Supplementary Materials

This Supplementary Information file contains Supplementary Notes 1–10, Supplementary references corresponding to the Supplementary Notes, and Supplementary Table 1.

Supplementary Notes

Supplementary Note 1. Statistical robustness of the evidence of the cascading mechanism. To further substantiate the presence of a physically grounded cascading mechanism, we provide a complementary analysis examining the links among Greenland ice-sheet runoff, Euro-Mediterranean atmospheric circulation, surface heat, and convective storm potential. This analysis combines lagged rank-based correlations, linear correlation diagnostics, and high-versus-low runoff composites to explore different aspects of the proposed cascade. We note, however, that these statistical approaches cannot fully resolve the inherently nonlinear and state-dependent nature of the processes involved.

Extended Data Fig. 5 summarizes the main findings: we first examine the relationship between summer (Apr-to-Aug of year) Greenland runoff and (subsequent Mar-to-May of year+1) North Atlantic SSTs after applying a 10-year filtering approach to reduce the influence of long-term warming and low-frequency variability, thereby emphasizing interannual behavior (Extended Data Fig. 5a). The all-year relationship is relatively weak and spatially fragmented, and does not reproduce the clear subpolar North Atlantic cooling pattern shown in Fig. 3a. This suggests that runoff alone does not produce a uniform SST response across all years. Instead, the SST expression of high-runoff years depends strongly on the atmospheric circulation state, e.g., the phase of the Jul-Aug North Atlantic Oscillation (NAO), as shown by the composite analysis in Extended Data Fig. 5b,c. This indicates that the oceanic response to Greenland runoff is modulated by the atmospheric background state.

We then test whether this state dependence is reflected in the Euro-Atlantic circulation response. The Pearson correlation between filtered runoff (Apr-Aug; year) and filtered 500-hPa geopotential-height zonal anomalies (May-Jul; year+1) shows a positive signal over western and central Europe when all years are considered (Extended Data Fig. 5d), but with very low statistical significance. This signal becomes stronger, more significant (p-value < 0.1) and spatially coherent when the analysis is restricted to years with colder-than-normal subpolar North Atlantic SSTs (Extended Data Fig. 5e). Similar conditional behaviour (or even more marked) is found for western Mediterranean SST and CAPE responses in Jul-Aug of year+1 (not shown), suggesting that the circulation anomaly effectively projects onto regional surface sea state and convective environments.

Finally, to further assess whether the Greenland runoff-European circulation connection is better described as a threshold-like response than as a simple linear scaling, we compare May-Jul (year+1) geopotential-height anomalies during Apr-Sep high- and low-runoff years (year). The high-minus-low runoff composite (Extended Data Fig. 5f) shows a clear positive geopotential-height anomaly over Europe, which is more evident than in the all-year correlation analysis (Extended Data Fig. 5d). The European-box distribution further confirms that high-runoff years are associated with significantly higher geopotential-height anomalies than low-runoff years (rank-sum p-value = 0.016; Extended Data Fig. 5g).

Overall, these results suggest that the runoff-GH link is not primarily linear in amplitude. Rather, it emerges more clearly in rank-based diagnostics, high-versus-low runoff contrasts, and under favorable North Atlantic background states. This supports a nonlinear and state-dependent interpretation, whereby large Greenland runoff anomalies increase the probability of Euro-Atlantic ridge-favorable circulation states, particularly when the subpolar North Atlantic is anomalously cold, becoming consistent with the proposed cascading mechanism.

Supplementary Note 2. Synoptic-scale dynamics of the cascading mechanism: the role of extratropical cyclones.

Even though the mechanism can be driven by both internal and external climate factors, an important component of it is the synoptic-scale dynamics, i.e., the dynamics associated with the baroclinicity and the extratropical cyclones over the North Atlantic, which foster persistent ridge building downstream over Europe. While the importance of latent heat release in extratropical cyclones for ridge building has been highlighted in the manuscript (cf. Fig. 4), this discussion item evaluates the role of "dry" dynamical processes. This is achieved by considering two standard dynamical metrics of Rossby wave activity: the low-frequency wave activity flux (e.g., **Takaya and Nakamura 1997, Riboldi et al. 2023**) to evaluate the presence of slow-moving, planetary-scale wave trains, and the recurrence metric R (**Röthlisberger et al. 2019**) to diagnose the constructive effect of transient, recurrent Rossby wave packets (RRWPs) on the low-frequency flow. Both those metrics have been extensively employed to study the dynamics of summer weather extremes (**Risbey et al. 2018, Ali et al. 2022, Tuel et al. 2022, Fang and Lu 2024, Kim et al. 2024**).

Low-frequency wave-activity flux: The composites highlight a clear, low-frequency trough-ridge-trough pattern extending from the central North Atlantic towards eastern Europe, crossed by anomalously strong WAF **(Extended Data Fig. 4a**). Anomalously strong WAF convergence upstream of the ridge over western Europe (and divergence downstream of it) is found in HRA years, a feature usually associated with the occurrence of atmospheric blocking as portrayed by, e.g., **Takaya and Nakamura (1997)**. In the proposed mechanism, synoptic cyclones act as a source of wave activity through dry and moist processes, which have been shown to promote WAF convergence in stationary ridges during heatwaves (e.g., **Neal et al. 2022**). While anomalous convergence and divergence patterns are also found in LRA years, they are not as clearly related to the quasi-stationary wave pattern, which is also weaker than the HRA composite (**Extended Data Fig. 4b**).

Recurrent Rossby wave packets: The presence of RRWP activity is usually diagnosed through a subjectively chosen threshold. Adopting the 8 m/s threshold by **Röthlisberger et al. (2019)** indicates the presence of some sporadic RRWP activity over the eastern Atlantic Ocean and western Europe, especially in the second half of June 2022 (**Extended Data Fig. 4c**). However, the presence of RRWPs is not a typical feature of HRA years: a climatological analysis contrasting HRA and LRA years in the period 1950-2021 actually indicates that significantly lower than usual values of the R-metric over the North Atlantic are found during HRA years, in particular at the longitudes corresponding to the cold freshwater anomalies (**Extended Data Fig. 4d**). This analysis suggests that the proposed atmospheric bridge mechanism does not systematically rely on RRWPs, but rather on a low-frequency dynamics supported by local cyclogenesis anomalies.

Supplementary Note 3. Lack of reproducibility of the cascading mechanism in CMIP6 models

The difficulty of CMIP6 models in simulating the cascading processes is illustrated in **Extended Data Fig. 9a-b,** where three metrics are calculated for comparison. For a CMIP6 model to be considered consistent with the observed changes in ZAGH (**Figure 3a**), it needs to capture well the increase in the mean between the two periods (*P1* and *P2*), the change in the standard deviation and the upper-tail changes (defined as $tail\_diff = [(max(P2) + perc95(P2))/2 - mean(P2)] - [(max(P1) + perc95(P1))/2 - mean(P1)]$). None of the models with statistically significant changes (FGOALS-g3, HadGEM3-GC31-LL, MRI-ESM2-0, NESM3, TaiESM1) reproduce the same change sign as in ERA5, and models that do show positive changes in the three metrics do not exhibit statistically significant differences. This points to the fact that CMIP6 models have problems in capturing the observed changes in ZAGH over western Europe, most likely reflecting their inability to reproduce the associated North Atlantic freshening, as discussed in the main text. This discrepancy is better seen in **Extended Data Fig. 9c**, where the Shape Index is shown. The Shape Index is calculated as follows:

$$abs[mean(P2) - mean(P1)]\ x\ abs[std(P2) - std(P1)]\ x\ abs[tail\_diff(P2) - tail\_diff(P1)]]$$

and its sign is determined by the signs of the three parameters used (the differences in the mean, standard deviation and tail_diff), such that the Shape Index is negative if any of the three metrics is negative.

Given that the two simulated periods reflect different climate conditions (one preindustrial and the other associated with marked ACC-induced melting), then the models should be expected to reproduce a changing ZAGH distribution similar to observations. Although internal climate variability could play a role in modulating the signal, this is unlikely to explain the discrepancy since the magnitude of the observed melting between these two periods is larger than the interannual variability (**Trusel et al., 2018; Hanna et al., 2021; Zhang et al., 2025**). An alternative interpretation is that the mechanism is primarily driven by ACC but also interacts with internal variability.

Supplementary Note 4. Potential connections of the cascading mechanism with ACC

Concluding whether the cascading mechanism presented herein is a response of anthropogenic forcing or a purely mechanism arising from internal climate variability is not straightforward based on the results as our current analysis cannot disentangle these contributions. A more detailed investigation would be required to fully address this issue, although it is beyond the scope of this study. The most likely answer lies in the middle, i.e., that this mechanism results from internal variability and its trigger and/or its behaviour is exacerbated under ACC forcing, which would explain the observed increase in variability and mean in ZAGH over the last three decades (1993-2022). An increasing mass loss from the Greenland Ice Sheet in response to anthropogenic global warming and Arctic Amplification has been highlighted in recent research (**Shepherd et al., 2020; Hanna et al., 2013a; Hanna et al., 2021; Bamber et al., 2018**), including a non-linear effect (melt–temperature sensitivity) of rising air temperatures on melt and runoff (**Trusel et al., 2018**) and a potential proximity to a tipping point (***Lenton et al., 2008; Box et al., 2018; Pattyn et al., 2018***). Indeed, the reported post-1990 rise in surface melt and extreme events **(Zhang et al., 2025),** which has been associated with a period of strong global warming influence on Greenland surface air temperatures (**Hanna et al., 2012*),*** is coincident with the sudden increase of post-1990 HRA years (**Extended Data Fig. 2**). The main concluding idea so far may thus be that ACC increases the likelihood or exacerbation of HRA years by increasing the mass loss from the ice sheet and its extremes, but ocean dynamics (surface subpolar freshening) is a key player in incorporating non-linear effects into this relationship between ACC and the mechanism. This likely role by ACC is also supported by the resemblance of the North Atlantic warming hole SST pattern to the SST pattern in HRA years, as discussed in the main text.

On the other hand, apart from the general increasing trend in ice sheet melting, it can be also argued that ACC plays a role in the cascading mechanism through dynamical changes in the polar atmospheric circulation, as indicated by recent literature. Extreme melting events in Greenland have been dominated by an increase of short- and long-wave radiation associated with blocking events over the region (**Bonsoms et al. 2024; Blau et al. 2024**). These blocking events have undergone a notable increase in the last years and have been linked to the early snow cover depletion in North America creating a stationary Rossby wave propagating over Greenland (**Preece et al. 2023**), suggesting therefore a climate influence on these extreme events, as recently suggested by **Bonsoms et al. (2025)**.

Supplementary Note 5. The cascading mechanism as a contributor to Western Europe's accelerated warming

The excess heating found in Europe has sparked a vibrant debate over the last years in the community, where different contributing processes have been proposed. They range from anthropogenic aerosol load reduction, dynamical circulation changes that can be either forced or due to low-frequency internal variability, and land-surface feedbacks, but the complete answer remains a subject of ongoing debate. A leading radiative driver is the sharp post-1980 decline in sulphate aerosols (**Philipona et al., 2009; Wild et al., 2021; Schumacher et al., 2024; Roldán-Gómez et al., 2026**). Dynamically, the atmospheric circulation has reorganised: southerly advection and Eurasian double-jet regimes have become more persistent, supplying ≈0.8 °C of the observed heat-extreme trend (**Vautard et al., 2023; Rousi et al., 2022**), while the summer Eurasian subtropical westerly jet has weakened by ~7 % under decreasing aerosol forcing, consistent with a hemispheric summer-circulation slowdown (**Dong et al., 2022; Coumou et al., 2015**). Amplifiers include early-summer soil-moisture depletion, which contributes 0.1–0.2 °C dec^{-1} (**Stegehuis et al., 2021**) and the post-1990 warm phase of the Atlantic Multidecadal Variability that reinforces anticyclonic ridging over Europe (**Dong et al., 2017**). **Extended Data Fig. 10** indicates that HRA years contribute to the observed high signal warming 1979-2022 trend over western Europe (with respect to the global trend; proportion), extending the noteworthy signal in Eurasia towards the western Europe, iberia peninsula and northern Africa (**Extended Data Fig. 10a**). However, this extension does not occur in the trend without counting HRA years (**Extended Data Fig. 10b-c)**. Also, these effects are mainly seen at mid-lower levels of the troposphere and the signal diminishes at surface (**Extended Data Fig. 10d-f**), which could be related to the dynamical effects of the mechanism in the temperature field. Overall, this analysis introduces a new key player into the causes of the excess heating in Europe.

Supplementary Note 6. Subtropical ridge activity analysis and the triggering of Saharan air intrusions by the cascading mechanism

To verify if the reported increasing frequency of subtropical ridges (**Sousa et al., 2021)** can be, at least partially, explained by the cascading mechanism introduced here, we apply a novel detection method to identify high-pressure systems and differentiate between subtropical ridges and blocks at the local scale (**Sousa et al., 2021**). The results show: i) an anomalously high frequency of low-latitude high-pressure conditions over the Mediterranean during MJJ 2022, mainly due to unusual subtropical ridge activity, with omega blocks contributing secondarily; ii) the increased occurrence of low-latitude high-pressure systems is not limited to 2022 but is a common feature of HRA years, while LRA years exhibit reduced subtropical ridge activity compared to climatology; iii) the link between HRA and enhanced low-latitude high-pressure systems may thus help explain the reported increase in spring-summer subtropical ridges over the Mediterranean, which cannot be fully explained by a poleward expansion of the subtropical belt (**Sousa et al., 2021**). These changes have been partly linked to tropical influences and enhanced subsidence resulting from the strengthening and/or poleward extension of the Hadley cell (**Staten et al., 2018**). However, in summer the Hadley circulation is weak, and observations (**Lionello et al., 2024**) and projections (**Brogli et al., 2019**) show no distinct expansion in the European sector. Instead, dynamical teleconnections from subtropical diabatic sources (e.g., the Asian and African monsoons; **Rodwell and Hoskins, 2001**), and regional forcings like changes in aerosols (e.g. black carbon, dust; **Hu et al., 2018**) and land-atmosphere coupling (**Tuel and Eltahir, 2021**) are considered significant drivers of Mediterranean summer climate.

On the other hand, as Saharan air intrusions (SAIs) are often connected to subtropical ridges and temperature extremes over the western Mediterranean (**Sousa et al. 2019; Cos et al, 2025),** we also analyzed the activity of SAIs and their relationship with the proposed mechanism. In effect, an increase of SAI frequency and persistence over the western Mediterranean is found in HRA versus LRA years as well as any other group years (**Extended Data Fig. 11**). Thus, SAIs could also play a role in the mechanism, likely incorporating non-linear effects when building ridge structures over western Europe. These likely non-linear effects are related to the dependence of the robustness and persistence of cyclone-related ridge building over Europe on the activation of SAIs. In other words, if the Saharan air mass was not present to the south of the ridge building location, or for instance, there was a broad water body to the south of the iberian peninsula, the ridge building mechanism by extratropical cyclones would have a more linear behaviour.

Supplementary Note 7. Potential links to hemispheric-scale dynamics: The quasi-stationary summer wave-7 pattern

To assess the links between the cascading mechanism and potential global patterns, we undertake an analysis of high wave-number patterns. Wave-5 and wave-7 circumglobal, slow-moving Rossby wave patterns have been identified as key contributors to simultaneous summer heatwaves across multiple midlatitude regions (**Kornhuber et al, 2016**; **Kornhuber et al., 2019; Drouard et al., 2019**). However, the actual existence and the properties of such Rossby wave patterns are still an object of debate (e.g., **Wirth and Polster, 2021; Riboldi and Russo, 2025**). Here, we use the daily wave-7 pattern index (W7I) following **Drouard et al. (2019)** to evaluate the possible relevance of such a pattern. We find that the years classified as HRA, associated with the proposed mechanism, show significantly higher W7I values and more persistent daily events compared to the climatology or years in LRA (**Extended Data Fig. 12**). Furthermore, recent work has further suggested that there exists a link between ACC and quasi-resonant amplification (QRA) events, and that these quasi-resonant patterns are associated with persistent extreme summer weather events (**Mann et al., 2018; Mann et al., 2017, 25; He et al., 2023; Li et al., 2025**). To further assess the role of QRA, we compared our seasonally averaged JJA W7I index with the annual QRA frequencies reported by **Li et al. (2025)**. This comparison revealed a nonsignificant correlation between these two indices, suggesting that the relationship between QRA frequencies and the wave-7 pattern is not straightforward. While both QRA yearly frequencies and the seasonally averaged wave-7 index display significant regressions with European summer temperatures, their hemispheric pattern differs substantially between them (**Extended Data Fig. 12b-c)**, suggesting that different mechanisms might be playing a role.

Supplementary Note 8. ACC influence on convective storms

The results presented herein connect ACC forcing with convective storms. Beyond adding a dynamical pathway, these findings align with a growing body of literature documenting how ACC-driven environmental changes contribute to more favorable thermodynamic conditions for convective storms (**Trapp et al., 2007; Púčik et al., 2017; Miglietta et al., 2017; Rädler et al., 2019; Ashley et al., 2023**), although considerable uncertainties remain, especially in terms of regional changes (**IPCC, 2021; Brooks, 2013; Tippett et al., 2015; Diffenbaugh et al., 2013**). On the other hand, in line with projections outlined by the **IPCC (2021**), which foresee increasing in severe storm potential across North America and Europe, event attribution studies are starting to confirm ACC's influence on specific extreme convective events, which overcomes the reported low confidence in observed trends. These case studies range from supercell storms (**Miglietta et al., 2017)** and heavy rainfall events (**Kawase et al., 2022)** to highly organized convective storms like the mentioned Mediterranean derecho (**González-Alemán et al., 2023)** or even destructive convective-fuelled cyclones over the Mediterranean Sea (**Argüeso et al., 2024**).

Supplementary Note 9. Other noteworthy convective storms in HRA years

As stated in the main text, not only 2022 is associated with an outlier-like behaviour of convective storms in the western Mediterranean. Other years contributing to HRA were also associated with the impact of this kind of storm. Another remarkable derecho hit the Catalan region in August 2003; (**López et al. 2007**), which is the only additional identified derecho over the region, consistent with the fact that the western Mediterranean is a region highly unfavorable for the development of such phenomena (**Fery and Faranda, 2024**; **Surowiecki et al., 2024**). In addition, an outbreak activity of convective supercells and a rare squall line of convective storms **(Álvarez-Alonso et al., 2018**) were both observed over the northeastern Iberian peninsula. Rare impactful tornadoes also developed in 2003 and 2015 over the same region.

Supplementary Note 10. Model reproduction of HRA atmospheric structures and the role of distributional changes

Different key atmospheric structures are similarly reproduced by the models, as in observations, in HRA years (**Fig. 6c**). Apart from the distinct signal of an increase in ridging over Europe, as explained in the main text, a much more robust connection with the North African subtropical high can be seen in HRA years compared to the climatology (CLIM; **Fig. 6d; Fig 6f**), as in observations, which takes place just over the western Mediterranean, i.e., between the European positive ZAGH anomaly and the North African subtropical ridge. This agrees well with the increase in the frequency and/or persistence of these subtropical ridges. Another key difference which matches well with observations is the ZAGH positive anomaly over Eurasia: In CLIM years there is a maximum just located over this region, which is not present in HRA years, just as it occurs with observations. The negative anomaly ZAGH in the form of a tip to the northeastern Atlantic has a similar contrasting shape in HRA vs CLIM, where in HRA it is broader and digs further east. There is also a clear cutoff low signal to the southwest of the iberian peninsula in HRA, consistent with observations as well as the deeper signal to the east of the Mediterranean. The western cutoff development is also a key factor which promotes the elongation of the SAM to the north in the form of SAIs and likely contributes to the robustness of the connection mentioned above, which occurs in both the model simulations and observations. Finally, the eastern Greenland positive anomaly is another key dynamic feature that the models reproduce well: note the weaker signal in HRA, consistent with observations.

In this analysis, it is especially important to note that what matters is not only the magnitude of the differences but the change in their spatial pattern, and especially the reshaping of the extremes: over western Europe, for instance, the regionally-average difference is small yet the shape of the maxima changes markedly. Because the relevant hazards are driven by the extremes rather than the mean, a change concentrated in the tail can leave the mean almost unaltered while sharply raising the likelihood of high-impact events. This also bears on the interpretation of significance testing: tests on the mean or median (e.g. the rank-sum test used here) may be non-significant even when the tail has changed substantially, so a non-significant central-tendency result should not be read as evidence of "no change". We therefore have mainly assessed the full distribution and its extremes rather than differences between groups alone.

Supplementary Table 1. Table containing the information of the CMIP6 models used in this study

Model name	Institution / Consortium	Country	Experiment	Member	Grid	Version
ACCESS-CM2	CSIRO / Bureau of Meteorology	Australia	historical	r1i1p1f1	gn	v20191108
ACCESS-ESM1-5	CSIRO / Bureau of Meteorology	Australia	historical	r1i1p1f1	gn	v20191115
AWI-CM-1-1-MR	Alfred Wegener Institute (AWI)	Germany	historical	r1i1p1f1	gn	v20181218
AWI-ESM-1-1-LR	Alfred Wegener Institute (AWI)	Germany	historical	r1i1p1f1	gn	v20200212
BCC-ESM1	Beijing Climate Center (BCC)	China	historical	r1i1p1f1	gn	v20181217
CESM2	NCAR	USA	historical	r1i1p1f1	gn	v20190308
CESM2-FV2	NCAR	USA	historical	r1i1p1f1	gn	v20191120
CESM2-WACCM	NCAR	USA	historical	r1i1p1f1	gn	v20190227
CESM2-WACCM-FV2	NCAR	USA	historical	r1i1p1f1	gn	v20191120
CIESM	CMCC Earth System Model	Italy	historical	r1i1p1f1	gr	v20200417
CMCC-CM2-HR4	CMCC	Italy	historical	r1i1p1f1	gn	v20200904
CMCC-CM2-SR5	CMCC	Italy	historical	r1i1p1f1	gn	v20200616
CMCC-ESM2	CMCC	Italy	historical	r1i1p1f1	gn	v20210114
CNRM-CM6-1	CNRM / CERFACS	France	historical	r1i1p1f2	gr	v20180917
CNRM-ESM2-1	CNRM / CERFACS	France	historical	r1i1p1f2	gr	v20181206
CanESM5-CanOE	Canadian Centre for Climate Modelling and Analysis	Canada	historical	r1i1p2f1	gn	v20190429
E3SM-1-0	U.S. Department of Energy	USA	historical	r1i1p1f1	gr	v20191220
E3SM-1-1-ECA	U.S. Department of Energy	USA	historical	r1i1p1f1	gr	v20200624
EC-Earth3-AerChem	EC-Earth Consortium	Europe	historical	r1i1p1f1	gr	v20200624
EC-Earth3-CC	EC-Earth Consortium	Europe	historical	r1i1p1f1	gr	v20210113
EC-Earth3-Veg-LR	EC-Earth Consortium	Europe	historical	r1i1p1f1	gr	v20200217
FGOALS-f3-L	LASG / Institute of Atmospheric Physics (CAS)	China	historical	r1i1p1f1	gr	v20190927
FGOALS-g3	LASG / Institute of Atmospheric Physics (CAS)	China	historical	r1i1p1f1	gn	v20190818

FIO-ESM-2-0	First Institute of Oceanography (MNR)	China	historical	r1i1p1f1	gn	v20191205
GFDL-ESM4	NOAA Geophysical Fluid Dynamics Laboratory	USA	historical	r1i1p1f1	gr1	v20190726
GISS-E2-1-H	NASA Goddard Institute for Space Studies	USA	historical	r1i1p1f1	gn	v20190403
HadGEM3-GC31-LL	UK Met Office Hadley Centre	UK	historical	r1i1p1f3	gn	v20190624
IITM-ESM	Indian Institute of Tropical Meteorology	India	historical	r1i1p1f1	gn	v20191226
INM-CM4-8	Institute of Numerical Mathematics (INM)	Russia	historical	r1i1p1f1	gr1	v20190605
INM-CM5-0	Institute of Numerical Mathematics (INM)	Russia	historical	r1i1p1f1	gr1	v20190610
IPSL-CM6A-LR	Institut Pierre-Simon Laplace (IPSL)	France	historical	r1i1p1f1	gr	v20180803
KACE-1-0-G	National Institute of Meteorological Sciences / KMA	South Korea	historical	r1i1p1f1	gr	v20191023
KIOST-ESM	Korea Institute of Ocean Science & Technology	South Korea	historical	r1i1p1f1	gr1	v20191104
MCM-UA-1-0	University of Arizona	USA	historical	r1i1p1f2	gn	v20190731
MIROC6	JAMSTEC / Univ. of Tokyo / NIES	Japan	historical	r1i1p1f1	gn	v20190311
MIROC-ES2H	JAMSTEC / Univ. of Tokyo / NIES	Japan	historical	r1i1p4f2	gn	v20220322
MIROC-ES2L	JAMSTEC / Univ. of Tokyo / NIES	Japan	historical	r1i1p1f2	gn	v20190823
MPI-ESM1-2-HR	Max Planck Institute for Meteorology	Germany	historical	r1i1p1f1	gn	v20190710
MPI-ESM1-2-LR	Max Planck Institute for Meteorology	Germany	historical	r1i1p1f1	gn	v20190710
MRI-ESM2-0	Meteorological Research Institute	Japan	historical	r1i1p1f1	gn	v20190308
NESM3	Nanjing Univ. of Information Science & Technology	China	historical	r1i1p1f1	gn	v20190630

NorCPM1	Norwegian Climate Centre	Norway	historical	r1i1p1f1	gn	v20200724
NorESM2-MM	Norwegian Climate Centre	Norway	historical	r1i1p1f1	gn	v20191108
SAM0-UNICON	Seoul National University	South Korea	historical	r1i1p1f1	gn	v20190323
TaiESM1	Academia Sinica / National Taiwan University	Taiwan	historical	r1i1p1f1	gn	v20200623
UKESM1-0-LL	UK Met Office Hadley Centre	UK	historical	r1i1p1f2	gn	v20190406

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