---	Short trail	Ruled out by 1/3 rule (less than that of the maximum number of points)		
10/01/2009	C1	33092	16546	65	76	0	0	76	0.9	1	1	1	1	0.90			---	0.63
10/01/2009	C3	35802	17901	68	84	0	0	84	0.9	1	1	0.9	1	0.84		Circle fit gave a nonsense value (too high) so parabola fit was used and had the same problem (data too vertical). Horizontal fit was used and worked.	---	H: 0.52
23/01/2009	A1	35295	17648	56	72	1	0	72 (36+36)	0.9	1	0.9	1	1	0.80	Two almost equal lobes	Exactly equal lobes. 1/3 "discontinuity" rule implies excluding these data. However, in order to make something out of it (even if the seeing result must have a lower weight) we kept all points and considered both lobes (the final circle fit is between lobes with about a 5-point gap). Warning in Mathematica: fit LevenbergMarquardt may be poor. So, followed the suggestion and used QuasiNewton instead (the seeing result was actually the same).		1.1
23/01/2009	A2	34558	17279	62	77	0	0	77	0.9	1	1	1	1	0.90			---	0.70
24/01/2009	C2	37567	18784	69	78	0	0	78	0.9	1	1	1	1	0.91		A few holes on the borders. Circle fitting gave too high a value. Parabola fit worked.	1.0	---

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
Date	Place	MaxADU 1pixel	FWHM	max.theo # points	initial #points (vector e)	#discont. (vector e)	#points removed (a+b+c+ … format)	final #points (vector e)	w_n	w_b	w_d	w_h	w_u	w	Comments (calibrated data)	Comments (data reduction)	Seeing (parabola)	Seeing (arccircle) (H)
24/01/2009	C3	39001	19501	57	54	0	0	54	0.8	1	1	1	1	0.79			---	0.54
12/02/2009	A1	37122	18561	70	77	0	0	77	0.9	1	1	1	0.8	0.73	S-shaped	After defining vector e we "unbent" it (in the same way it was done in the "standard" procedure section, picking the points (588,394),(582,426), 33-degree and 37-degree bends on each side, of a total of 19 and 27 points, respectively). Only afterwards was seeing calculated.	---	1.0
13/02/2009	B2	36184	18092	60	72	0	0	72	0.9	1	1	1	1	0.88			---	1.1
20/02/2009	C1	34643	17322	68	90	0	0	90	1	1	1	1	1	0.97		Circle fit gave too high a value. Parabola fit worked fine.	0.84	---

Data availability

Contributing to the goals of data sharing, reproducibility of science results and following the FAIR (Findable, Accessible, Interoperable, and Reusable) guiding principles for scientific data management and stewardship, we make the following data available:

Data S1. (Mathematica_Routines_and_Instructions.zip)
The Mathematica routines (.nb format) with instructions in word documents.

Data S2. (Calibrated_Data.zip)
The calibrated data (dark subtracted and flat normalized) in both SBIG and ASCII formats.

Data S3. (Raw_Data.zip)
Raw data. See Column 5 of Table XX for reference.

Data S4. (Flats.zip)
Flat exposures and master flats. See Table CC, especially Column 3.

Data S5. (Dark_Library.zip)
The Darks Library. See Table DARK, especially Column 5.

Data S6 (Results_Images.zip). For each data reduction method (RMS and FWHM), and each data point, all the Mathematica output graphs are compiled here in a single PDF file.

Data S7 (vectors_e_h_cf.pdf). We here show the full graphs that we used to compare vectors h (RMS method) and e (FWHM method). Vector_e is presented in red and vector_h in blue. See Table AL and Section “RMS & FWHM methods compared”.