



*Supplement of*

## **COVID-19 lockdown-induced changes in NO<sub>2</sub> levels across India observed by multi-satellite and surface observations**

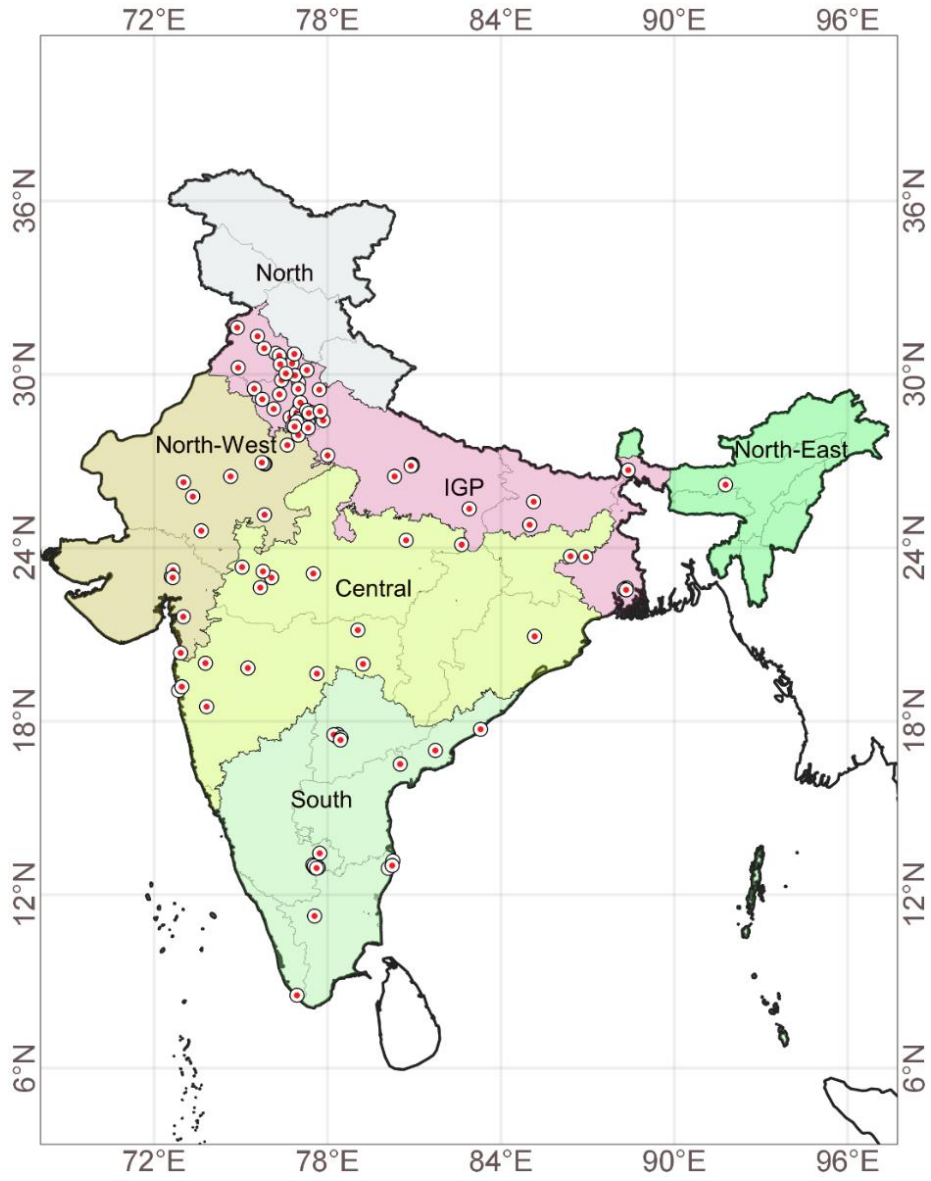
**Akash Biswal et al.**

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2 **1. CPCB locations with regions of India**



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4 *Fig. S1: Location of the CPCB monitoring stations used in the study and six geographic regions*  
5 *of India filled in different colours.*

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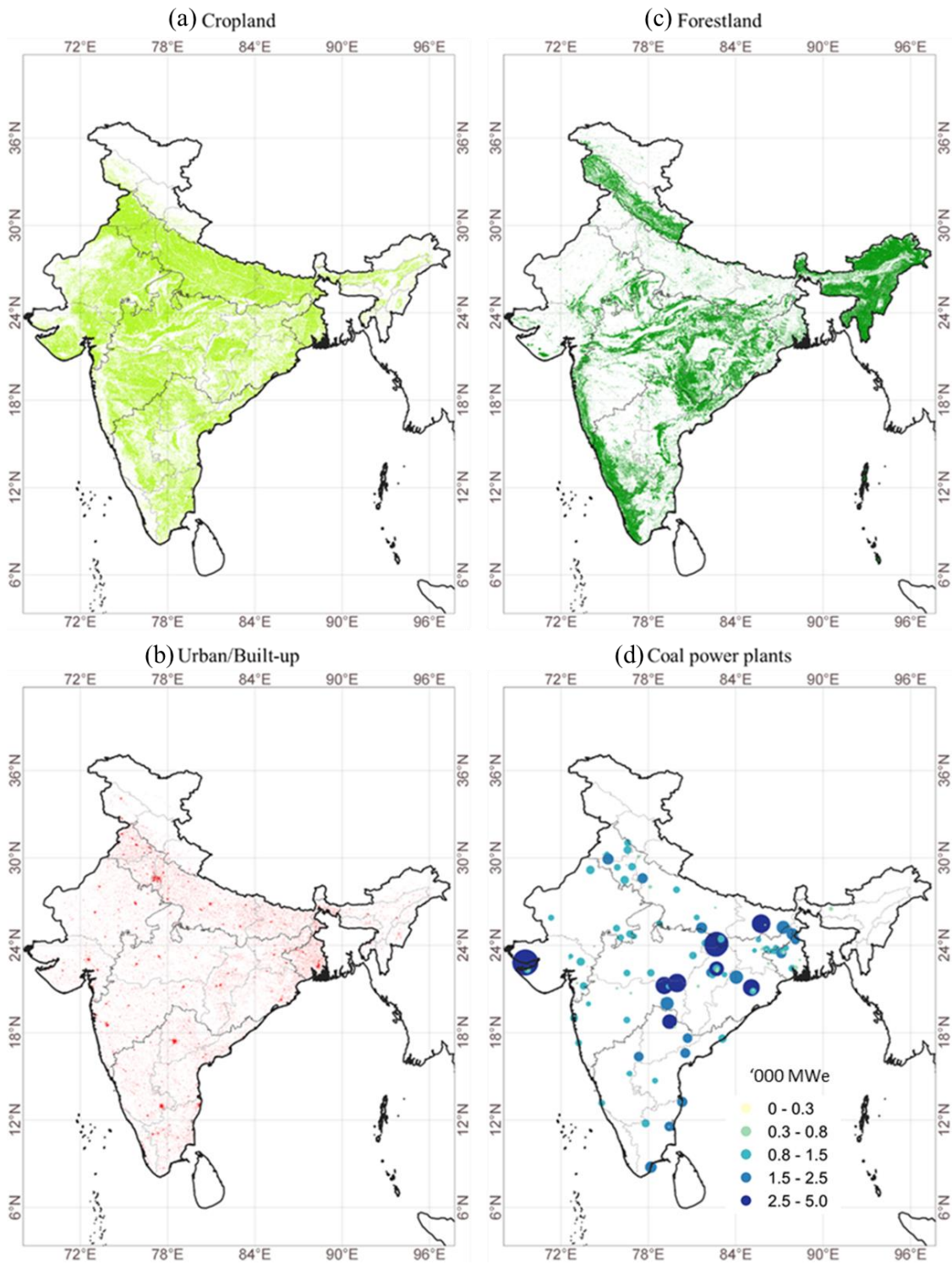
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2. Different land use land cover spread over India



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13 Fig. S2: (a-c) NRSC LULC over India (a) Cropland (b) Urban/Built-up (c) Forestland and, (d)

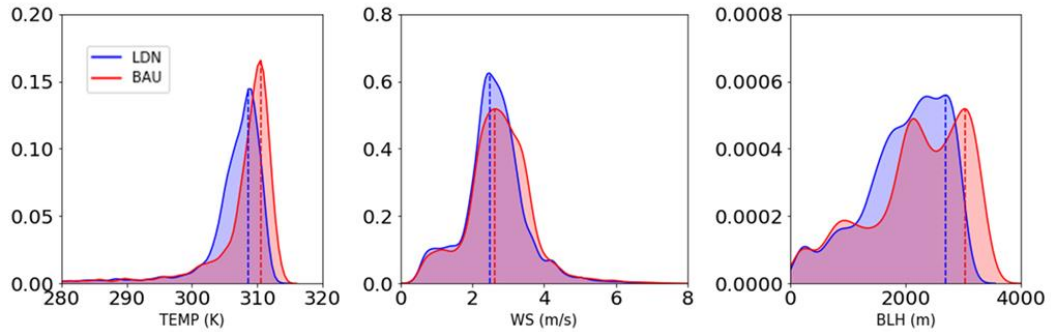
14 Thermal powerplants over India and the increasing bubble size proportional to the capacity.

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### 18 3. KDE plots for MET Parameters



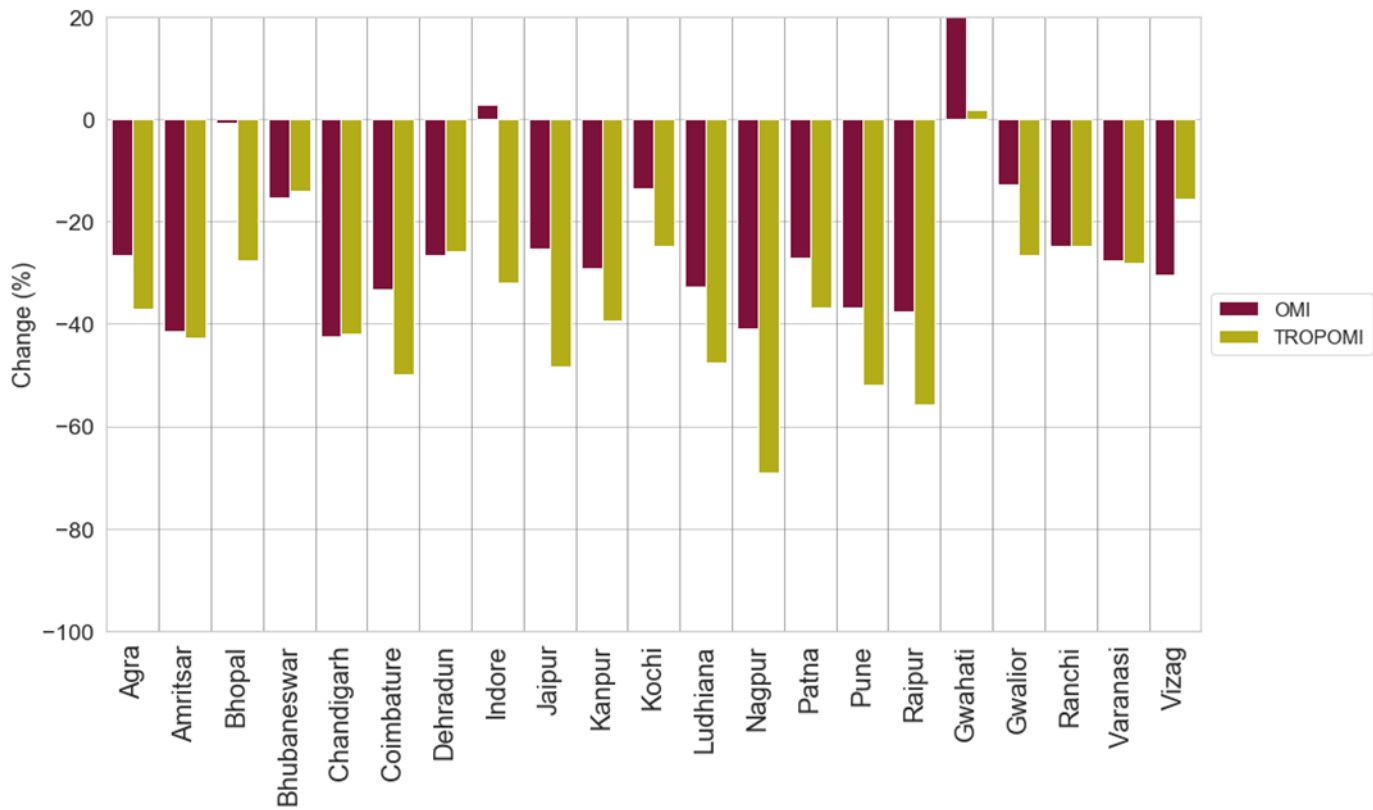
19

20 *Fig. S3: Probability density function (PDF) of monthly mean meteorological parameters*  
21 *during March, April and May of 2020 and during the same time period business as usual period*  
22 *of 2016-2019.*

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### 24 4. Change in $VCD_{trop}$ over twenty-two cities of India

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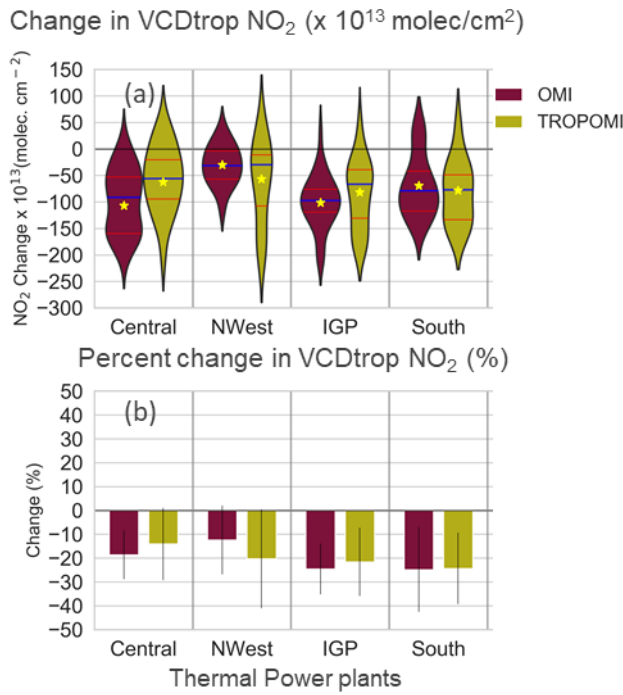


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27 *Fig. S4: Bar chart showing the  $VCD_{trop}$   $NO_2$  change observed by OMI and TROPOMI over*  
28 *major cities of India*

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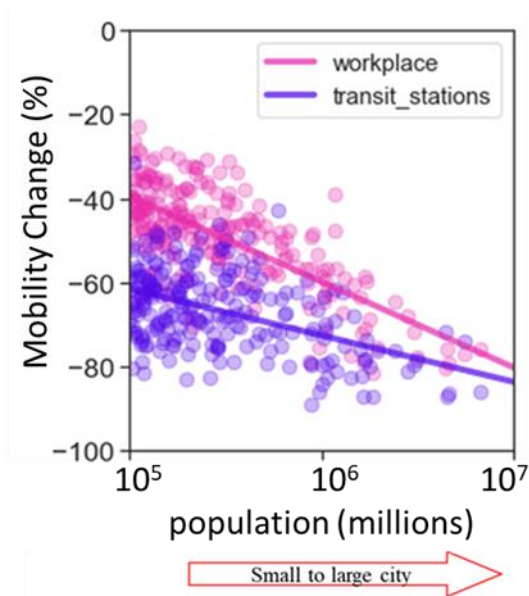
30 **5. Change in  $VCD_{trop}$  over thermal power plants**



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32 *Fig. S5: Observed change in  $VCD_{trop} NO_2$  between LDN and BAU from OMI and TROPOMI*  
 33 *for different regions shown as (a) violin plot of the observed change over thermal power plants,*  
 34 *and (b) percentage change over thermal power plants.*

35 **6. Population and Google mobility change**



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37 *Fig. S6: Google mobility reduction according to city population.*

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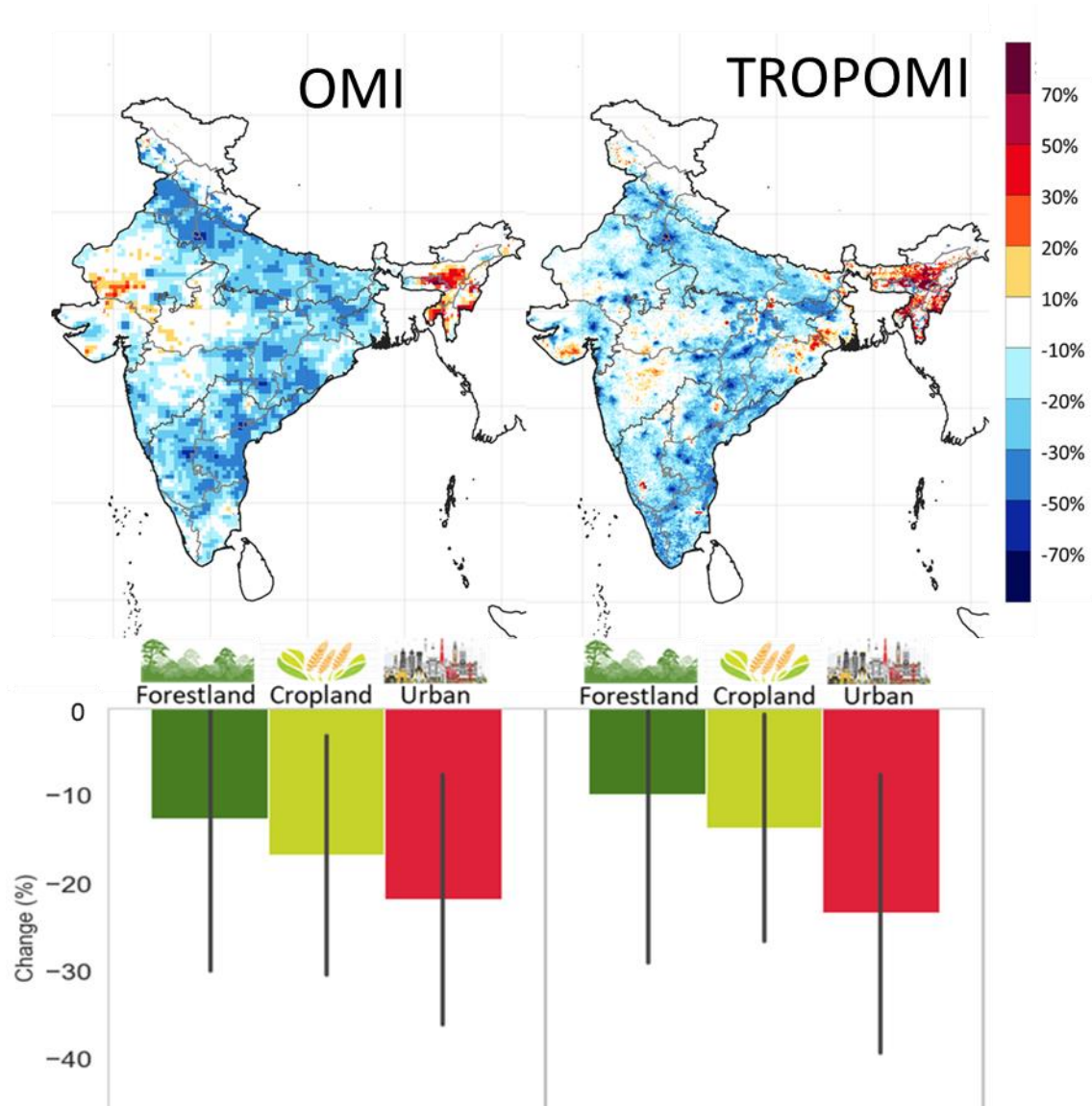
Table S1 Statistics of VCD<sub>trop</sub> NO<sub>2</sub> difference and percentage change observed over different regions

Landuse	Region	Change in VCD <sub>trop</sub> NO <sub>2</sub> ( $\times 10^{13}$ molecules cm <sup>-2</sup> )				Change in VCD <sub>trop</sub> NO <sub>2</sub> (%)			
		mean $\pm$ SD		Median (25th, 75th Percentile)		mean $\pm$ SD		Median (25th, 75th Percentile)	
		OMI	TROPOMI	OMI	TROPOMI	OMI	TROPOMI	OMI	TROPOMI
Crop	Central	-47.3 $\pm$ 48.6	-26.4 $\pm$ 35.7	-38.3 (-76.6, -11.5)	-19.5 (-39.0, -3.8)	-14.2 $\pm$ 12.7	-10.9 $\pm$ 12.6	-15.0 (-23.8, -5.0)	-10.3 (-19.1, -2.2)
	NWest	-15.6 $\pm$ 28.4	-24.8 $\pm$ 28.4	-13.3 (-33.3, 3.9)	-20.5 (-35.2, -8.0)	-6.1 $\pm$ 13.2	-12.3 $\pm$ 11.7	-7.3 (-15.9, 2.2)	-12.7 (-18.7, -5.7)
	IGP	-86.2 $\pm$ 35.0	-39.7 $\pm$ 31.1	-85.7 (-106.0, -62.3)	-39.6 (-54.5, -25.5)	-24.8 $\pm$ 8.2	-16.2 $\pm$ 11.2	-25.4 (-30.2, -19.8)	-17.9 (-22.8, -12.3)
	South	-52.8 $\pm$ 33.8	-39.8 $\pm$ 27.4	-48.3 (-68.0, -28.6)	-37.7 (-52.2, -23.6)	-23.0 $\pm$ 10.6	-19.3 $\pm$ 10.7	-22.9 (-30.1, -16.3)	-19.8 (-25.9, -13.3)
	North	-48.7 $\pm$ 41.8	-22.3 $\pm$ 21.5	-41.7 (-83.9, -18.9)	-23.4 (-38.8, -3.9)	-17.3 $\pm$ 13.6	-12.4 $\pm$ 12.0	-17.4 (-28.0, -8.4)	-14.7 (-20.7, -2.9)
	NEast	10.3 $\pm$ 21.5	23.7 $\pm$ 16.0	11.6 (-5.1, 25.3)	23.0 (13.3, 32.8)	5.2 $\pm$ 10.9	20.2 $\pm$ 13.7	5.5 (-2.3, 12.5)	19.4 (10.3, 29.1)
Forest	Central	-61.9 $\pm$ 47.9	-34.3 $\pm$ 37.7	-58.8 (-92.3, -26.4)	-29.7 (-51.0, -10.4)	-18.3 $\pm$ 12.3	-14.5 $\pm$ 13.8	-19.6 (-26.2, -11.1)	-15.5 (-23.3, -5.8)
	NWest	-15.9 $\pm$ 31.3	-20.8 $\pm$ 27.4	-13.2 (-34.2, 4.8)	-16.5 (-28.5, -6.5)	-6.7 $\pm$ 13.2	-10.9 $\pm$ 11.6	-7.6 (-16.2, 2.8)	-10.7 (-16.7, -4.5)
	IGP	-72.3 $\pm$ 46.5	-21.6 $\pm$ 41.2	-76.9 (-103.1, -34.4)	-23.3 (-45.3, 7.4)	-19.4 $\pm$ 11.7	-7.5 $\pm$ 17.8	-20.3 (-27.4, -11.5)	-10.8 (-20.8, 4.0)
	South	-35.2 $\pm$ 33.0	-37.5 $\pm$ 27.3	-26.3 (-52.5, -11.6)	-35.1 (-50.1, -22.1)	-17.9 $\pm$ 12.6	-20.9 $\pm$ 12.0	-18.3 (-26.5, -9.7)	-21.9 (-28.6, -14.6)
	North	-26.6 $\pm$ 35.0	-10.8 $\pm$ 23.8	-21.2 (-51.2, -3.3)	-5.5 (-22.6, 4.5)	-14.5 $\pm$ 17.0	-5.5 $\pm$ 16.1	-16.6 (-27.0, -5.2)	-5.3 (-17.1, 5.2)
	NEast	9.5 $\pm$ 29.4	8.2 $\pm$ 27.1	9.3 (-9.9, 28.9)	6.8 (-7.1, 24.7)	4.6 $\pm$ 19.6	7.6 $\pm$ 23.7	5.7 (-7.2, 16.7)	6.8 (-8.6, 22.5)
Power	Central	-107.0 $\pm$ 58.8	-62.1 $\pm$ 62.9	-109.7 (-158.4, -54.9)	-58.1 (-95.9, -27.2)	-20.7 $\pm$ 10.4	-14.2 $\pm$ 14.1	-20.8 (-30.1, -13.8)	-12.8 (-19.0, -4.0)
	NWest	-30.0 $\pm$ 36.8	-56.7 $\pm$ 80.0	-27.9 (-53.5, -4.7)	-28.7 (-90.3, -9.4)	-12.4 $\pm$ 14.3	-17.8 $\pm$ 23.0	-14.2 (-24.8, -3.5)	-12.6 (-35.7, -8.7)
	IGP	-101.5 $\pm$ 50.0	-81.4 $\pm$ 67.3	-97.0 (-121.0, -75.2)	-66.0 (-130.5, -37.9)	-24.4 $\pm$ 11.0	-20.9 $\pm$ 14.8	-26.6 (-31.3, -21.3)	-21.0 (-30.5, -11.6)
	South	-69.1 $\pm$ 55.9	-78.2 $\pm$ 58.9	-75.7 (-112.8, -47.4)	-60.3 (-129.5, -42.6)	-25.1 $\pm$ 17.7	-23.3 $\pm$ 15.3	-29.4 (-34.4, -23.2)	-20.4 (-32.5, -13.2)
	NEast	11.7 $\pm$ 0.1	25.9 $\pm$ 19.9	11.7 (11.6, 11.7)	25.9 (18.9, 33.0)	5.2 $\pm$ 0.4	12.8 $\pm$ 9.3	5.2 (5.1, 5.3)	12.8 (9.6, 16.1)
Urban	Central	-69.8 $\pm$ 58.5	-62.8 $\pm$ 52.6	-54.4 (-99.6, -24.9)	-44.7 (-83.4, -28.7)	-20.1 $\pm$ 12.8	-21.2 $\pm$ 13.3	-21.0 (-30.7, -11.6)	-19.3 (-26.8, -12.7)
	NWest	-39.1 $\pm$ 34.3	-73.1 $\pm$ 50.8	-42.3 (-52.1, -10.6)	-59.8 (-107.2, -35.0)	-14.6 $\pm$ 12.2	-27.2 $\pm$ 13.3	-16.4 (-23.5, -7.1)	-27.3 (-36.8, -18.3)
	IGP	-99.1 $\pm$ 40.3	-74.2 $\pm$ 48.3	-98.1 (-127.1, -75.8)	-71.1 (-103.1, -44.3)	-26.9 $\pm$ 9.1	-24.6 $\pm$ 13.4	-27.2 (-32.8, -22.0)	-26.7 (-33.5, -18.9)
	South	-67.8 $\pm$ 48.8	-76.5 $\pm$ 46.7	-57.3 (-109.5, -27.9)	-62.1 (-105.7, -39.6)	-26.9 $\pm$ 13.2	-29.7 $\pm$ 10.9	-27.6 (-34.4, -18.1)	-28.3 (-38.2, -21.4)
	North	-56.9 $\pm$ 36.8	-50.8 $\pm$ 11.4	-48.1 (-83.9, -30.3)	-50.7 (-57.1, -46.5)	-20.9 $\pm$ 10.7	-25.7 $\pm$ 6.1	-22.3 (-29.3, -15.8)	-25.9 (-28.6, -21.8)
	NEast	22.2 $\pm$ 20.2	25.1 $\pm$ 15.8	24.2 (11.3, 36.3)	24.0 (15.3, 34.4)	10.5 $\pm$ 10.2	19.0 $\pm$ 13.5	11.4 (5.0, 16.9)	16.8 (9.0, 24.9)

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### Highlight figure

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Percentage change in VCD<sub>trop</sub> NO<sub>2</sub> during COVID-19 lockdown

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