

Figure S1. Above ground biomass (in kg/m²) map.

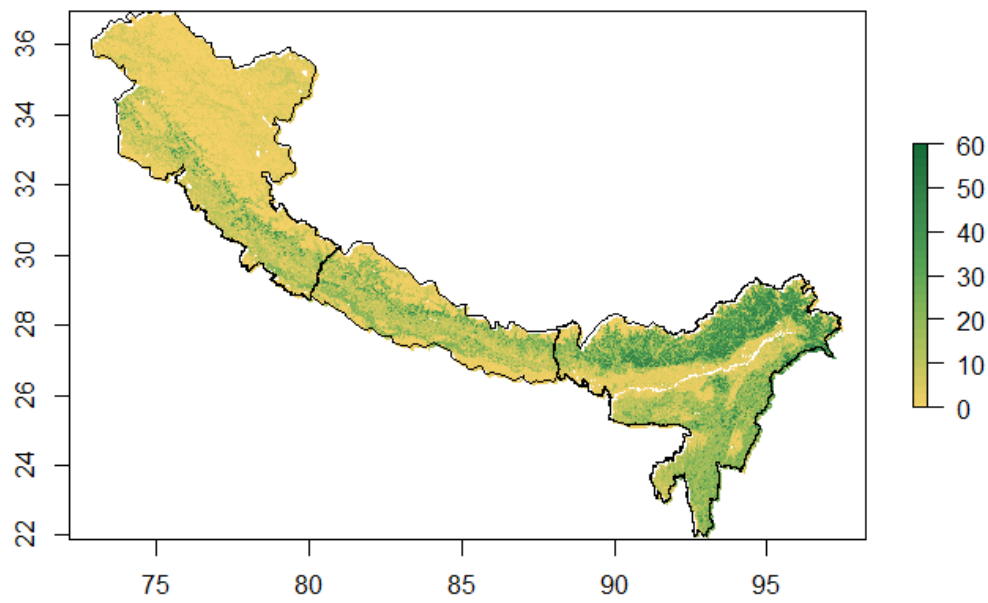


Figure S2. Monthly average (2001–2020) of combustion efficiency (CE).

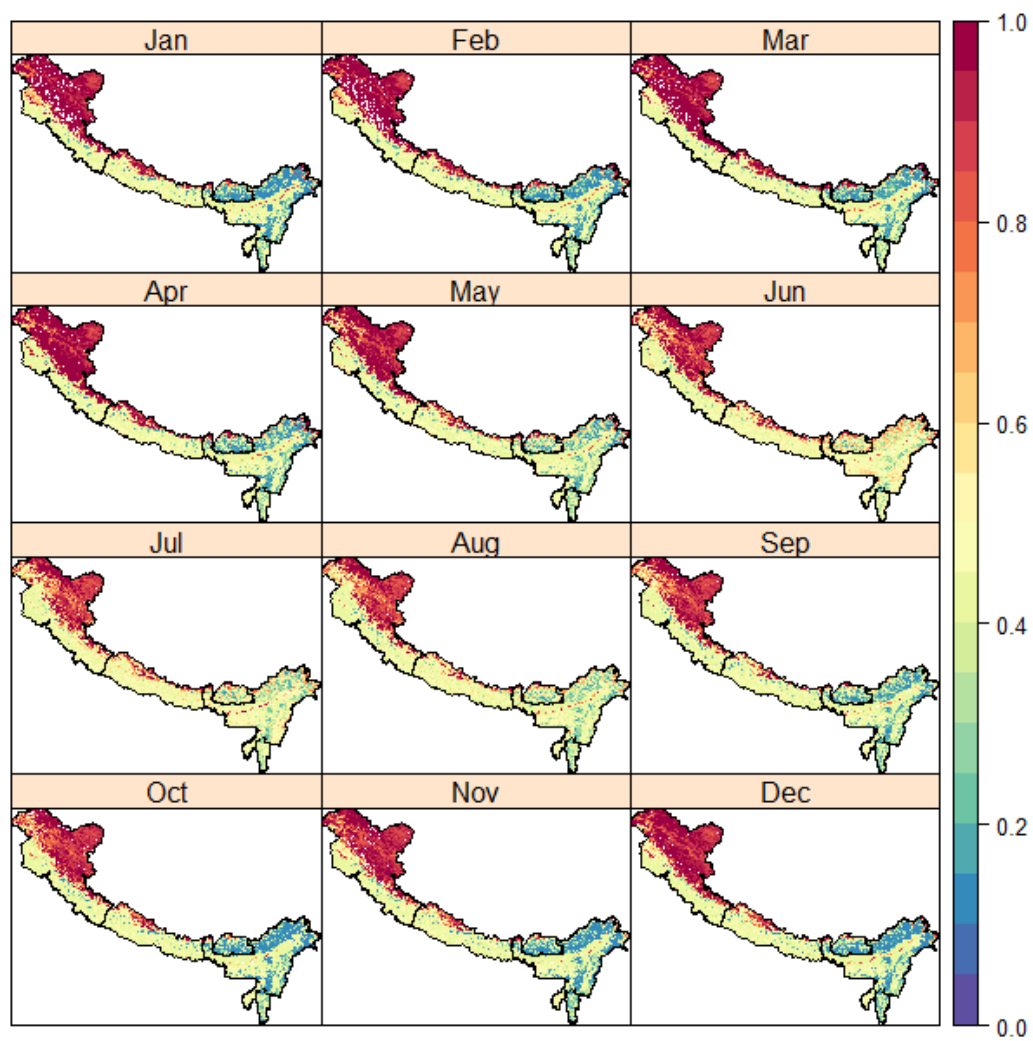


Table S1. Inter-annual variations (2001–2020) of emissions in Tg over western Himalaya.

Years	CO	CO2	CH4	NOx	SO2	NH3	PM25	PM10	OC	BC
2001	6.3E-02	1.0E+00	3.1E-03	8.3E-04	6.1E-04	9.4E-04	8.0E-03	1.1E-02	5.6E-03	3.6E-04
2002	9.8E-02	1.5E+00	4.8E-03	1.3E-03	9.5E-04	1.6E-03	1.2E-02	1.8E-02	8.7E-03	5.4E-04
2003	5.1E-01	8.1E+00	2.5E-02	7.1E-03	4.8E-03	8.1E-03	6.4E-02	9.1E-02	4.4E-02	2.8E-03
2004	3.9E-01	6.0E+00	1.9E-02	5.2E-03	3.7E-03	6.6E-03	4.9E-02	6.9E-02	3.4E-02	2.0E-03
2005	3.5E-01	5.5E+00	1.7E-02	4.6E-03	3.4E-03	5.7E-03	4.4E-02	6.3E-02	3.1E-02	1.9E-03
2006	8.2E-02	1.3E+00	4.0E-03	1.1E-03	8.0E-04	1.3E-03	1.0E-02	1.5E-02	7.3E-03	4.7E-04
2007	1.7E-01	2.7E+00	8.5E-03	2.3E-03	1.7E-03	2.8E-03	2.2E-02	3.1E-02	1.5E-02	9.4E-04
2008	5.1E-01	8.1E+00	2.5E-02	6.7E-03	4.9E-03	7.7E-03	6.4E-02	9.2E-02	4.5E-02	2.9E-03
2009	5.6E-01	8.7E+00	2.7E-02	7.5E-03	5.3E-03	9.3E-03	6.9E-02	9.9E-02	4.8E-02	2.9E-03
2010	4.2E-01	6.7E+00	2.1E-02	5.4E-03	4.1E-03	6.4E-03	5.3E-02	7.6E-02	3.7E-02	2.4E-03
2011	1.0E-02	1.5E-01	5.1E-04	1.4E-04	9.3E-05	2.1E-04	1.2E-03	1.7E-03	8.0E-04	4.1E-05
2012	7.3E-01	1.1E+01	3.6E-02	9.9E-03	6.9E-03	1.3E-02	9.0E-02	1.3E-01	6.2E-02	3.6E-03
2013	3.6E-02	5.7E-01	1.8E-03	4.7E-04	3.5E-04	5.5E-04	4.6E-03	6.5E-03	3.2E-03	2.0E-04
2014	3.6E-01	5.4E+00	1.8E-02	4.8E-03	3.4E-03	6.5E-03	4.4E-02	6.3E-02	3.0E-02	1.7E-03
2015	1.6E-01	2.5E+00	7.8E-03	2.1E-03	1.5E-03	2.5E-03	2.0E-02	2.8E-02	1.4E-02	8.6E-04
2016	8.5E-01	1.3E+01	4.2E-02	1.1E-02	8.2E-03	1.4E-02	1.1E-01	1.5E-01	7.4E-02	4.6E-03
2017	6.2E-02	9.6E-01	3.0E-03	8.2E-04	5.9E-04	1.0E-03	7.7E-03	1.1E-02	5.3E-03	3.2E-04
2018	4.8E-01	7.3E+00	2.4E-02	6.3E-03	4.5E-03	8.2E-03	5.9E-02	8.4E-02	4.1E-02	2.4E-03
2019	4.7E-01	7.1E+00	2.3E-02	6.3E-03	4.4E-03	8.4E-03	5.8E-02	8.2E-02	3.9E-02	2.3E-03
2020	1.5E-02	2.4E-01	7.5E-04	2.0E-04	1.5E-04	2.5E-04	1.9E-03	2.7E-03	1.3E-03	8.1E-05

Table S2. Inter-annual variations (2001–2020) of emissions in Tg over Nepal/Central Himalaya.

Years	CO	CO2	CH4	NOx	SO2	NH3	PM25	PM10	OC	BC
2001	6.6E-01	1.0E+01	3.2E-02	8.4E-03	6.4E-03	9.8E-03	8.4E-02	1.2E-01	5.9E-02	3.8E-03
2002	1.4E-01	2.2E+00	6.8E-03	1.8E-03	1.4E-03	2.0E-03	1.8E-02	2.5E-02	1.2E-02	8.1E-04
2003	1.1E+00	1.7E+01	5.2E-02	1.4E-02	1.0E-02	1.6E-02	1.3E-01	1.9E-01	9.5E-02	6.2E-03
2004	8.7E-01	1.4E+01	4.3E-02	1.1E-02	8.5E-03	1.3E-02	1.1E-01	1.6E-01	7.8E-02	5.1E-03
2005	8.4E-01	1.3E+01	4.1E-02	1.1E-02	8.3E-03	1.3E-02	1.1E-01	1.5E-01	7.6E-02	4.9E-03
2006	4.4E-01	7.1E+00	2.2E-02	5.7E-03	4.3E-03	6.5E-03	5.6E-02	8.0E-02	4.0E-02	2.6E-03
2007	3.4E-01	5.4E+00	1.7E-02	4.4E-03	3.3E-03	4.9E-03	4.3E-02	6.1E-02	3.0E-02	2.0E-03
2008	7.7E-01	1.2E+01	3.8E-02	9.9E-03	7.6E-03	1.1E-02	9.9E-02	1.4E-01	7.0E-02	4.5E-03
2009	1.1E+00	1.7E+01	5.4E-02	1.4E-02	1.1E-02	1.6E-02	1.4E-01	2.0E-01	9.8E-02	6.4E-03
2010	1.3E+00	2.0E+01	6.3E-02	1.6E-02	1.2E-02	1.9E-02	1.6E-01	2.3E-01	1.1E-01	7.5E-03
2011	7.5E-01	1.2E+01	3.7E-02	9.6E-03	7.4E-03	1.1E-02	9.6E-02	1.4E-01	6.8E-02	4.4E-03
2012	1.2E+00	2.0E+01	6.0E-02	1.6E-02	1.2E-02	1.8E-02	1.6E-01	2.2E-01	1.1E-01	7.2E-03
2013	1.4E+00	2.2E+01	6.7E-02	1.8E-02	1.3E-02	2.0E-02	1.7E-01	2.5E-01	1.2E-01	8.0E-03
2014	1.4E+00	2.2E+01	6.8E-02	1.8E-02	1.4E-02	2.1E-02	1.8E-01	2.5E-01	1.2E-01	8.1E-03
2015	1.9E-01	3.0E+00	9.3E-03	2.4E-03	1.9E-03	2.9E-03	2.4E-02	3.5E-02	1.7E-02	1.1E-03
2016	3.7E+00	5.9E+01	1.8E-01	4.8E-02	3.6E-02	5.5E-02	4.7E-01	6.7E-01	3.3E-01	2.2E-02
2017	7.8E-01	1.2E+01	3.8E-02	9.9E-03	7.6E-03	1.1E-02	9.9E-02	1.4E-01	7.0E-02	4.6E-03
2018	5.6E-01	8.8E+00	2.7E-02	7.1E-03	5.4E-03	8.3E-03	7.1E-02	1.0E-01	5.0E-02	3.2E-03
2019	1.7E+00	2.8E+01	8.5E-02	2.2E-02	1.7E-02	2.6E-02	2.2E-01	3.1E-01	1.6E-01	1.0E-02
2020	2.5E-01	4.0E+00	1.2E-02	3.3E-03	2.4E-03	3.6E-03	3.2E-02	4.5E-02	2.2E-02	1.5E-03

Table S3. Inter-annual variations (2001–2020) of emissions in Tg over eastern Himalaya.

Years	CO	CO ₂	CH ₄	NO _x	SO ₂	NH ₃	PM ₂₅	PM ₁₀	OC	BC
2001	6.3E-01	1.0E+01	3.2E-02	1.1E-02	5.4E-03	8.3E-03	7.6E-02	1.1E-01	5.0E-02	3.6E-03
2002	1.7E-01	2.8E+00	8.7E-03	3.0E-03	1.4E-03	2.2E-03	2.0E-02	2.9E-02	1.3E-02	9.7E-04
2003	7.9E-01	1.3E+01	4.0E-02	1.4E-02	6.8E-03	1.0E-02	9.6E-02	1.4E-01	6.3E-02	4.6E-03
2004	1.6E+00	2.7E+01	8.4E-02	3.0E-02	1.4E-02	2.1E-02	2.0E-01	2.8E-01	1.3E-01	9.4E-03
2005	5.6E-01	9.3E+00	2.9E-02	9.3E-03	4.9E-03	7.6E-03	6.9E-02	9.8E-02	4.6E-02	3.2E-03
2006	2.2E+00	3.7E+01	1.1E-01	3.7E-02	2.0E-02	3.0E-02	2.7E-01	3.9E-01	1.8E-01	1.3E-02
2007	1.4E+00	2.3E+01	7.0E-02	2.6E-02	1.1E-02	1.7E-02	1.6E-01	2.3E-01	1.0E-01	7.7E-03
2008	5.2E-01	8.6E+00	2.6E-02	8.6E-03	4.6E-03	7.0E-03	6.4E-02	9.1E-02	4.2E-02	3.0E-03
2009	3.1E+00	5.1E+01	1.6E-01	5.4E-02	2.6E-02	3.9E-02	3.7E-01	5.3E-01	2.4E-01	1.8E-02
2010	3.0E+00	4.9E+01	1.5E-01	5.1E-02	2.5E-02	3.8E-02	3.6E-01	5.1E-01	2.3E-01	1.7E-02
2011	8.7E-01	1.4E+01	4.4E-02	1.4E-02	7.5E-03	1.1E-02	1.1E-01	1.5E-01	7.0E-02	5.0E-03
2012	2.1E+00	3.4E+01	1.0E-01	3.5E-02	1.8E-02	2.7E-02	2.5E-01	3.6E-01	1.7E-01	1.2E-02
2013	1.7E+00	2.8E+01	8.5E-02	2.8E-02	1.4E-02	2.2E-02	2.0E-01	2.9E-01	1.3E-01	9.6E-03
2014	2.0E+00	3.3E+01	1.0E-01	3.5E-02	1.7E-02	2.6E-02	2.4E-01	3.5E-01	1.6E-01	1.2E-02
2015	1.5E+00	2.4E+01	7.5E-02	2.4E-02	1.3E-02	2.0E-02	1.8E-01	2.6E-01	1.2E-01	8.5E-03
2016	5.4E-01	8.7E+00	2.7E-02	8.2E-03	4.9E-03	7.5E-03	6.6E-02	9.5E-02	4.5E-02	3.1E-03
2017	5.0E-01	8.2E+00	2.5E-02	8.2E-03	4.4E-03	6.8E-03	6.1E-02	8.7E-02	4.0E-02	2.8E-03
2018	3.2E-01	5.3E+00	1.6E-02	4.7E-03	3.0E-03	4.6E-03	4.0E-02	5.8E-02	2.8E-02	1.9E-03
2019	3.4E-01	5.6E+00	1.7E-02	5.2E-03	3.1E-03	4.8E-03	4.3E-02	6.1E-02	2.9E-02	2.0E-03
2020	8.9E-01	1.5E+01	4.5E-02	1.4E-02	8.0E-03	1.2E-02	1.1E-01	1.6E-01	7.4E-02	5.2E-03

Figure S3. Inter-annual variations of forest fire emissions from 2001–2020 over the entire study area.

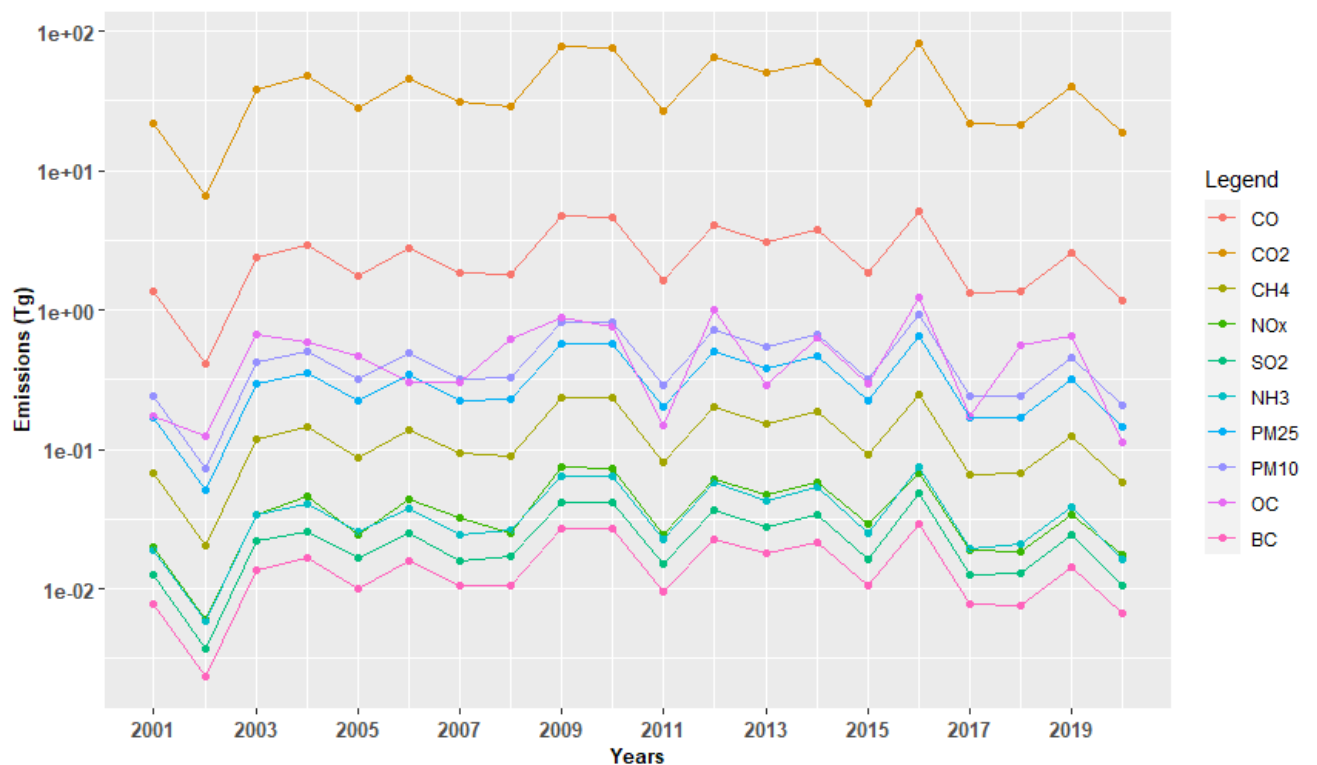


Figure S4. Average monthly (2001–2020) forest fire emissions over the study area.

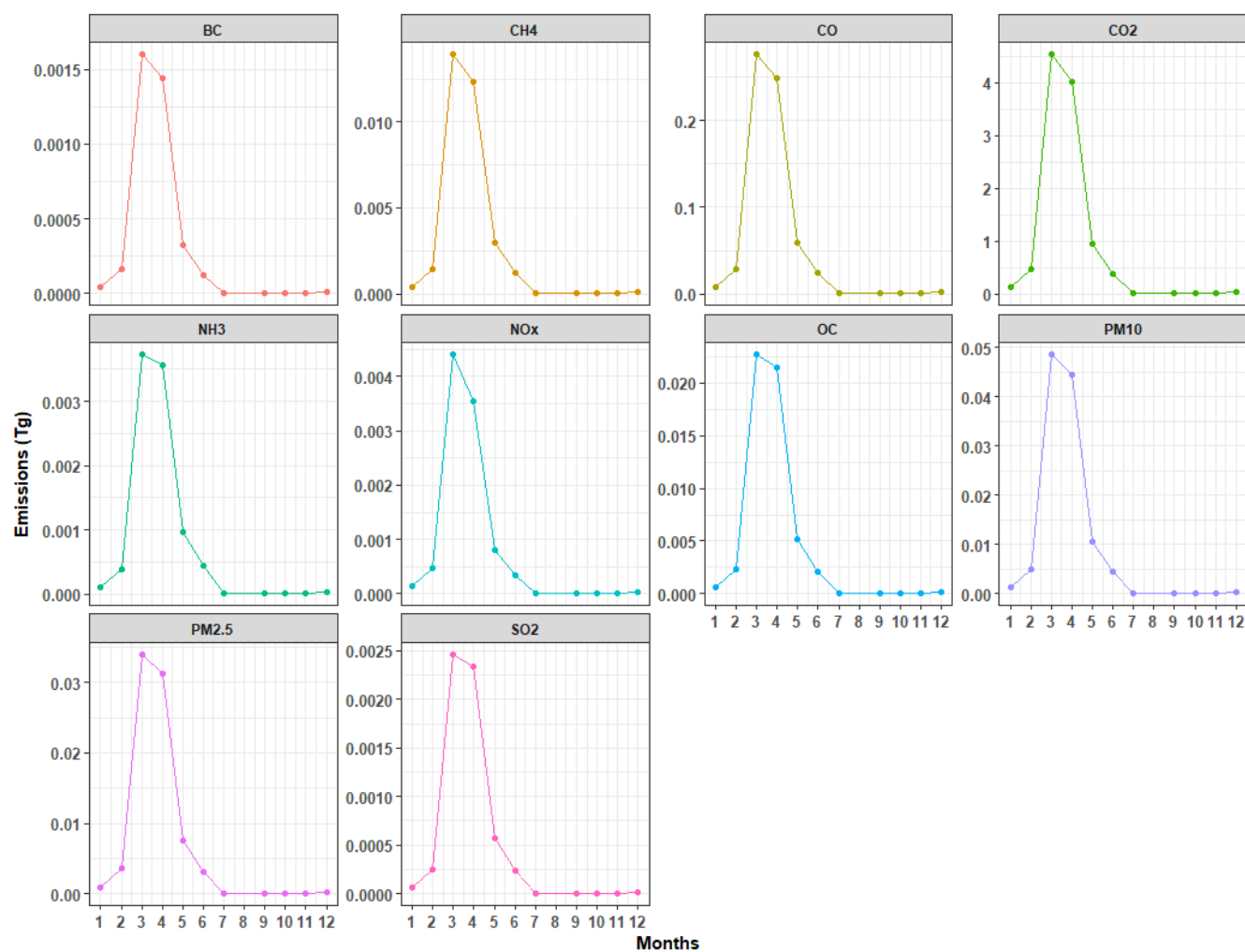


Figure S5. Annual forest fire emissions from Global Fire Emission Dataset 4.1 (GFED4.1) over Himalaya.

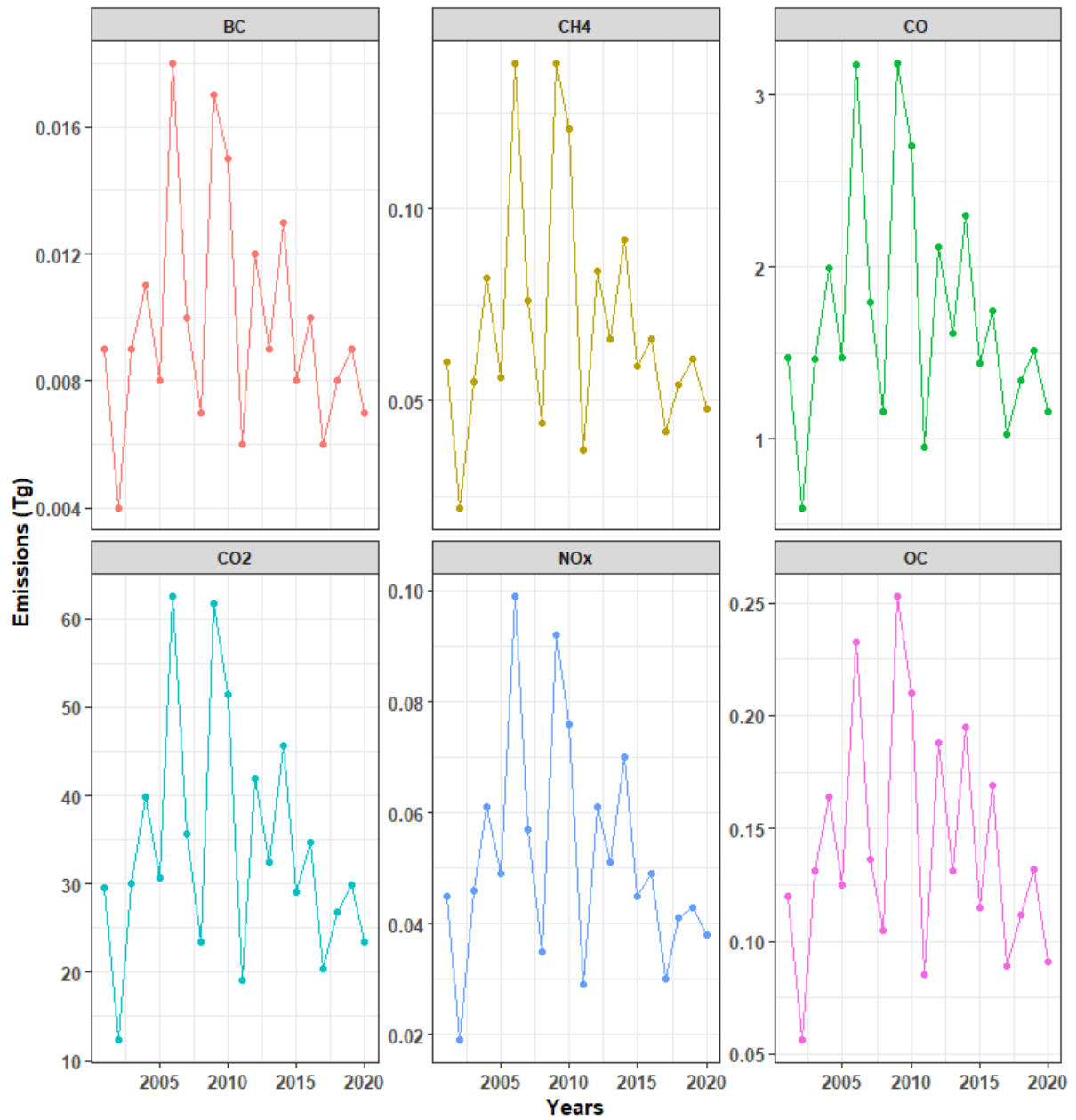


Figure S6. Population density of 2015 (persons/km²) over the study area. (Source: <https://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-density-rev11>).

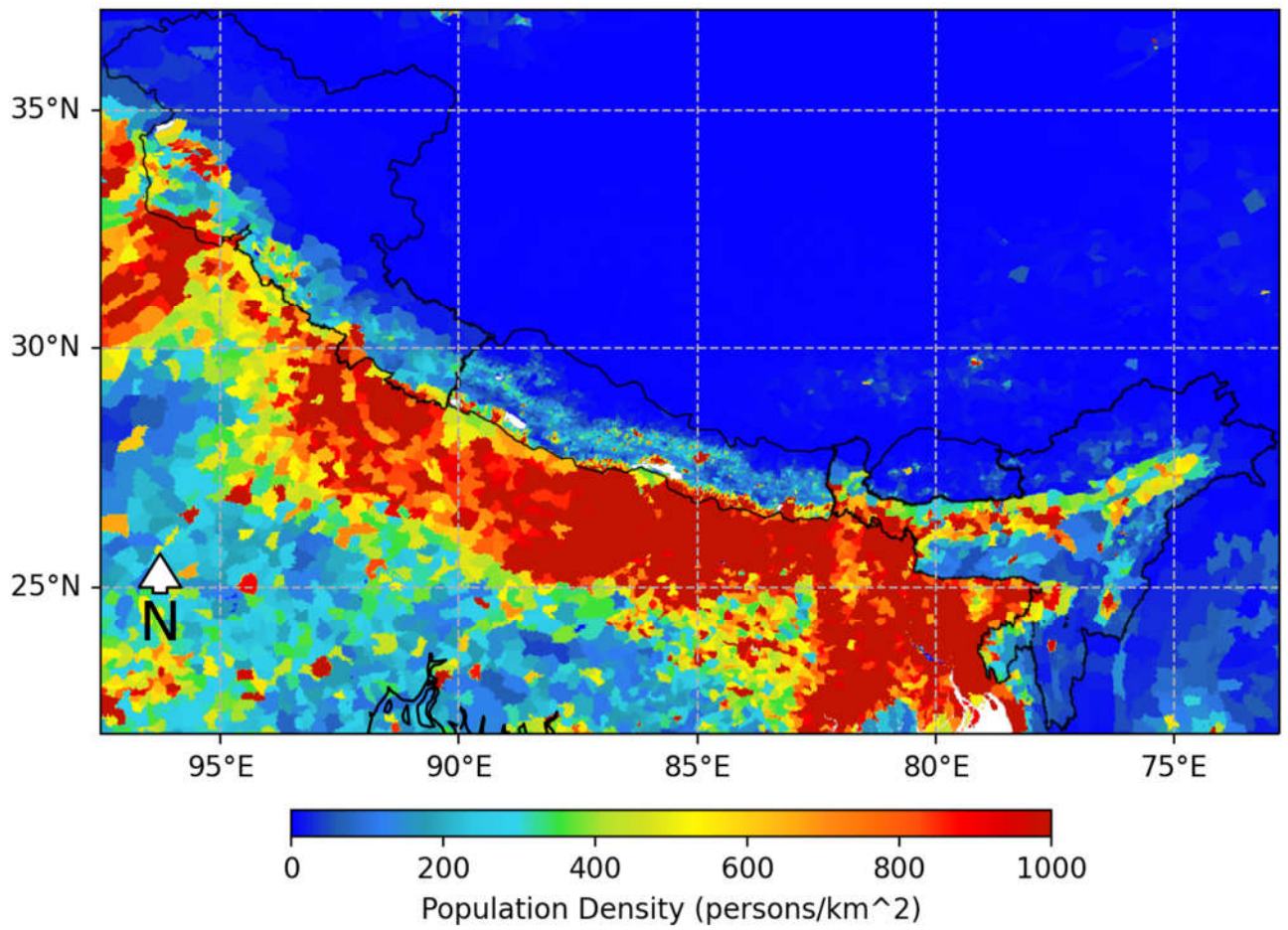


Figure S7. Wind vector plot on 950 hpa pressure level of March, April and May, respectively, 2010 (a–c), 2016 (d–f) and 2018 (g–i).

