

Supplementary Data

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Supplementary Table 1: Details of criteria air pollutants retrieved from Sentinel-5P TROPOMI

Pollutant	Atmospheric level of pollutant	Unit	From Date	To Date
CO	Total column CO	10 ⁻³ mol/m ²	01/01/2019	30/06/2022
NO ₂	Tropospheric NO ₂	10 ⁻⁵ mol/m ²	10/07/2018	30/06/2022
SO ₂	Total column SO ₂	Dobson Units	01/12/2018	30/06/2022

Supplementary Table 2: CPCB Ground Station Data Collection Sites

Site No.	Site	Agency	State	Lat	Lon
1	Alipur, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.81533	77.15301
2	Anand Vihar, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.64684	77.31603
3	Ashok Vihar, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.69538	77.18167
4	Aya Nagar, Delhi - IMD	India Meteorological Department	Delhi	28.47069	77.10994
5	Bawana, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.7762	77.05107
6	Burari Crossing, Delhi - IMD	India Meteorological Department	Delhi	28.72565	77.20116
7	Chandni Chowk, Delhi - IITM	Indian Institute Of Tropical Meteorology	Delhi	28.65676	77.22723
8	CRRI Mathura Road, Delhi - IMD	India Meteorological Department	Delhi	28.5512	77.27357
9	Dr. Karni Singh Shooting Range, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.49857	77.26484
10	DTU, Delhi - CPCB	Central Pollution Control Board	Delhi	28.75005	77.11126
11	Dwarka-Sector 8, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.57103	77.0719
12	East Arjun Nagar, Delhi - CPCB	Central Pollution Control Board	Delhi	28.65594	77.2949
13	IGI Airport (T3), Delhi - IMD	India Meteorological Department	Delhi	28.56278	77.11801
14	IHBAS, Dilshad Garden, Delhi - CPCB	Central Pollution Control Board	Delhi	28.68117	77.30252

15	ITO, Delhi - CPCB	Central Pollution Control Board	Delhi	28.62862	77.24106
16	Jahangirpuri, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.73282	77.17063
17	Jawaharlal Nehru Stadium, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.58028	77.23383
18	Lodhi Road, Delhi - IMD	India Meteorological Department	Delhi	28.59182	77.22731
19	Major Dhyan Chand National Stadium, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.61128	77.23774
20	Mandir Marg, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.63643	77.20107
21	Mundka, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.68468	77.07657
22	Najafgarh, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.57017	76.93376
23	Narela, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.82284	77.10198
24	Nehru Nagar, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.56789	77.25052
25	North Campus, DU, Delhi - IMD	India Meteorological Department	Delhi	28.65738	77.15854
26	NSIT Dwarka, Delhi - CPCB	Central Pollution Control Board	Delhi	28.60909	77.03254
27	Okhla Phase-2, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.53079	77.27126
28	Patparganj, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.62375	77.28721
29	Punjabi Bagh, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.67405	77.13102
30	Pusa, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.63965	77.14626
31	Pusa, Delhi - IMD	India Meteorological Department	Delhi	28.63704	77.17231
32	R K Puram, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.56326	77.18694
33	Rohini, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.73253	77.11992
34	Shadipur, Delhi - CPCB	Central Pollution Control Board	Delhi	28.65148	77.14731
35	Sirifort, Delhi - CPCB	Central Pollution Control Board	Delhi	28.55042	77.21594
36	Sonia Vihar, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.71051	77.24949
37	Sri Aurobindo Marg, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.53135	77.19016
38	Vivek Vihar, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.67234	77.31526
39	Wazirpur, Delhi - DPCC	Delhi Pollution Control Committee	Delhi	28.69979	77.16545

Supplementary Table 3: Exceedance Days for CO from 2019 to 2022

	2019	2020	2021	2022
Day Availability (%)	84.93	89.04	88.22	88.22
Mean (10^{-3} mol/m²)	41.07	41.05	41.69	40.87
Standard Deviation ($\pm 10^{-3}$ mol/m²)	6.05	6.03	6.36	5.89
% Days Exceedance for Mean				
<i>Annual</i>	43.55	45.23	41.30	43.79
<i>Winter</i>	11.29	15.69	17.08	13.66
<i>Pre-Monsoon</i>	12.26	9.85	9.94	15.22
<i>Monsoon</i>	10.00	5.54	4.66	4.97
<i>Post-Monsoon</i>	10.00	14.15	9.63	9.94
% Days Exceedance for Mean + SD				
<i>Annual</i>	12.26	11.08	16.77	13.04
<i>Winter</i>	3.87	1.85	6.21	2.48
<i>Pre-Monsoon</i>	2.26	0.62	3.42	5.59
<i>Monsoon</i>	1.61	0.62	0.00	0.93
<i>Post-Monsoon</i>	4.52	8.00	7.14	4.04

Supplementary Table 4: Exceedance Days for NO₂ from 2019 to 2022

	2019	2020	2021	2022
Day Availability	84.66	86.58	87.95	87.40
Mean (10^{-5} mol/m²)	11.02	8.59	11.75	11.84
Standard Deviation ($\pm 10^{-5}$ mol/m²)	7.58	5.04	8.38	6.28
% Days Exceedance for Mean				
<i>Annual</i>	32.36	38.92	29.60	33.86
<i>Winter</i>	14.89	20.89	16.20	16.30
<i>Pre-Monsoon</i>	6.80	3.80	3.43	8.46
<i>Monsoon</i>	5.18	3.80	1.56	2.19
<i>Post-Monsoon</i>	5.50	10.44	8.41	6.90
% Days Exceedance for Mean + SD				
<i>Annual</i>	10.00	11.38	10.56	13.35
<i>Winter</i>	8.39	8.31	7.14	9.63
<i>Pre-Monsoon</i>	0.00	1.23	0.62	1.24
<i>Monsoon</i>	0.00	0.00	0.00	0.00
<i>Post-Monsoon</i>	1.61	1.85	2.80	2.48

Supplementary Table 5: Exceedance Days for SO₂ from 2019 to 2022

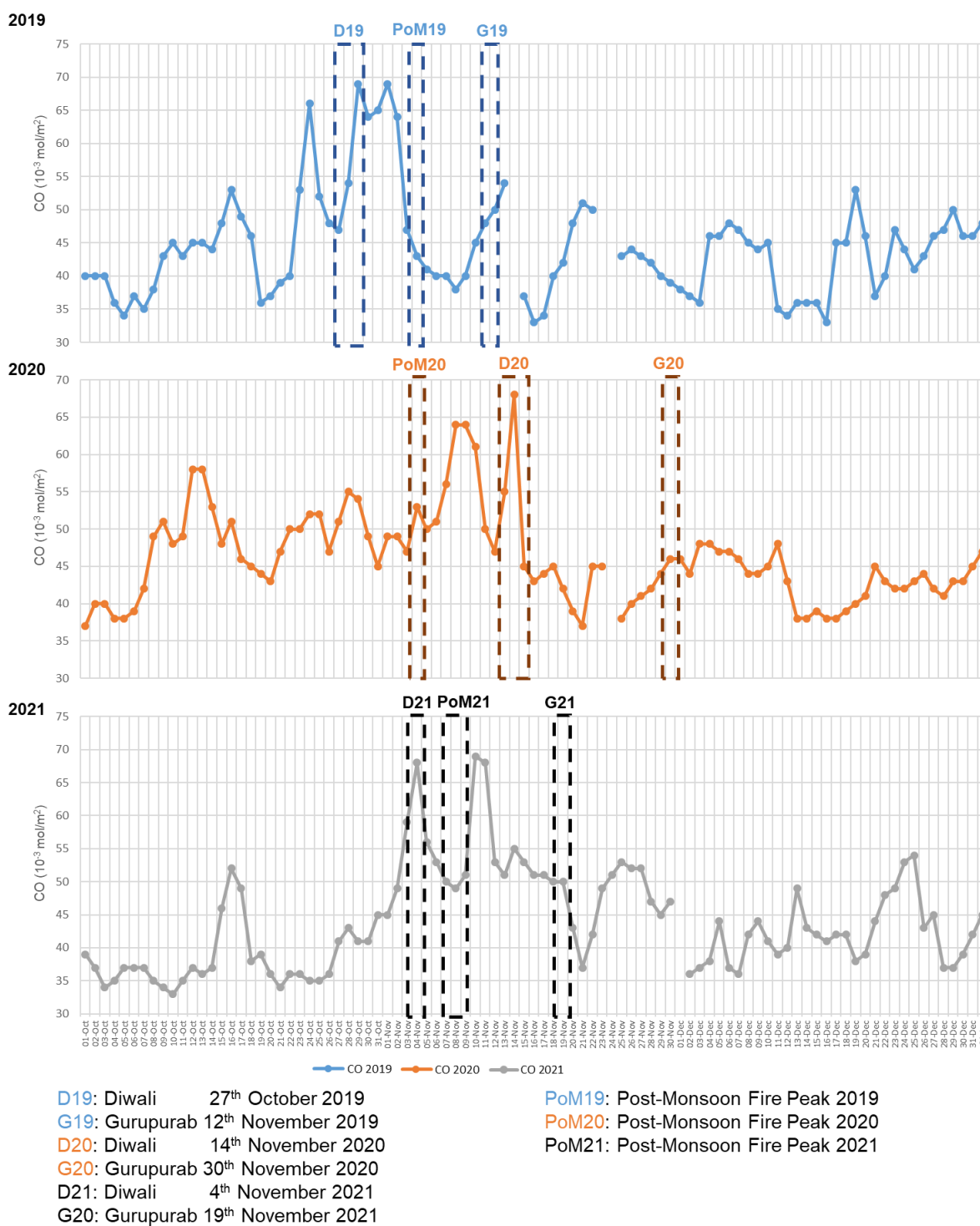
	2019	2020	2021	2022
Day Availability	87.12	86.85	84.66	84.38
Mean (DU)	0.82	0.87	0.82	0.88
Standard Deviation ($\pm$ DU)	0.58	0.46	0.49	0.58
% Days Exceedance for Mean				
<i>Annual</i>	33.33	37.85	38.19	34.09
<i>Winter</i>	15.09	16.09	13.92	12.34
<i>Pre-Monsoon</i>	9.43	9.46	12.30	9.74
<i>Monsoon</i>	5.97	5.68	4.85	5.52
<i>Post-Monsoon</i>	2.83	6.62	7.12	6.49
% Days Exceedance for Mean + SD				
<i>Annual</i>	9.68	12.00	10.25	7.45
<i>Winter</i>	7.42	7.38	4.35	4.04
<i>Pre-Monsoon</i>	1.29	2.15	2.48	0.62
<i>Monsoon</i>	0.32	0.31	0.93	0.62
<i>Post-Monsoon</i>	0.65	2.15	2.48	2.17

Supplementary Figures

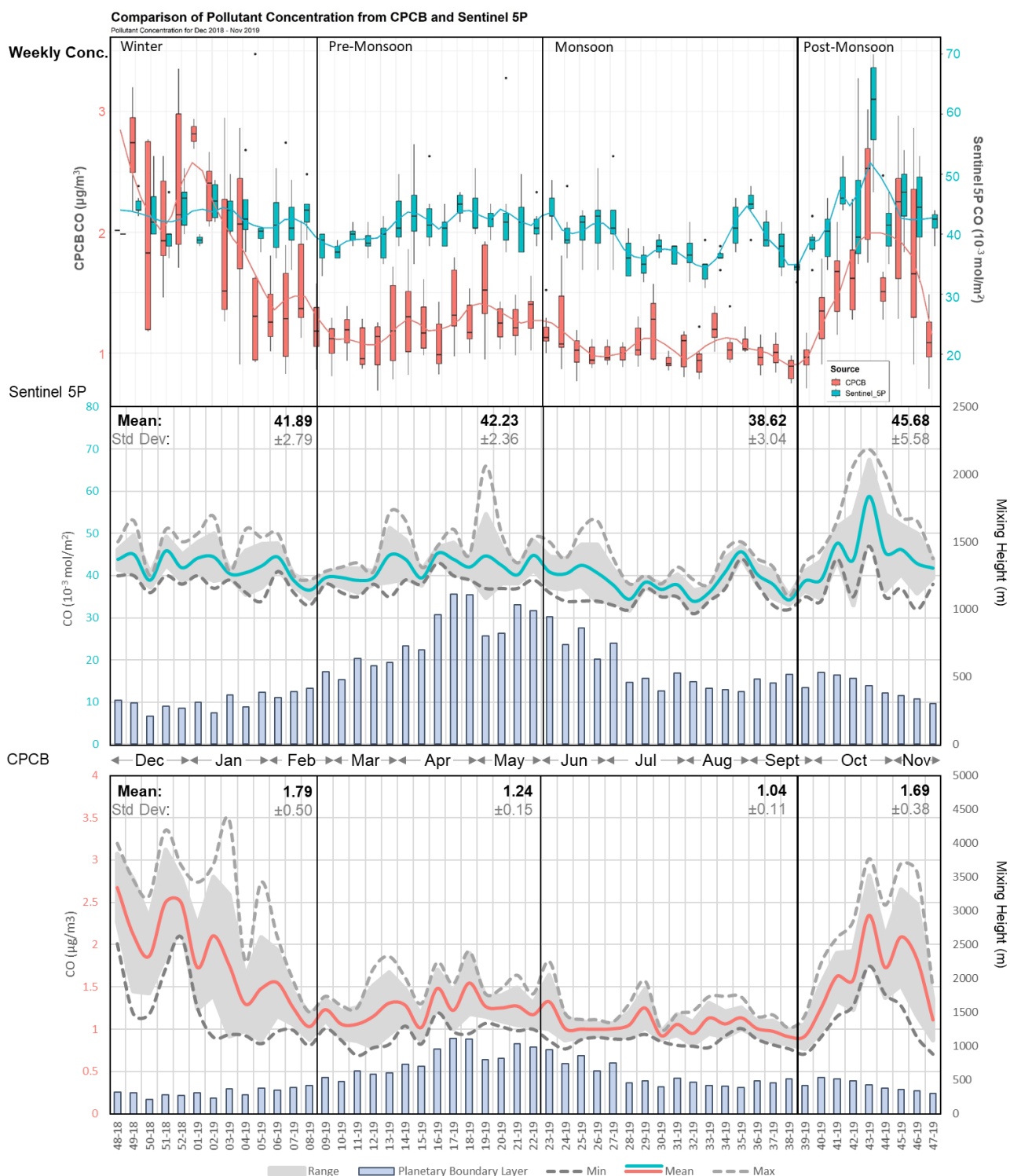
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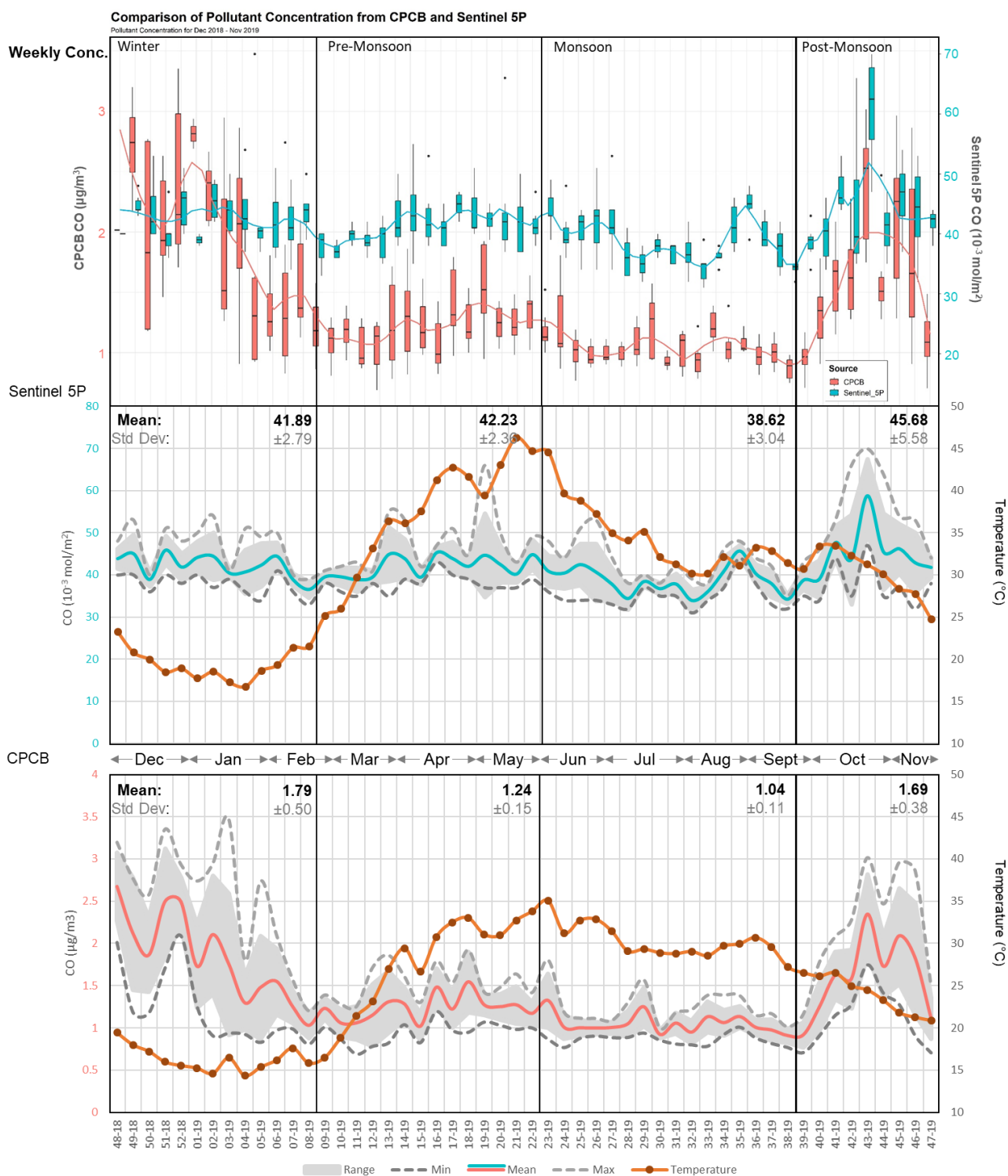
Carbon Monoxide Daily Concentration Sentinel 5P



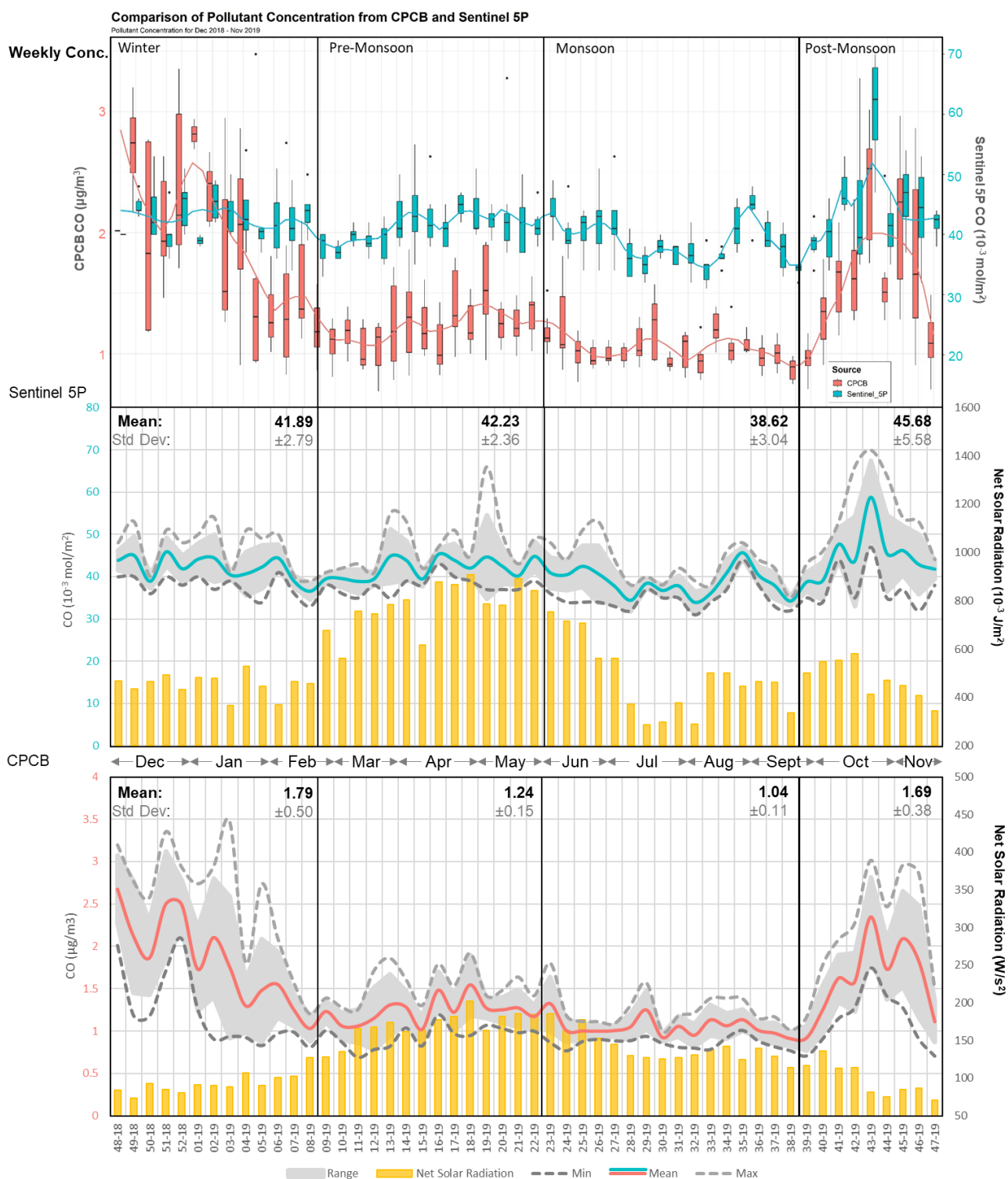
Supplementary Figure S 1: Daily Carbon Monoxide levels in Delhi NCR for 2019, 2020 and 2021 festive seasons



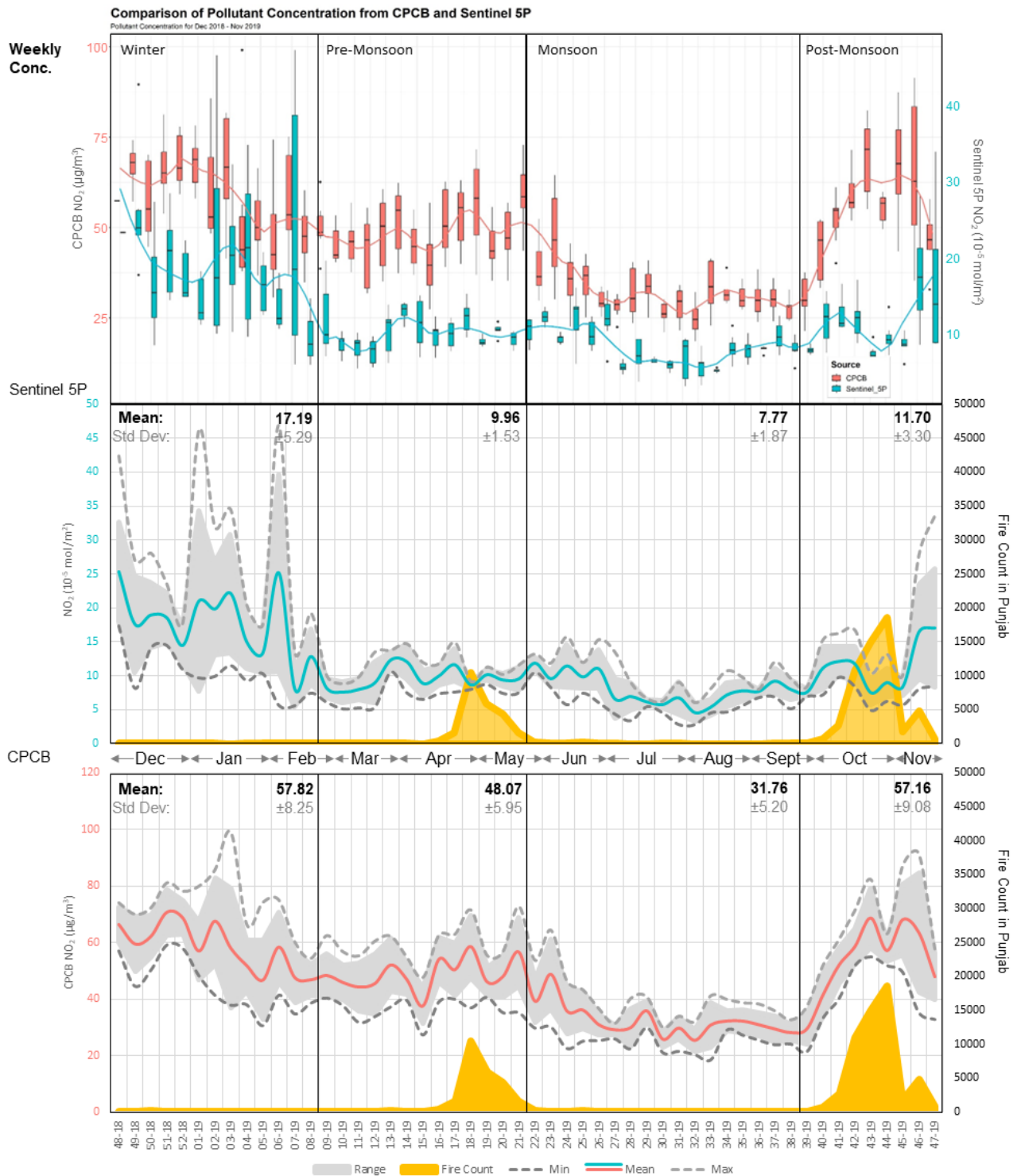
Supplementary Figure S 2: Carbon Monoxide Trends in Delhi and Mixing Height in Punjab from 2018 December to 2019 November



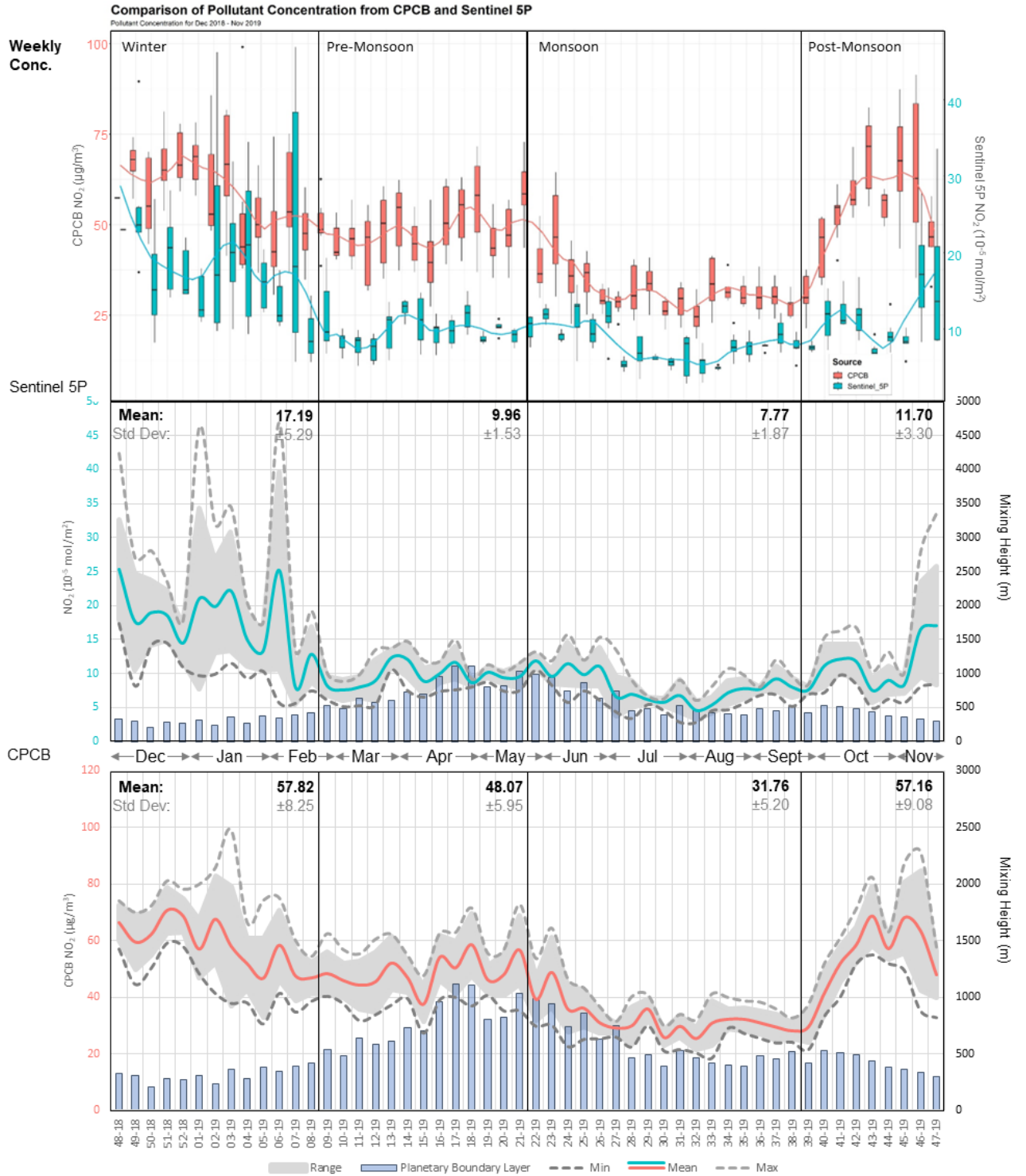
Supplementary Figure S 3: Carbon Monoxide Trends in Delhi and Temperature in Punjab from 2018 December to 2019 November



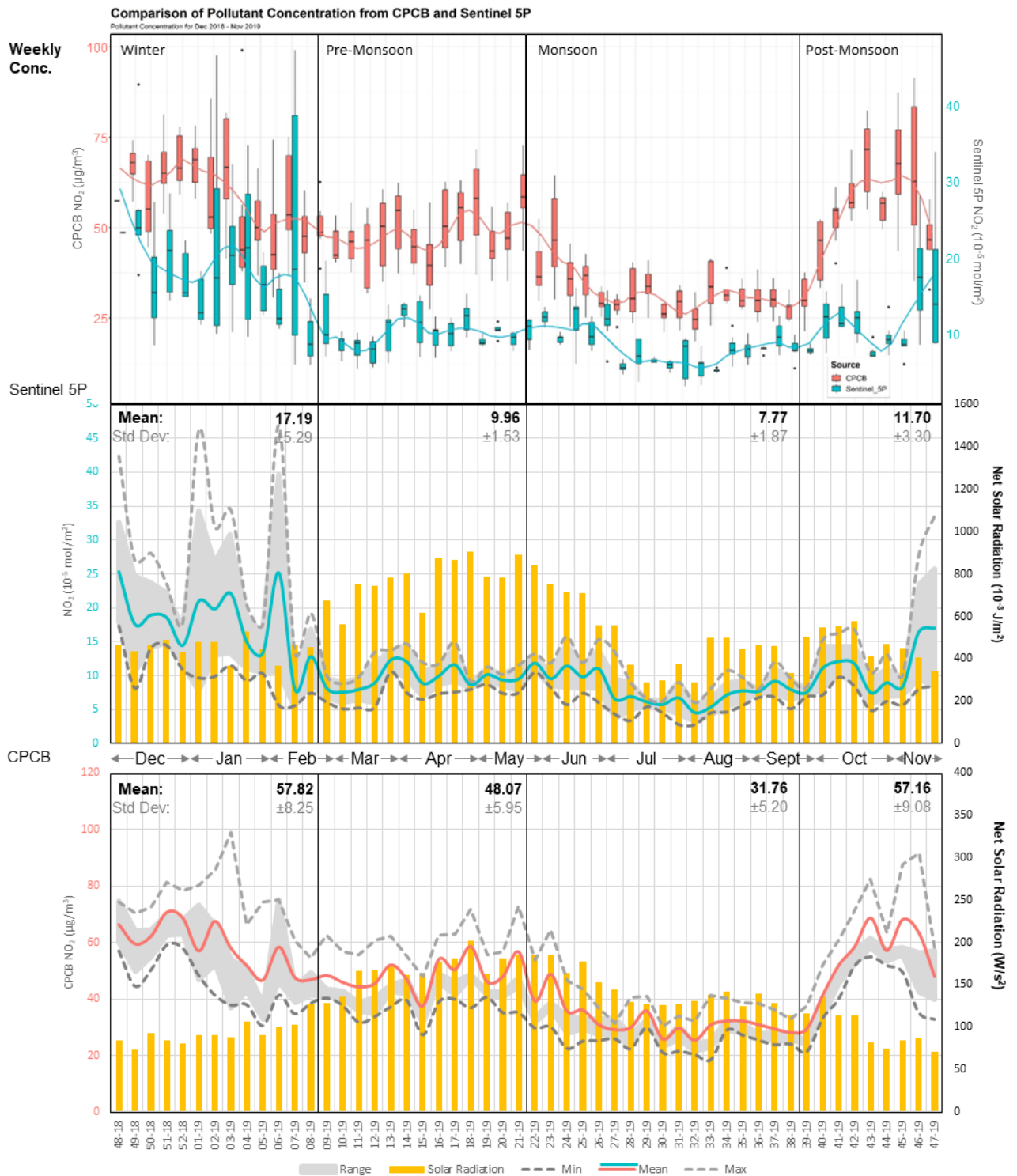
Supplementary Figure S 4: Carbon Monoxide Trends in Delhi and Net Solar Radiation in Punjab from 2018 December to 2019 November



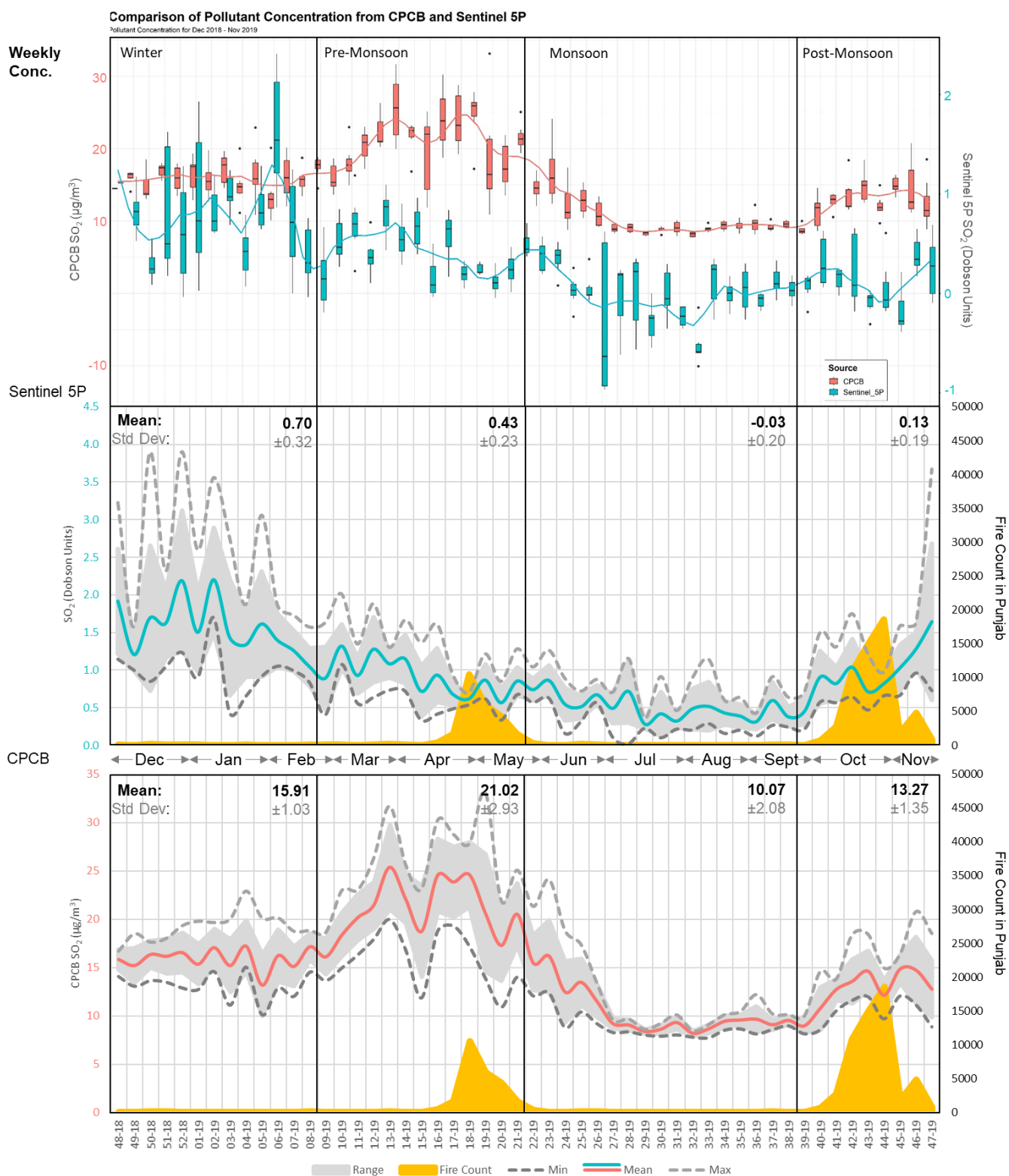
Supplementary Figure S 5: Nitrogen Dioxide Trends in Delhi and Fire Count from 2018 December to 2019 November



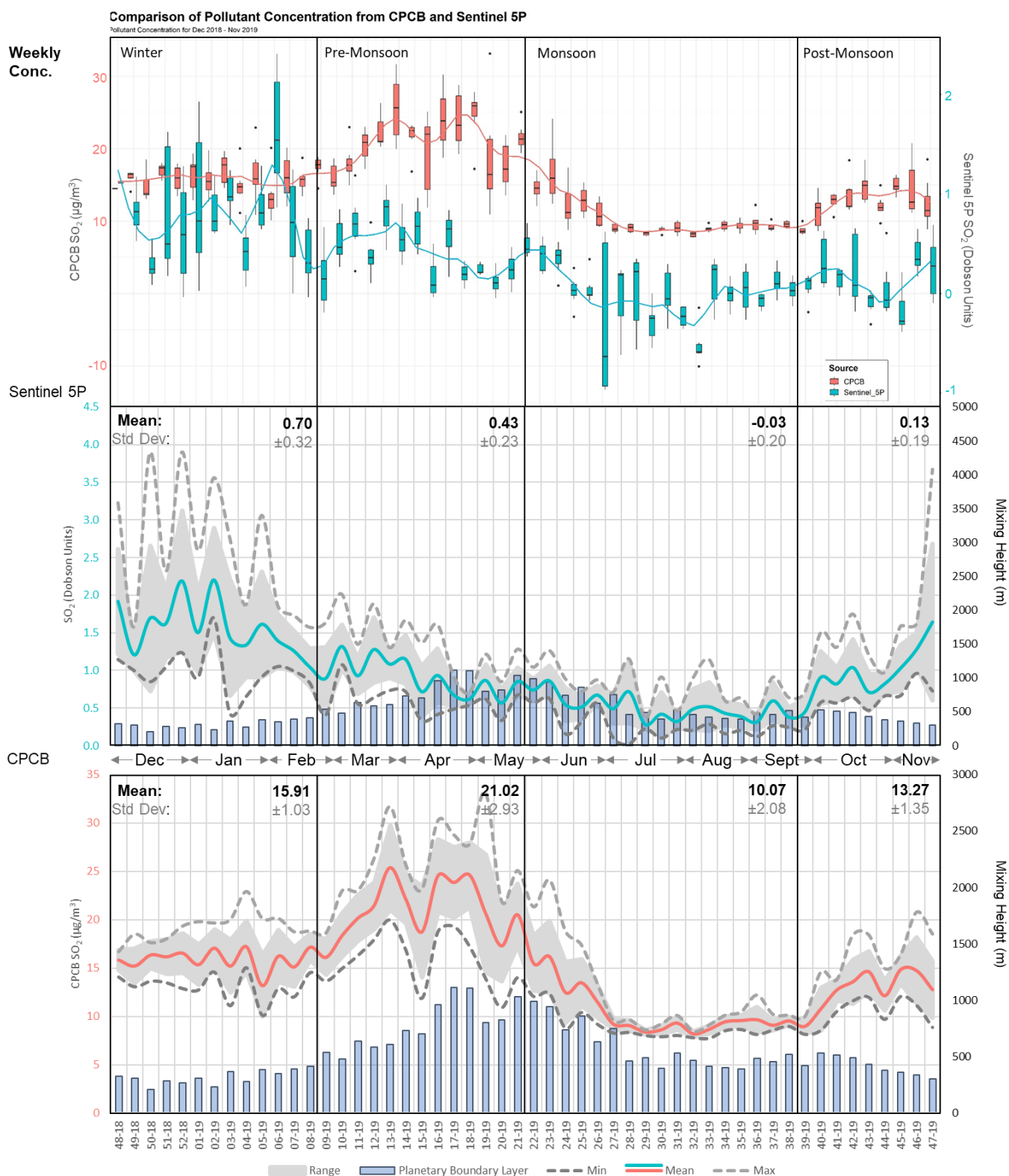
Supplementary Figure S 6: Nitrogen Dioxide Trends in Delhi and Mixing Height from 2018 December to 2019 November



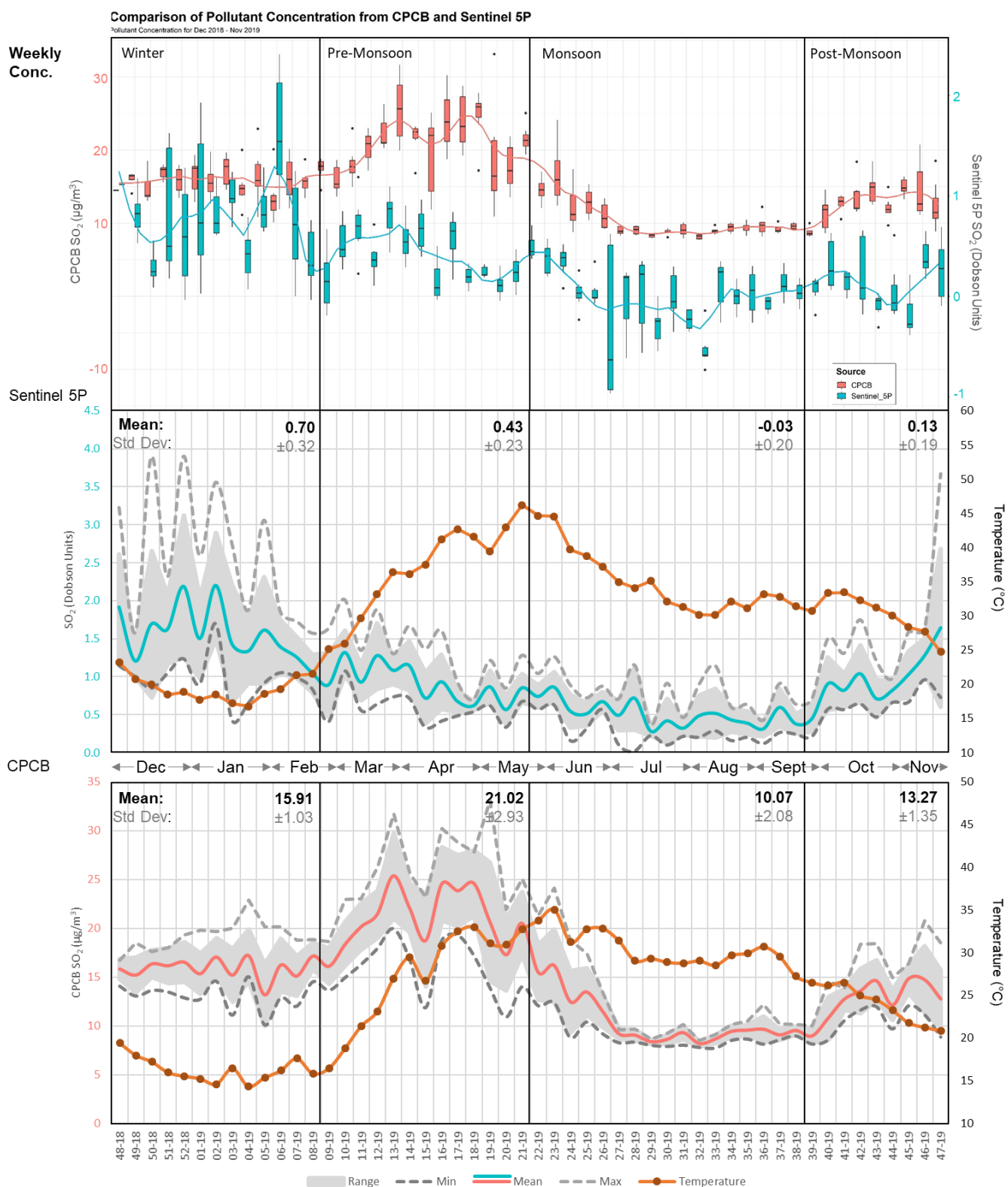
Supplementary Figure S 7: Nitrogen Dioxide Trends in Delhi and Net Solar Radiation from 2018 December to 2019 November



Supplementary Figure S 8: Sulphur Dioxide Trends in Delhi and Fire Count from 2018 December to 2019 November

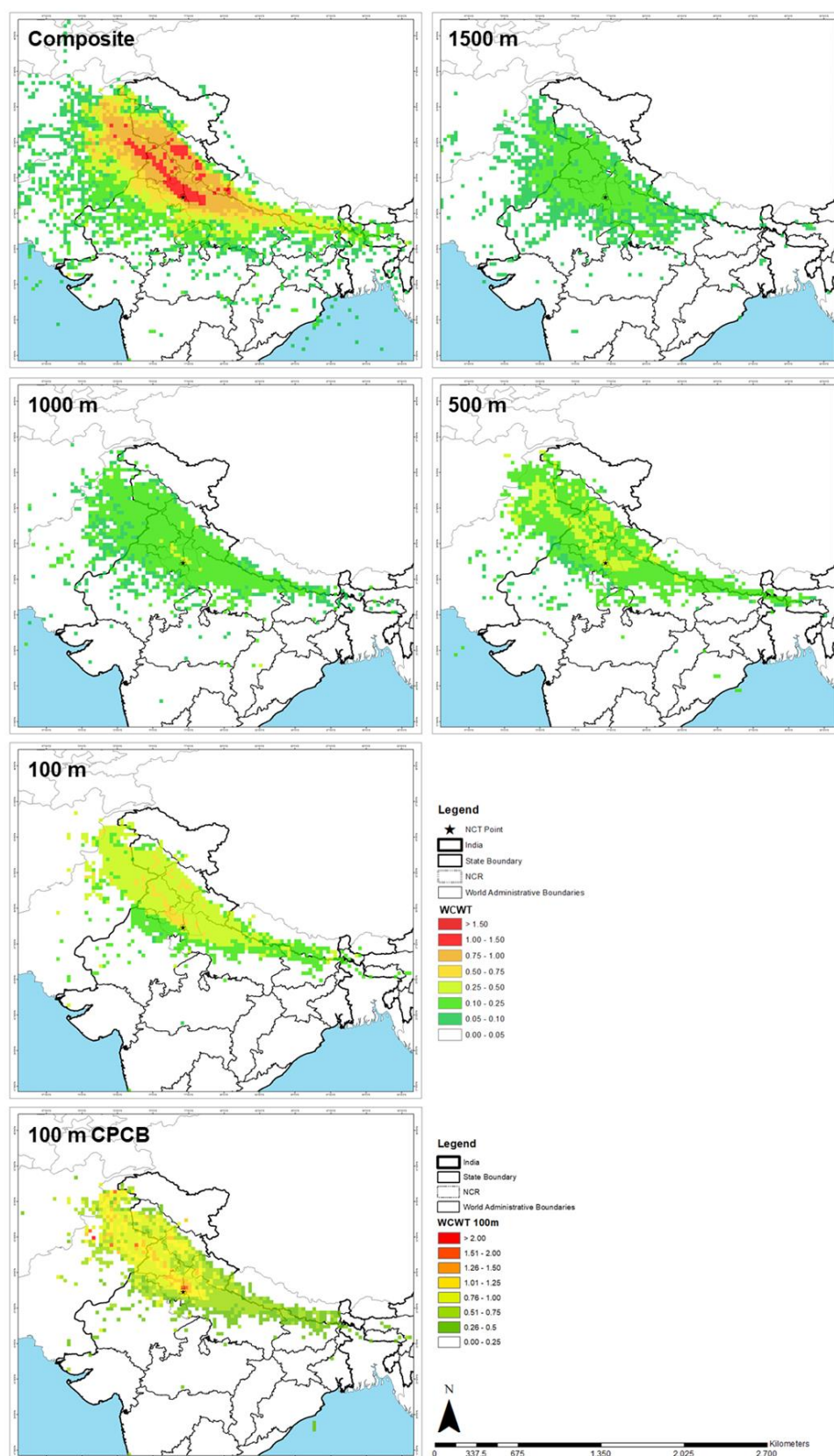


Supplementary Figure S 9: Sulphur Dioxide Trends in Delhi and Mixing Height from 2018 December to 2019 November



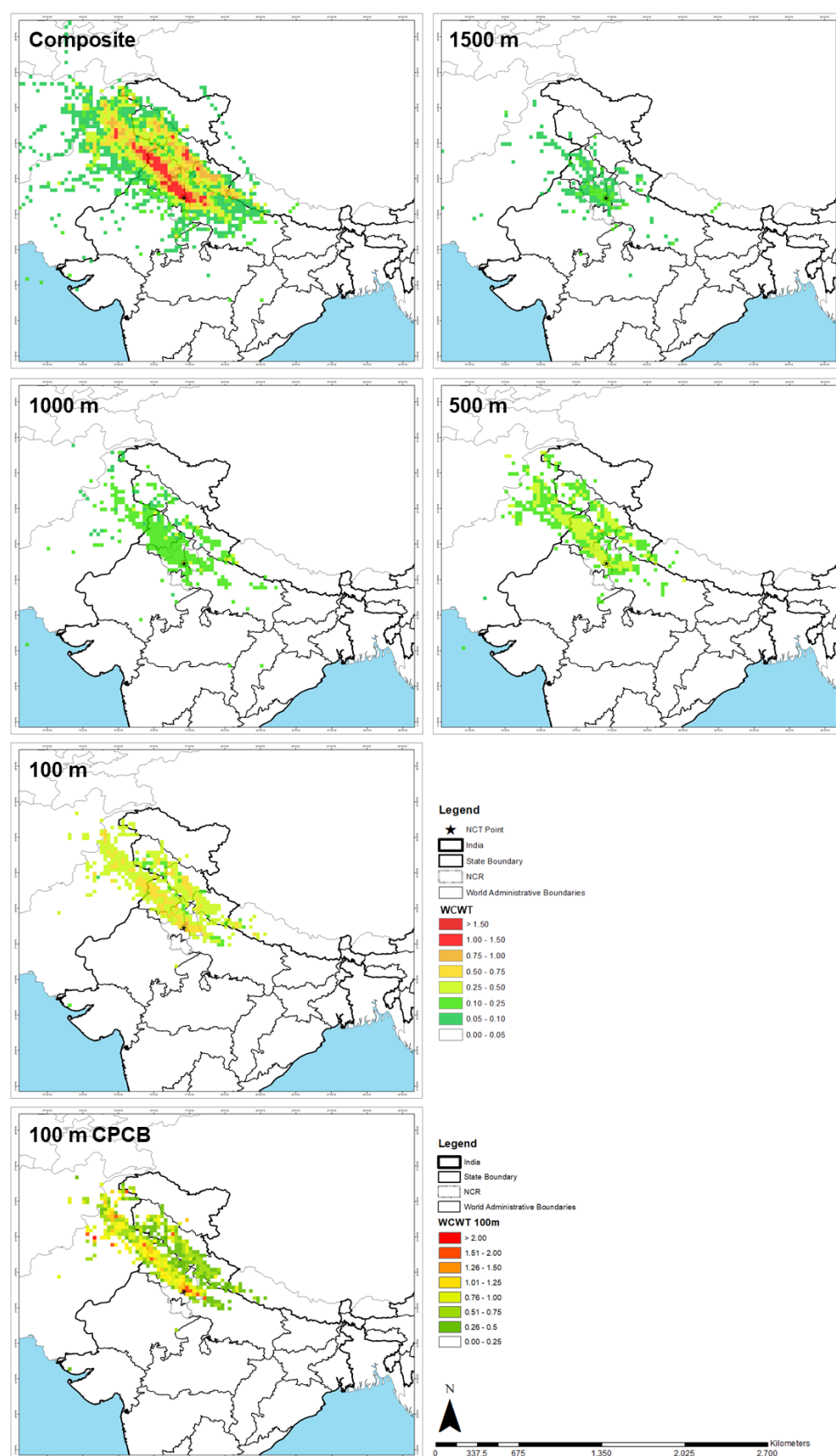
Supplementary Figure S 10: Sulphur Dioxide Trends in Delhi and Temperature from 2018 December to 2019 November

Annual 2018-19 WCWT for Carbon Monoxide



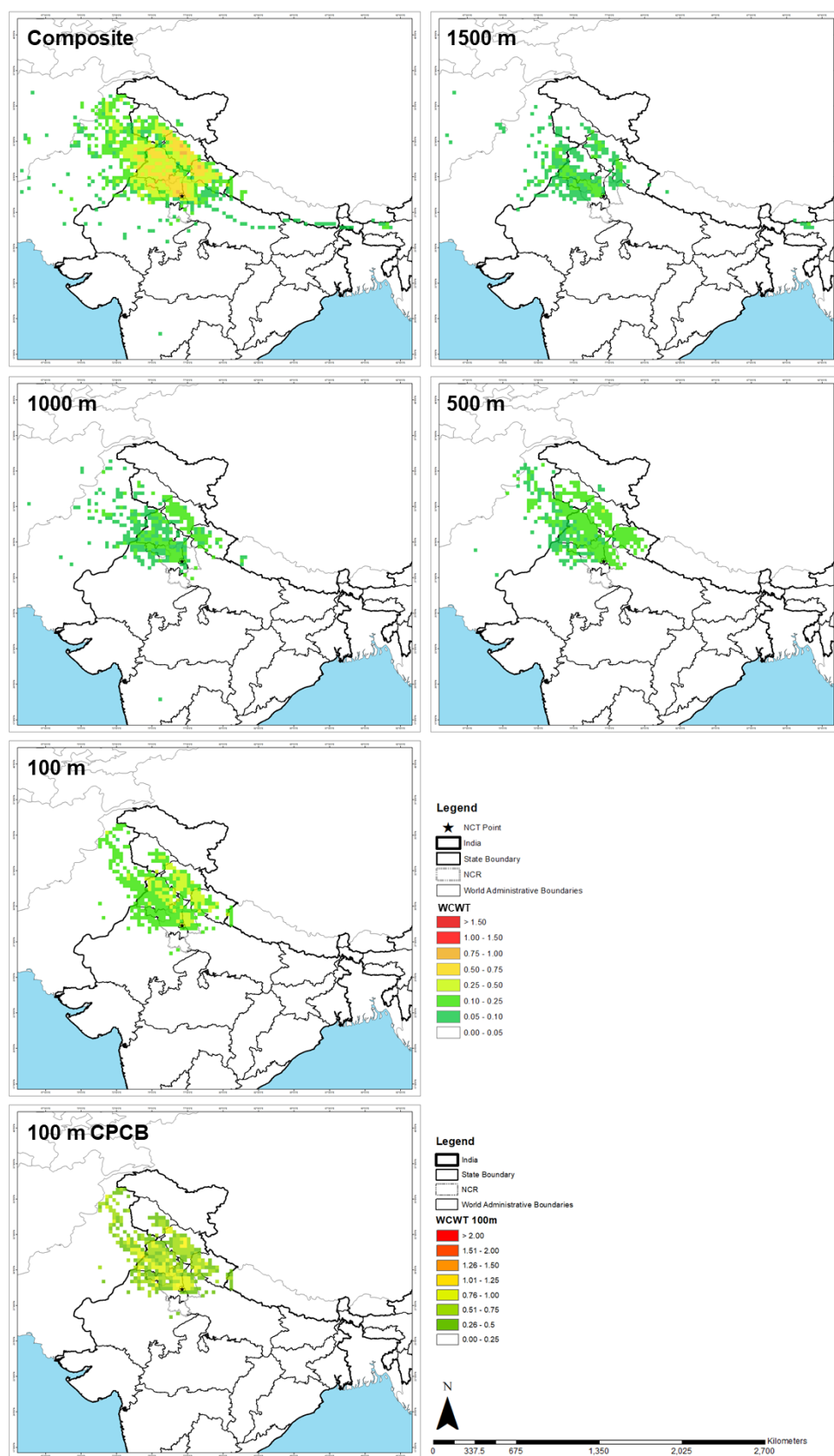
Supplementary Figure S 11: Annual WCWT results for CO using CAMS and CPCB data at varying heights and composite result

Winter 2018-19 WCWT for Carbon Monoxide



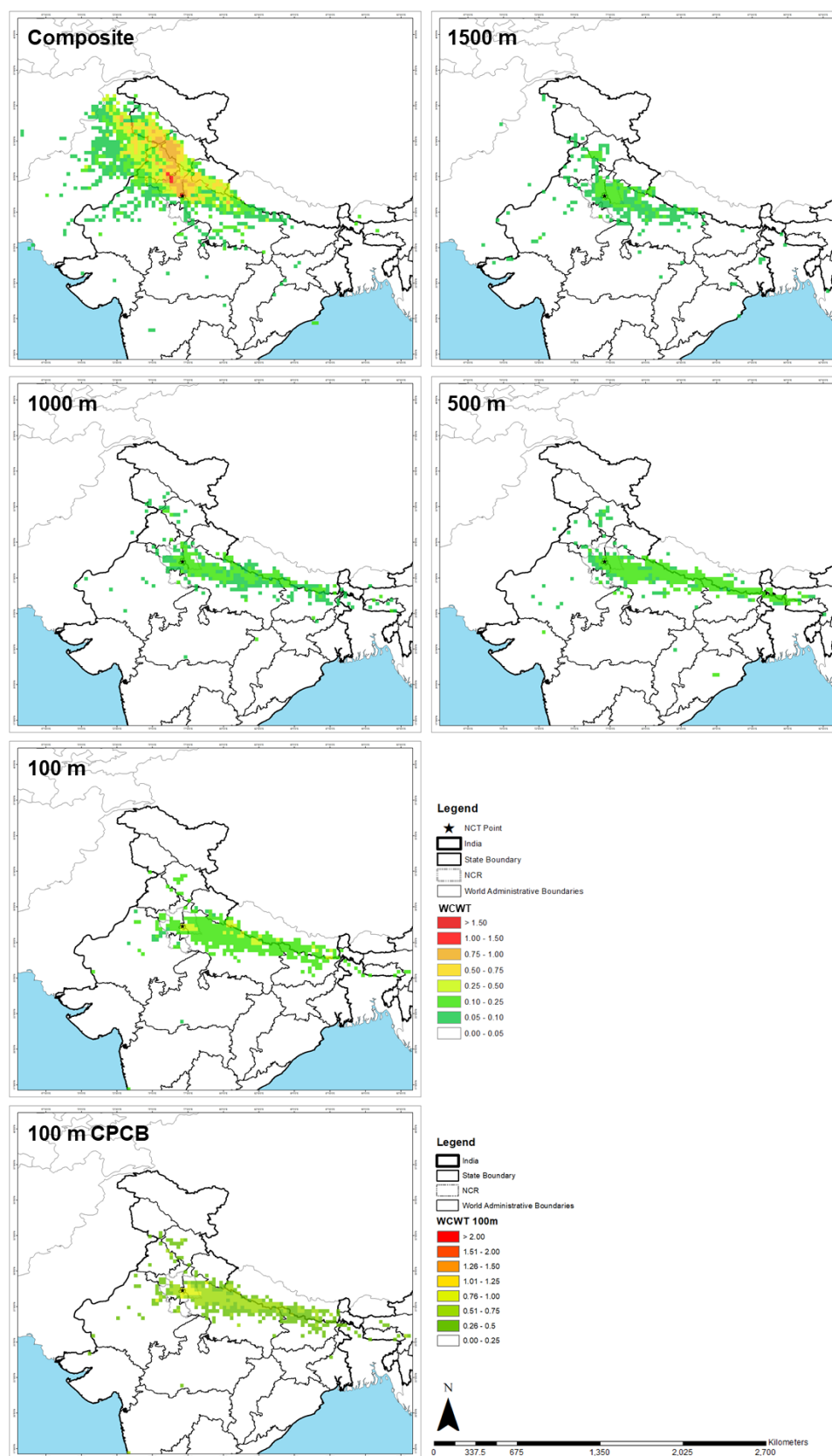
Supplementary Figure S 12: Winter WCWT results for CO using CAMS and CPCB data at varying heights and composite result

Pre-Monsoon 2019 WCWT for Carbon Monoxide



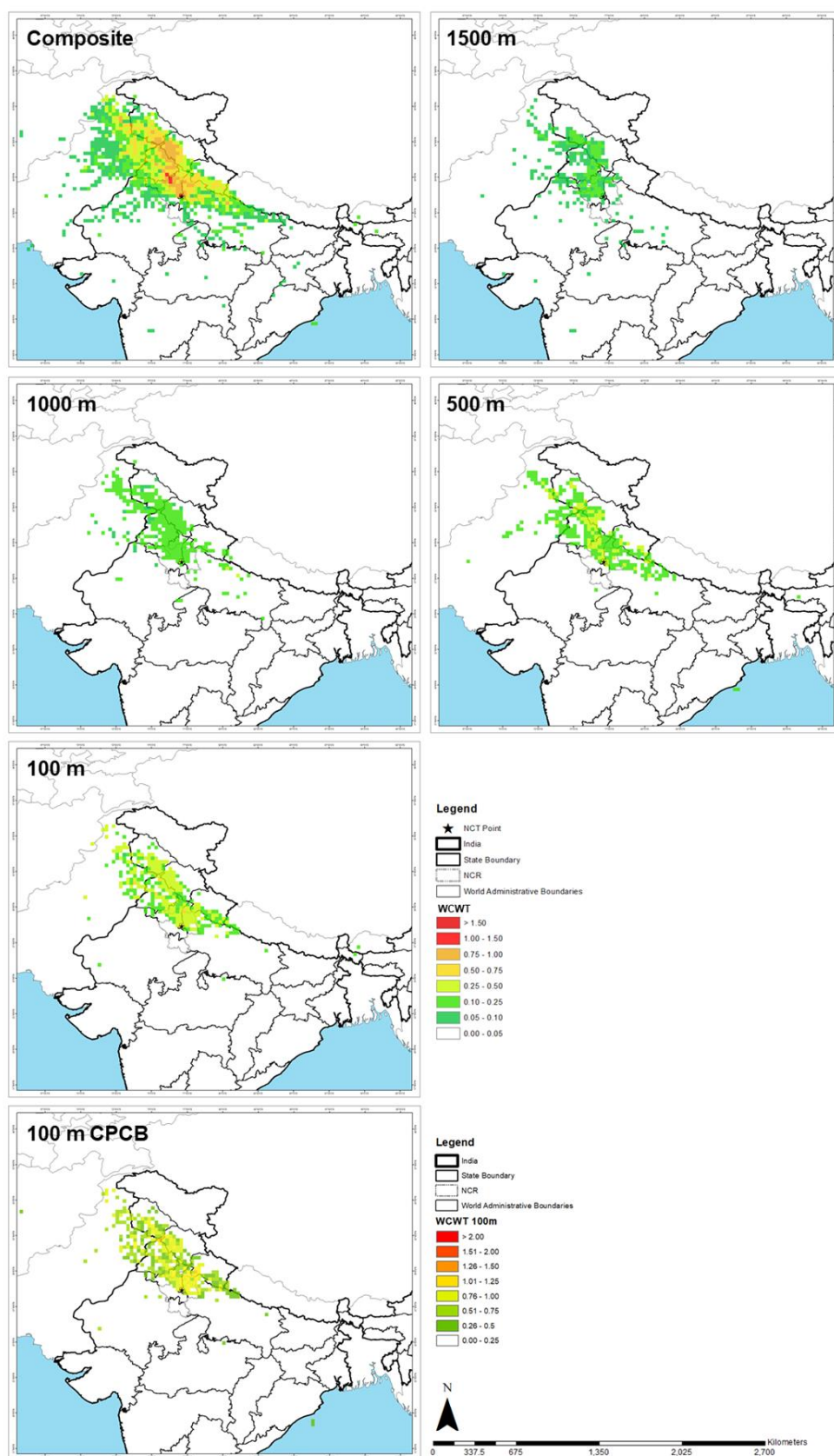
Supplementary Figure S 13: PrM WCWT results for CO using CAMS and CPCB data at varying heights and composite result

Monsoon 2019 WCWT for Carbon Monoxide



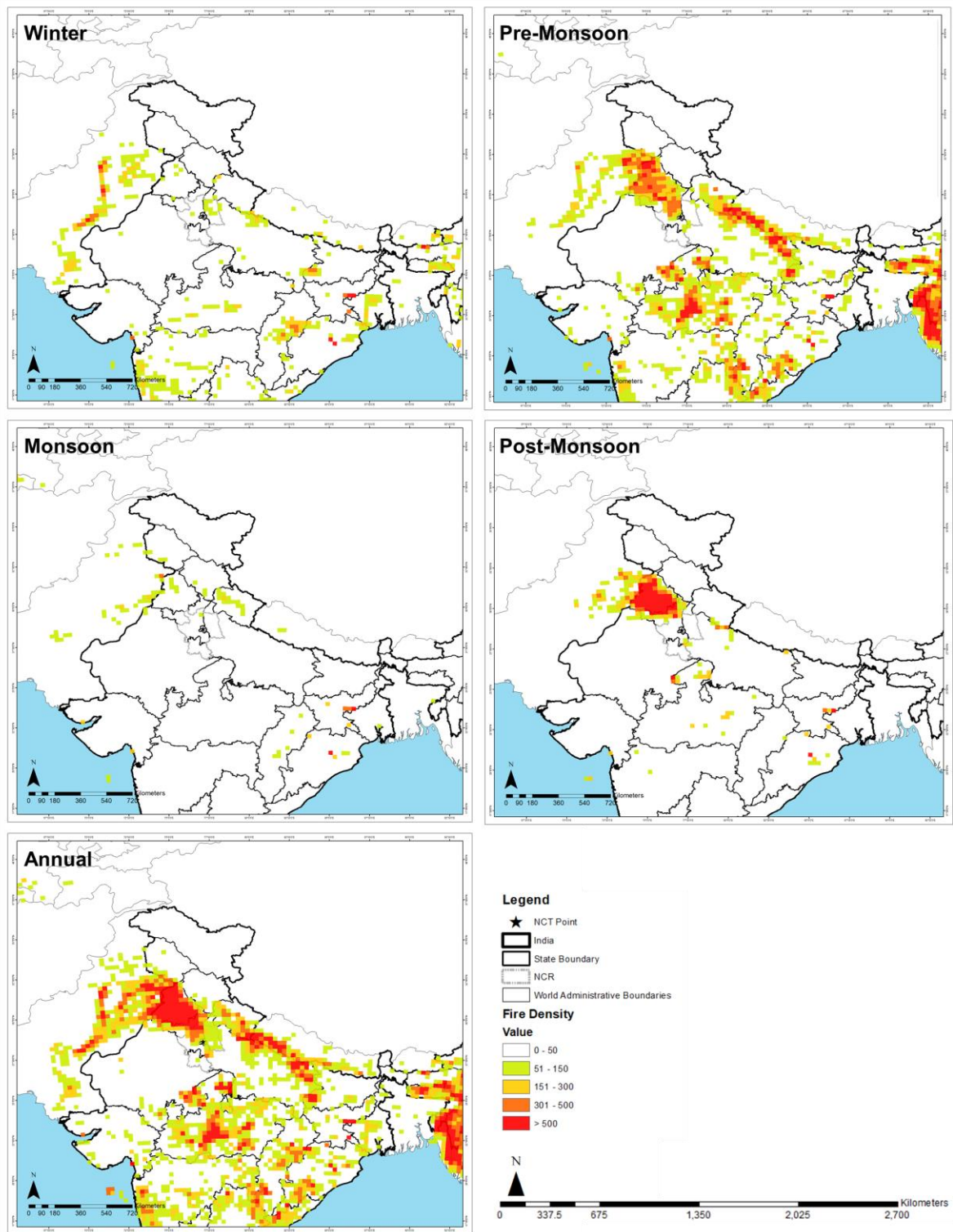
Supplementary Figure S 14: Monsoon WCWT results for CO using CAMS and CPCB data at varying heights and composite result

Post-Monsoon 2019 WCWT for Carbon Monoxide



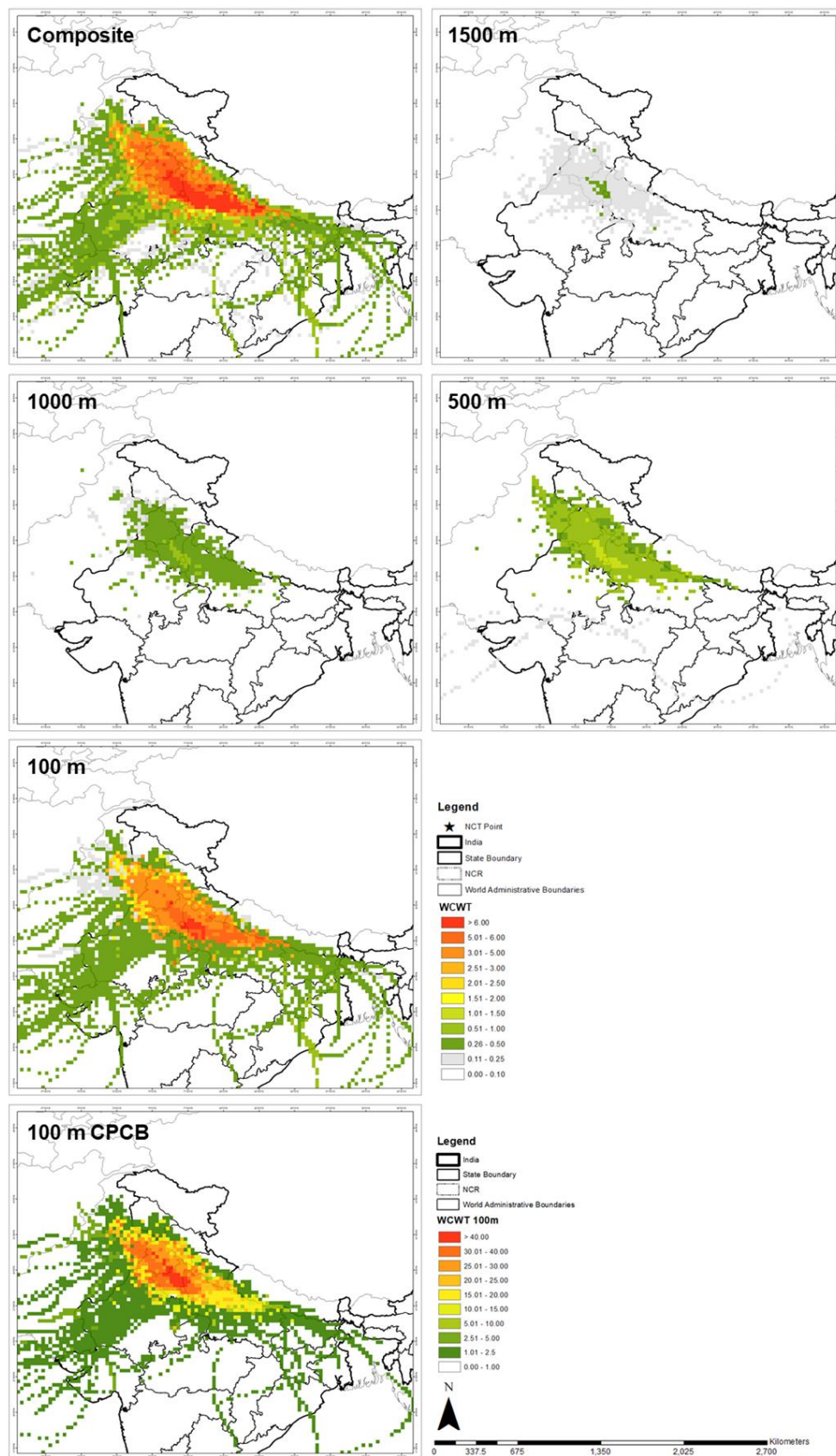
Supplementary Figure S 15: PoM WCWT results for CO using CAMS and CPCB data at varying heights and composite result

Fire Density



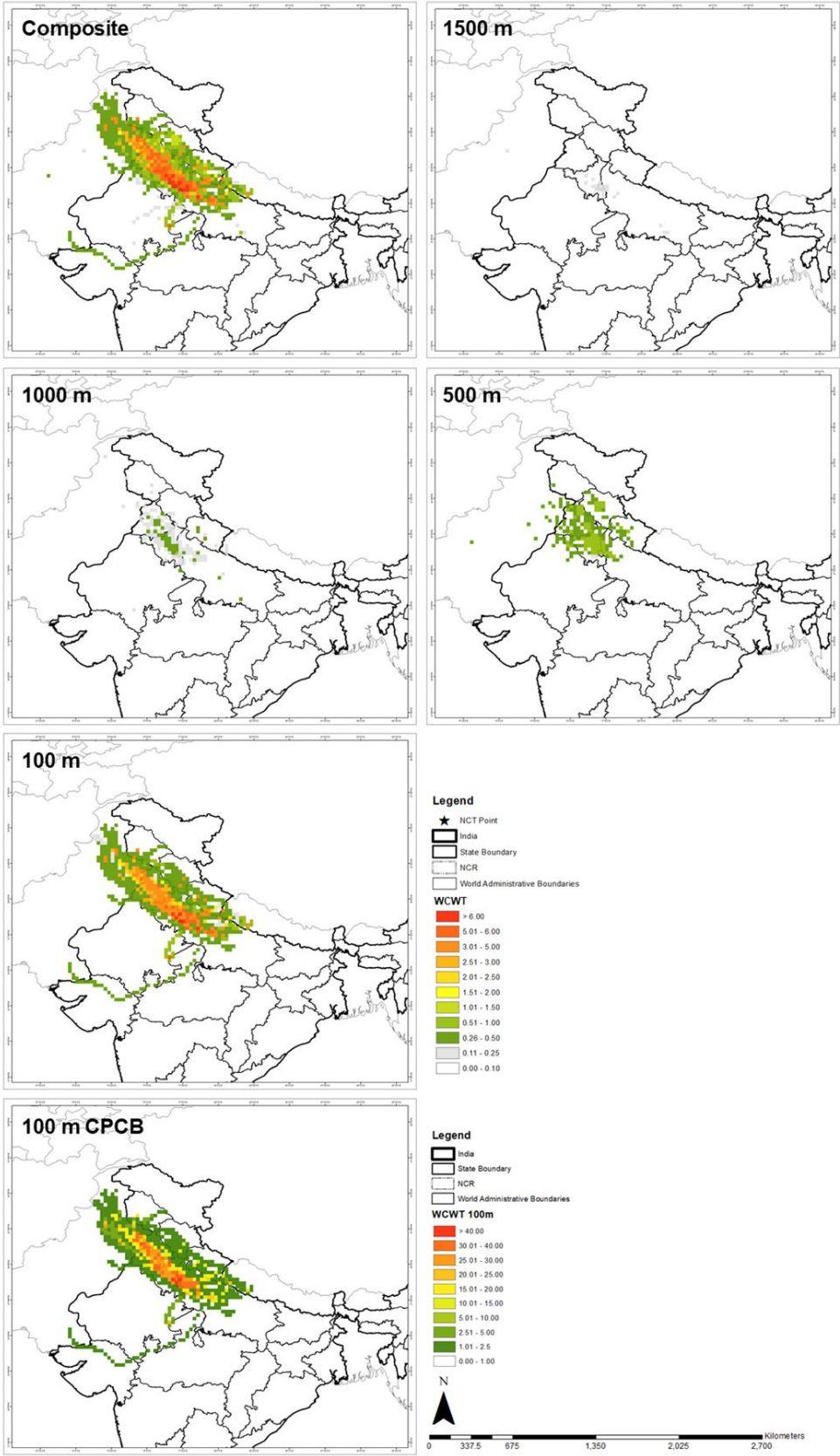
Supplementary Figure S 16: Fire Density Maps for different seasons over India

Annual 2018-19 WCWT for Nitrogen Dioxide



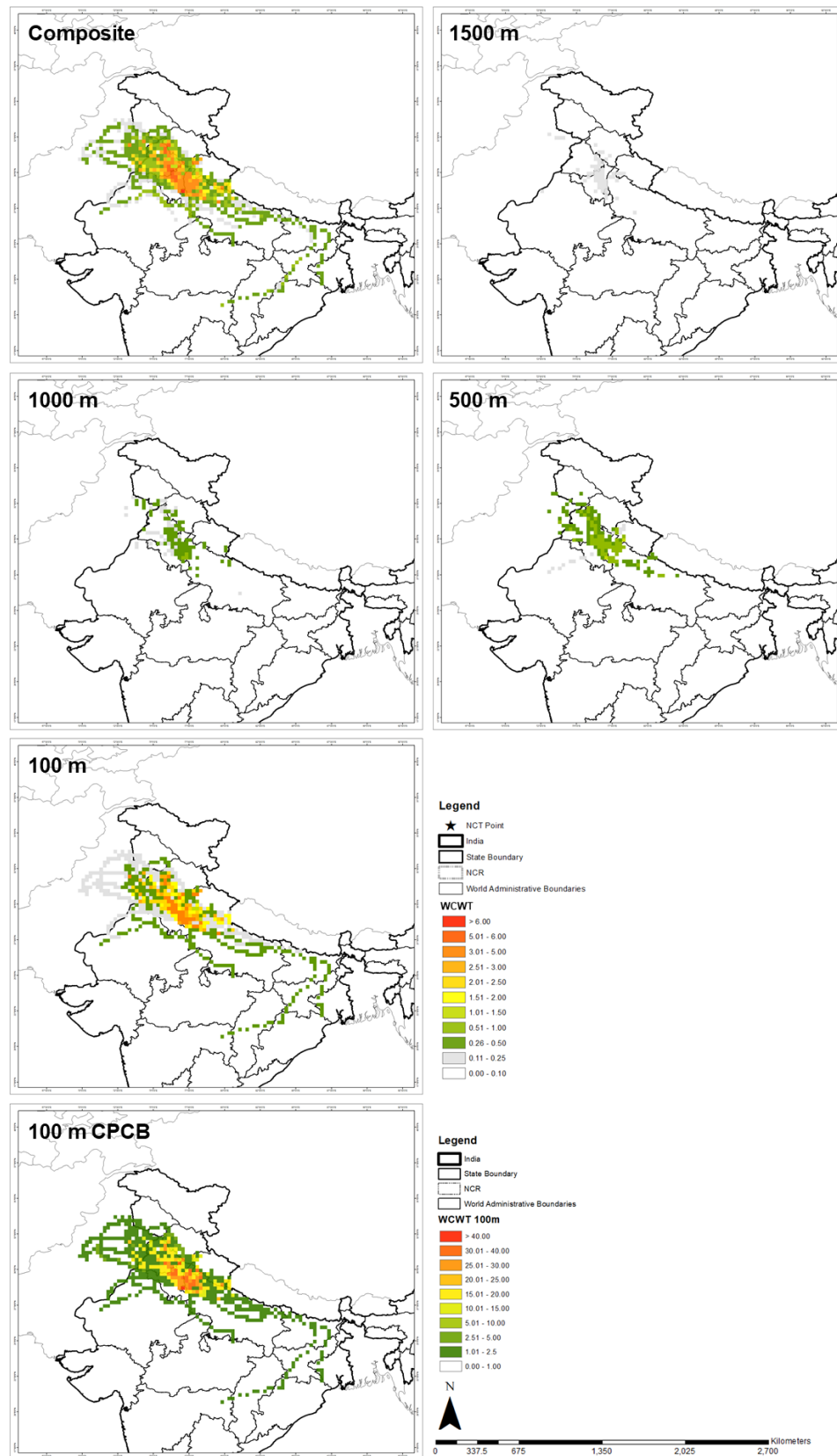
Supplementary Figure S 17: Annual WCWT results for NO₂ using CAMS and CPCB data at varying heights and composite result

Winter 2018-19 WCWT for Nitrogen Dioxide



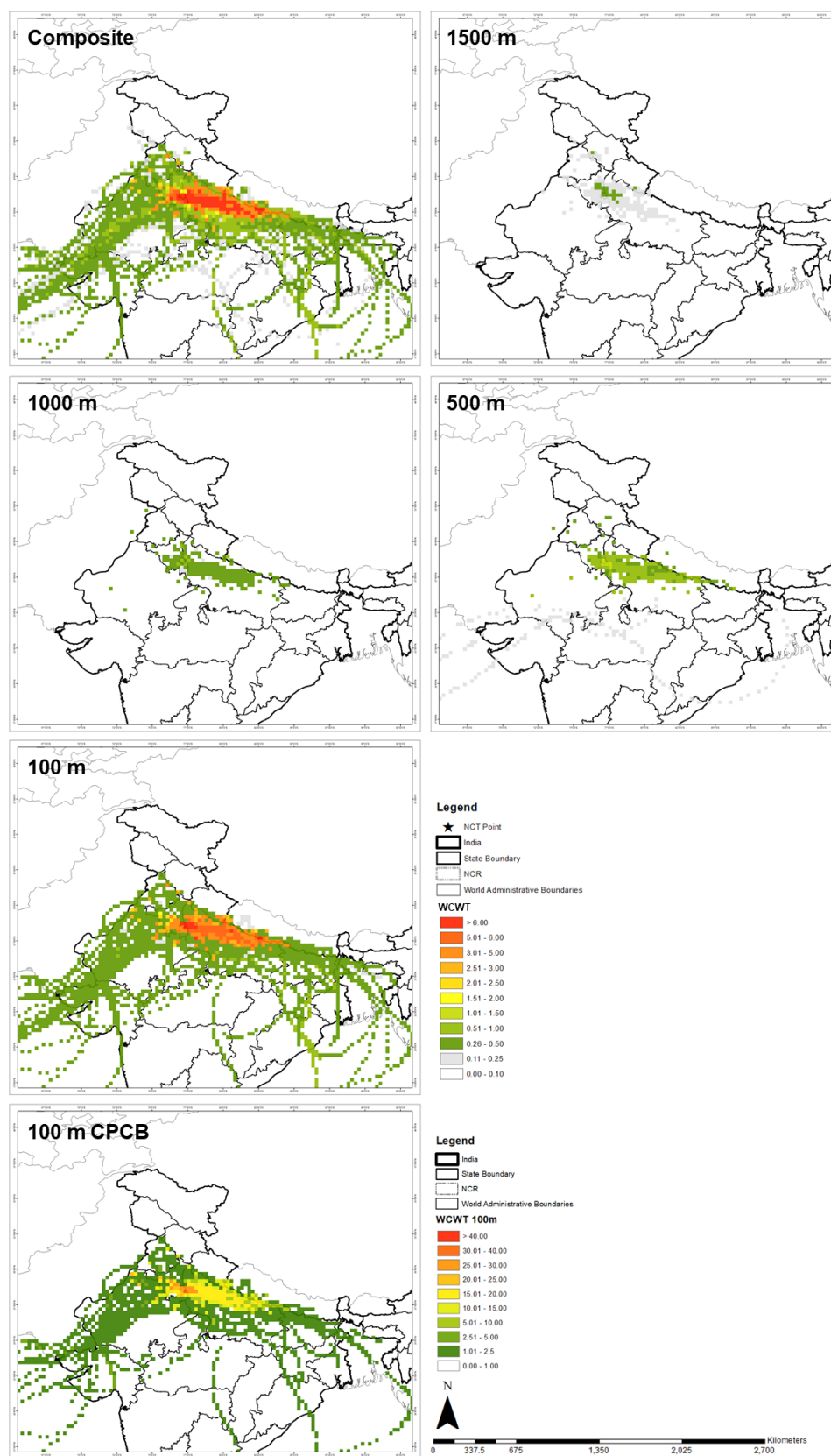
Supplementary Figure S 18 Winter WCWT results for NO₂ using CAMS and CPCB data at varying heights and composite result

Pre-Monsoon 2019 WCWT for Nitrogen Dioxide



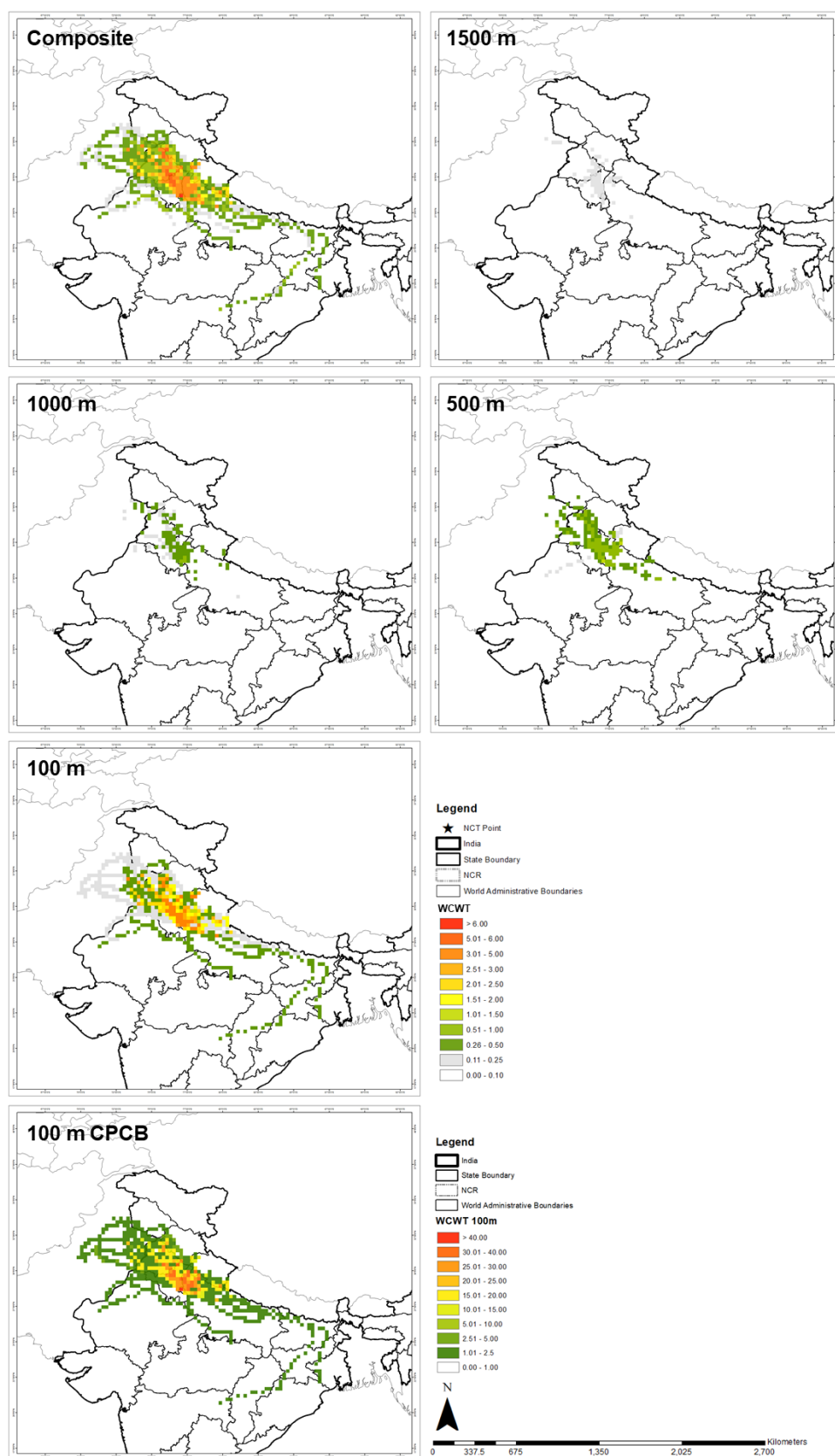
Supplementary Figure S 19: PrM WCWT results for NO₂ using CAMS and CPCB data at varying heights and composite result

Monsoon 2019 WCWT for Nitrogen Dioxide



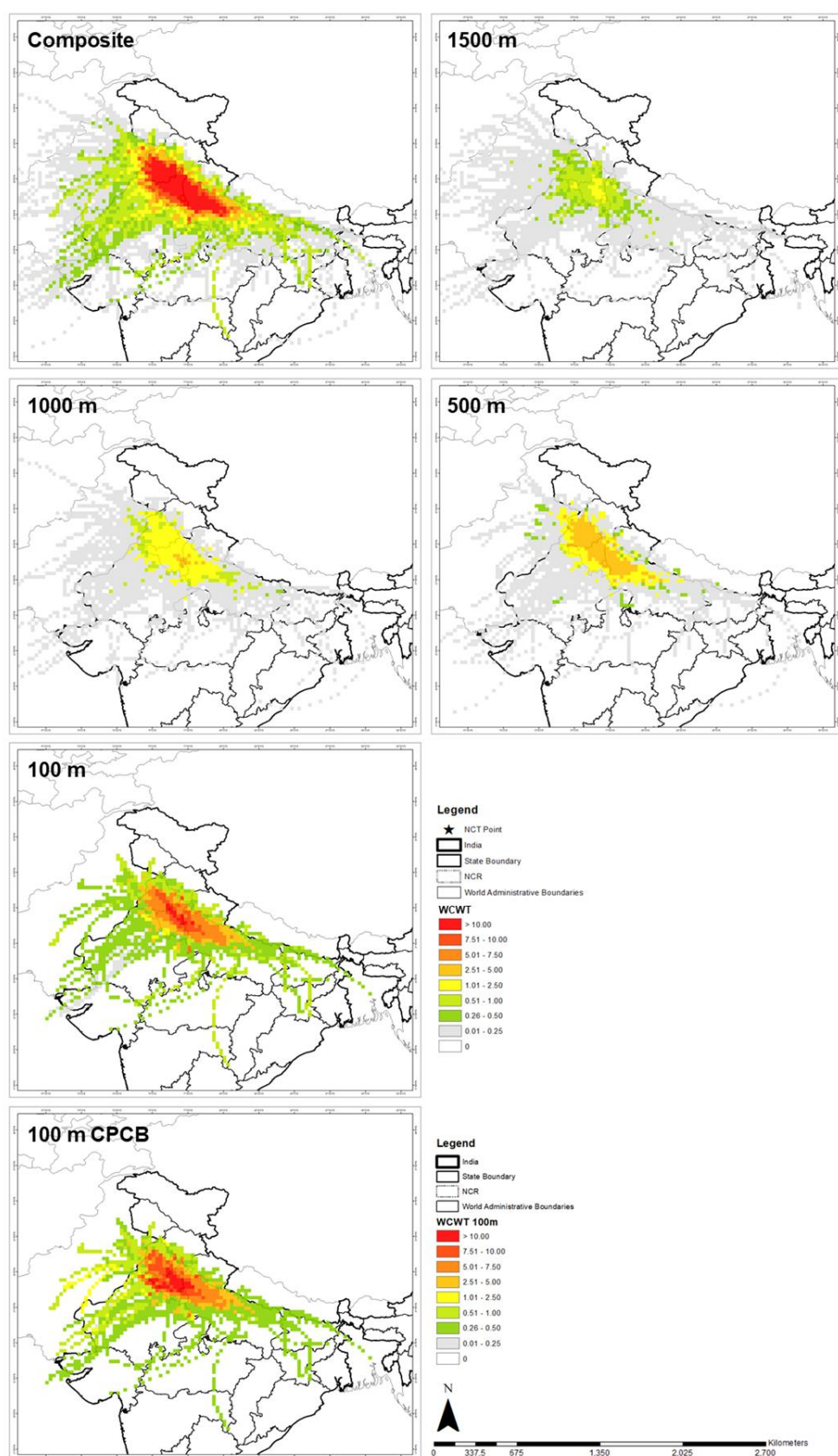
Supplementary Figure S 20: Monsoon WCWT results for NO₂ using CAMS and CPCB data at varying heights and composite result

Post-Monsoon 2019 WCWT for Nitrogen Dioxide



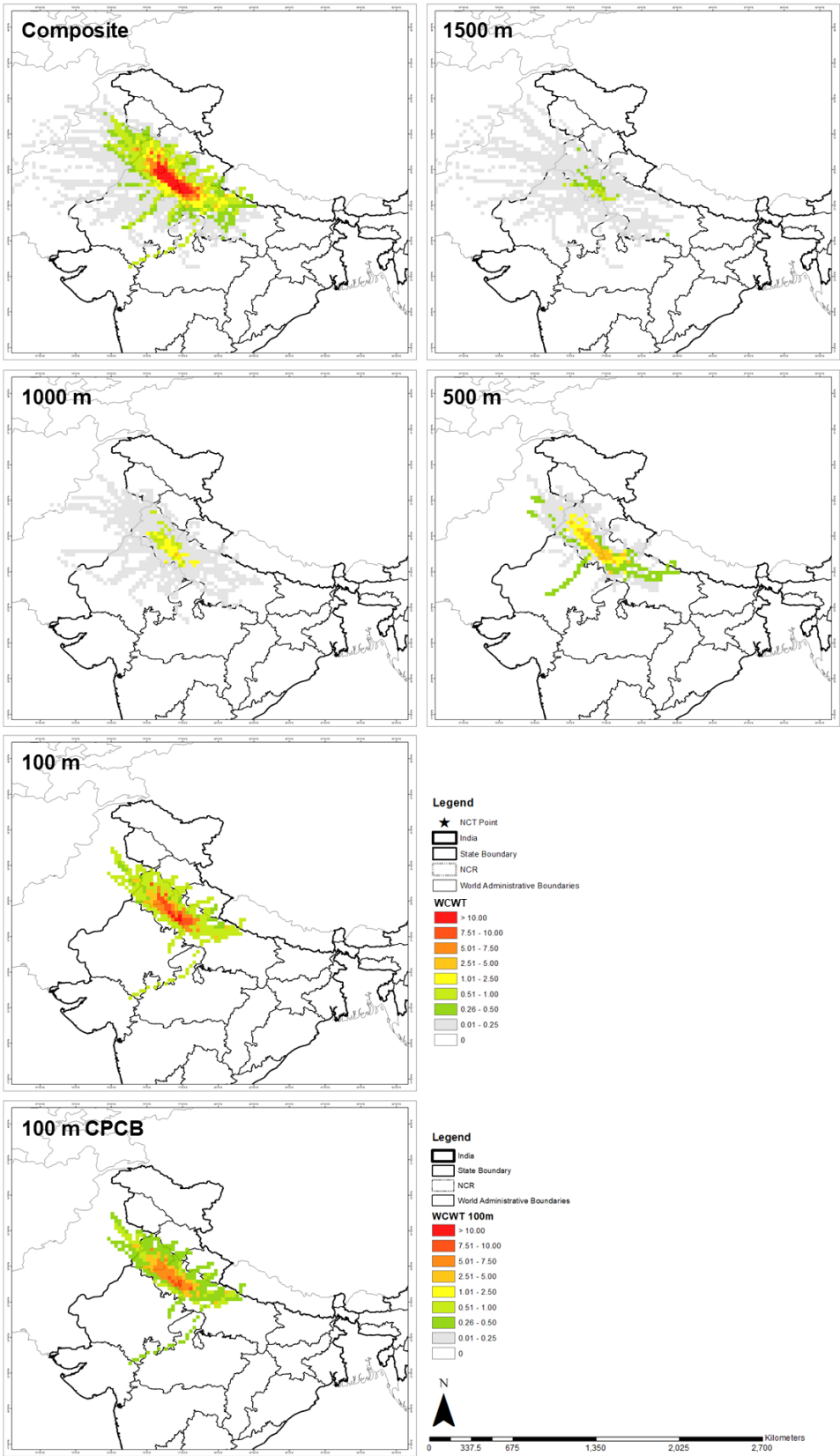
Supplementary Figure S21: Post-Monsoon WCWT results for NO₂ using CAMS and CPCB data at varying heights and composite result

Annual 2018-19 WCWT for Sulphur Dioxide



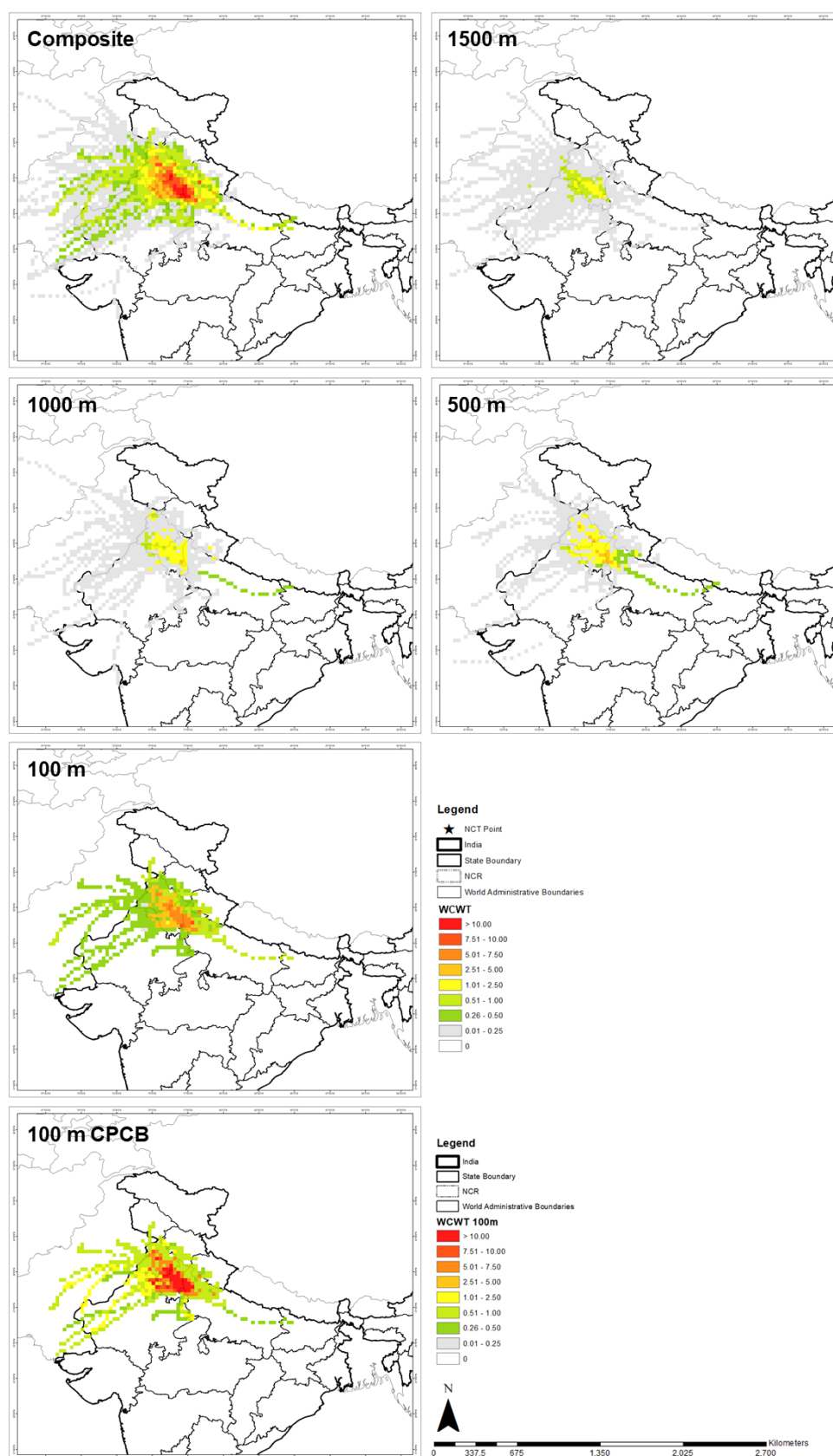
supplementary Figure S22: Annual WCWT results for SO₂ using CAMS and CPCB data at varying heights and composite result

Winter 2018-19 WCWT for Sulphur Dioxide



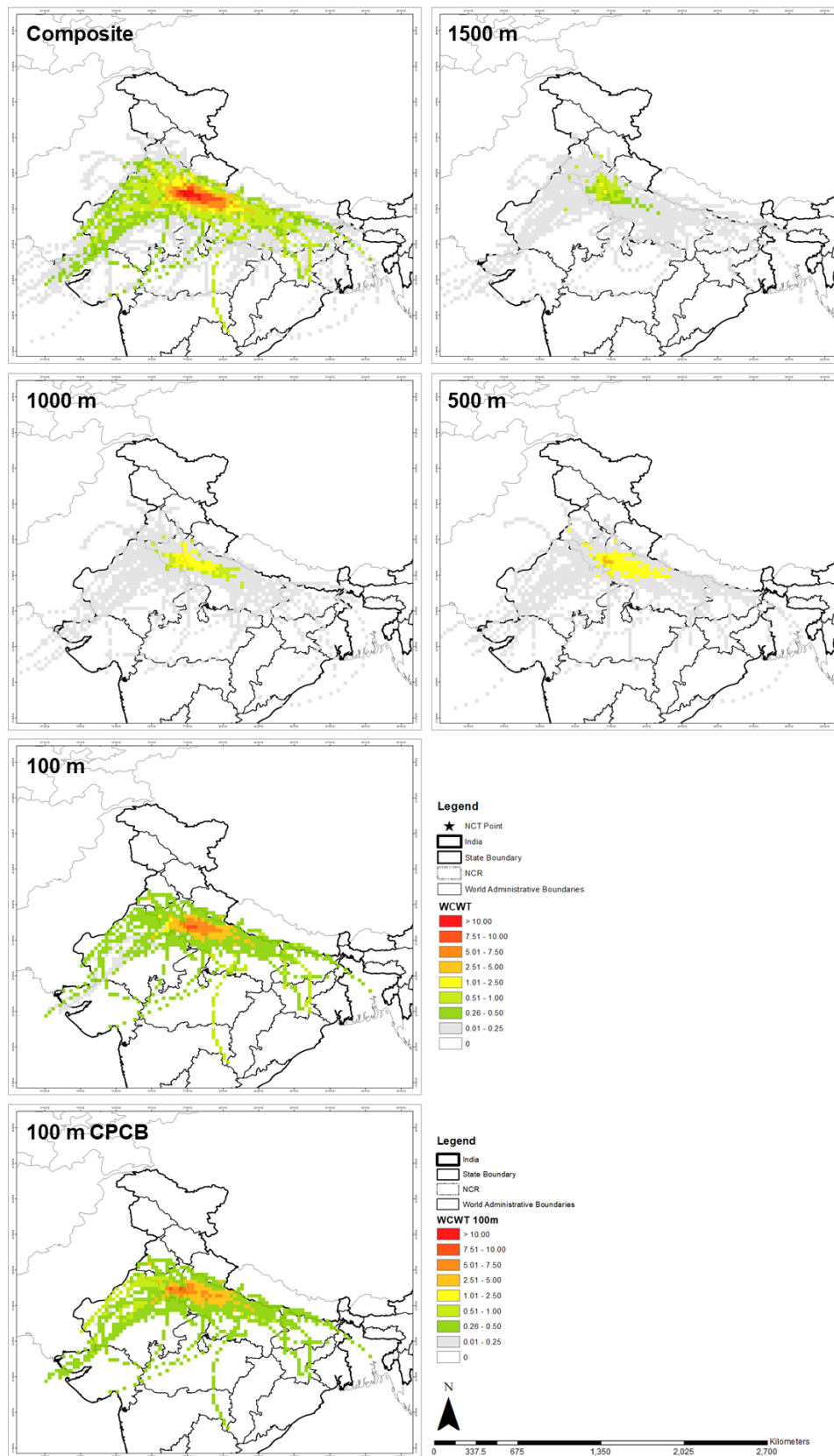
Supplementary Figure S23: Winter WCWT results for SO₂ using CAMS and CPCB data at varying heights and composite result

Pre-Monsoon 2019 WCWT for Sulphur Dioxide



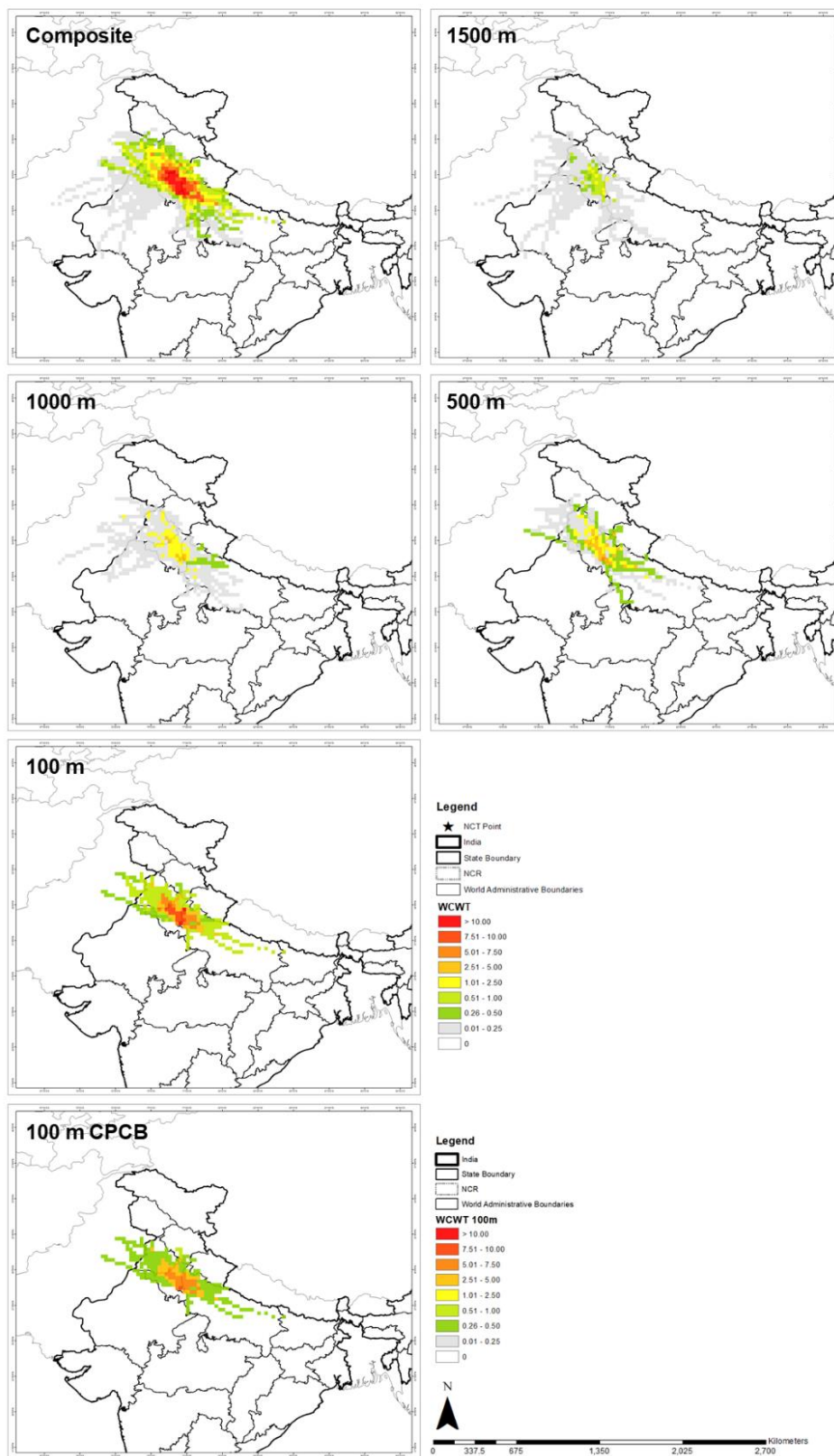
Supplementary Figure S24: PrM WCWT results for SO₂ using CAMS and CPCB data at varying heights and composite result

Monsoon 2019 WCWT for Sulphur Dioxide

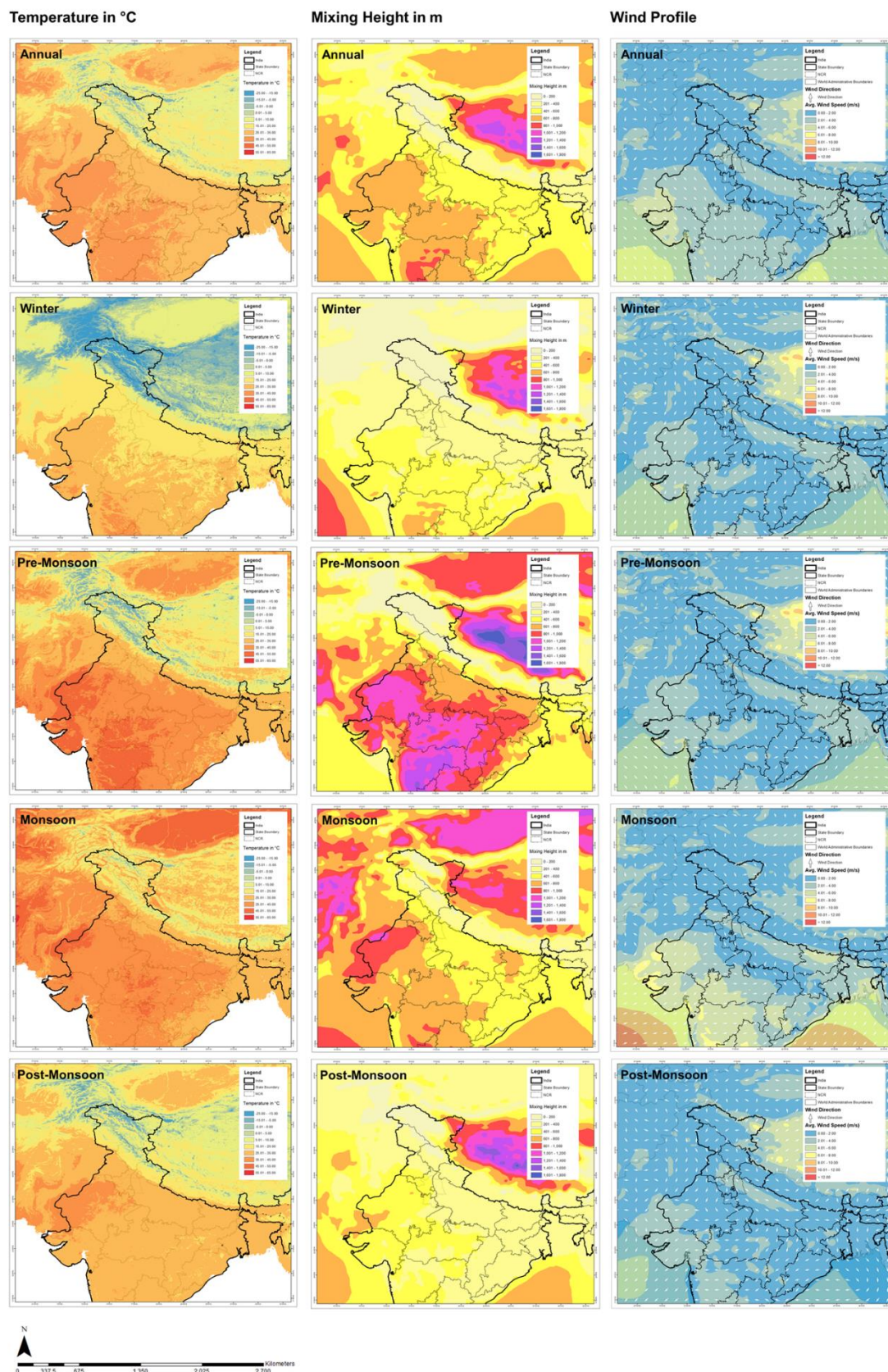


Supplementary Figure S25: Monsoon WCWT results for SO₂ using CAMS and CPCB data at varying heights and composite result

Post-Monsoon 2019 WCWT for Sulphur Dioxide



Supplementary Figure S26: PoM WCWT results for SO₂ using CAMS and CPCB data at varying heights and composite result



Supplementary Figure S27: Annual and Seasonal average Temperature (MODIS), Mixing Height (ERA 5) and Wind Profile (ERA 5) for 2019