Carbonaceous aerosol from open burning and its impact on regional weather in South Asia*

Prashant Singh
Goethe-Universität Frankfurt
prashantsinghprs@gmail.com

10th IWAQFR| 21st October| 16:35 GMT

*Singh, P., Sarawade, P. and Adhikary, B. (2020). Carbonaceous Aerosol from Open Burning and its Impact on Regional Weather in South Asia Aerosol Air Qual. Res. 20: 419-431. https://doi.org/10.4209/aaqr.2019.03.0146

P. Singh, et al., *"Carbonaceous aerosol from open burning and its impact on regional weather in South Asia",* Aerosol and Air Quality Research (2019)

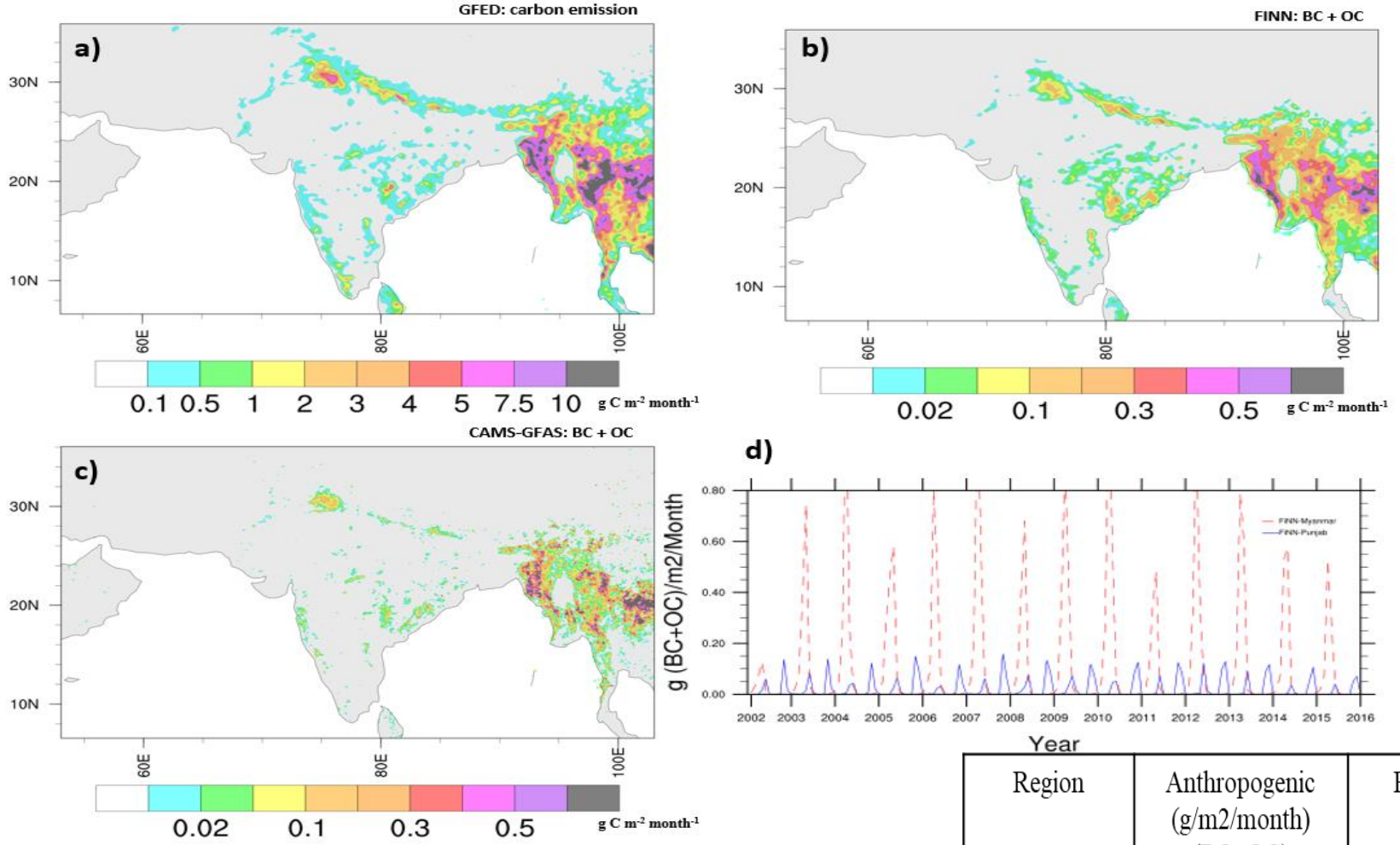


Figure 1: Long term average of carbonaceous aerosol emission from open biomass burning (OBB): (a) GFED monthly average total carbon emission from 1997-2015, (b) FINN average carbonaceous (Black + Organic) aerosols emission rates from 2002-2015, (c) Area averaged carbonaceous (Black + Organic) aerosol emission from CAMS and (d) Climatology of carbonaceous aerosol (Black + Organic) from FINN model for Punjab and Myanmar regions

Table 1 : Comparison of carbonaceous aerosol emission with anthropogenic emissions and different fire emission model estimates.

Region	Anthropogenic (g/m2/month) (BC+OC)	FINN Emission (g/m2/month) (BC+OC)	CAMS (g/m2/month) (BC+OC)	GFED Emission (g/m2/month) (carbon emissions)
Myanmar	0.03	0.62-0.81 (0.0011-0.0019)	0.13-0.19 (0.0002-0.0005)	9.91-12.71 (0.0319-0.0775)
Punjab	0.11	0.091-0.12 (0.0019-0.0038)	0.03-0.05 (0.0001-0.0013)	1.59-5.59 (0.044-0.2250)

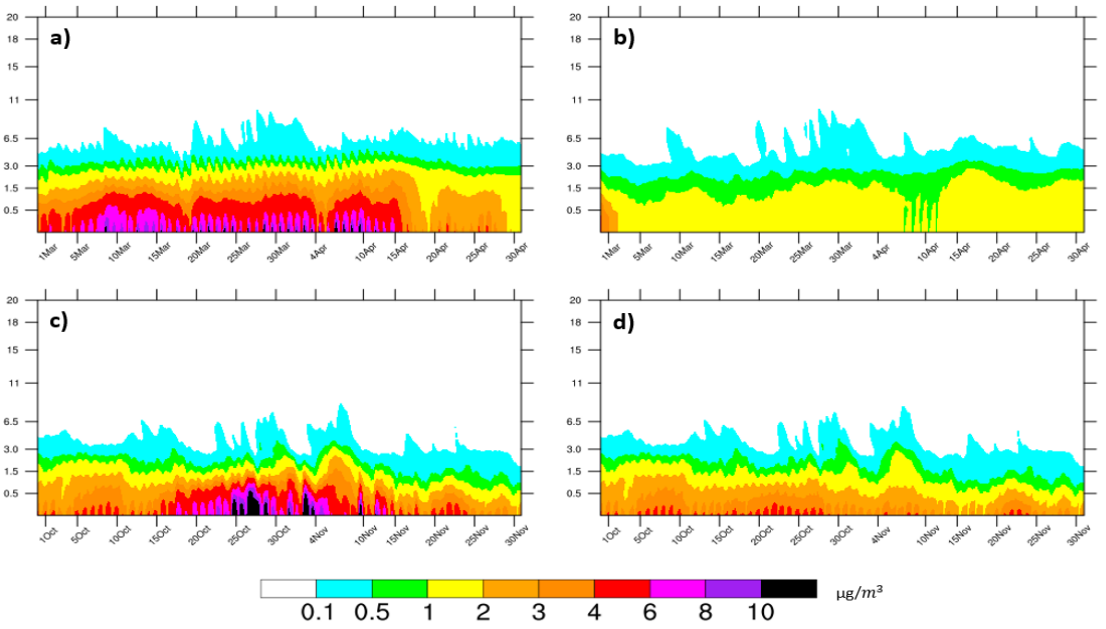
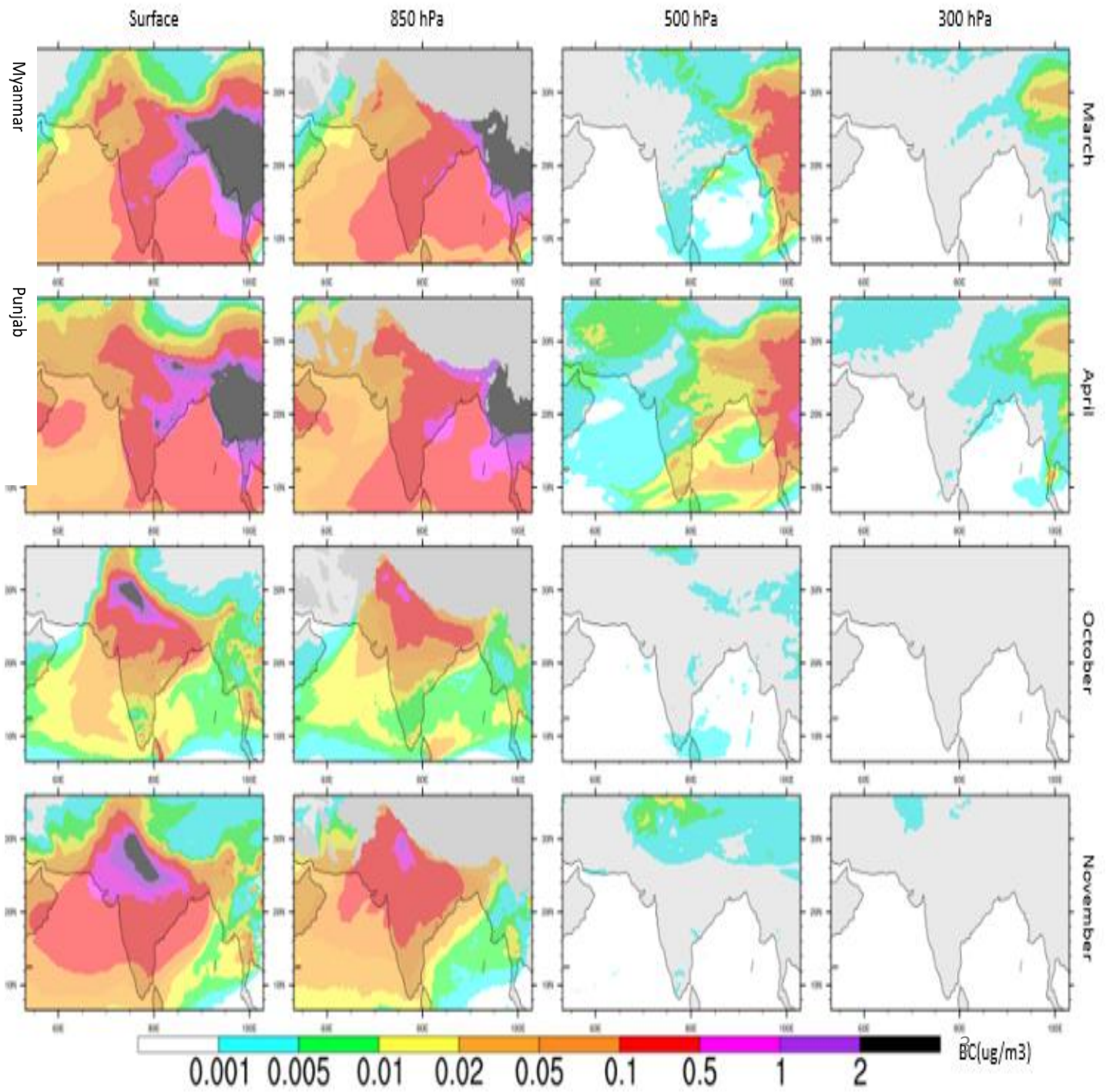


Figure 2: Area averaged BC concentration (a) Myanmar control run (b) Myanmar without OBB BC (c) Punjab control run and (d) Punjab without OBB BC.

Figure 3: Atmospheric loading of BC from OBB (a) at the Surface, (b) 850 hPa, (c) 500 hPa, (d) 300 hPa.



Region	Month	Domain area average effect			Local area average effect		
		CA added from fire (µg/m3)	Surface incoming short wave flux (W/m2)	TOA outgoing longwave wave flux (W/m2)	CA added from fire (µg/m3)	Surface incoming short wave flux (W/m2)	TOA outgoing longwave wave flux (W/m2)
Myanmar (13.86˚-27.74˚N, 90.28˚-102.69˚E)	March	11.47	-8.05	-0.28	78.61	-42.76	-1.91
	April	7.87	-6.78	-0.1	51.26	-29.16	-0.52
Punjab (28.83˚-32.04˚N, 72.91˚-77.86˚E)	October	0.70	-0.45	-0.02	18.27	-5.13	-0.48
	November	1.90	-1.34	-0.06	16.73	-6.14	-0.50

Table 2: Radiative forcing from OBB carbonaceous aerosol over Myanmar and Punjab.

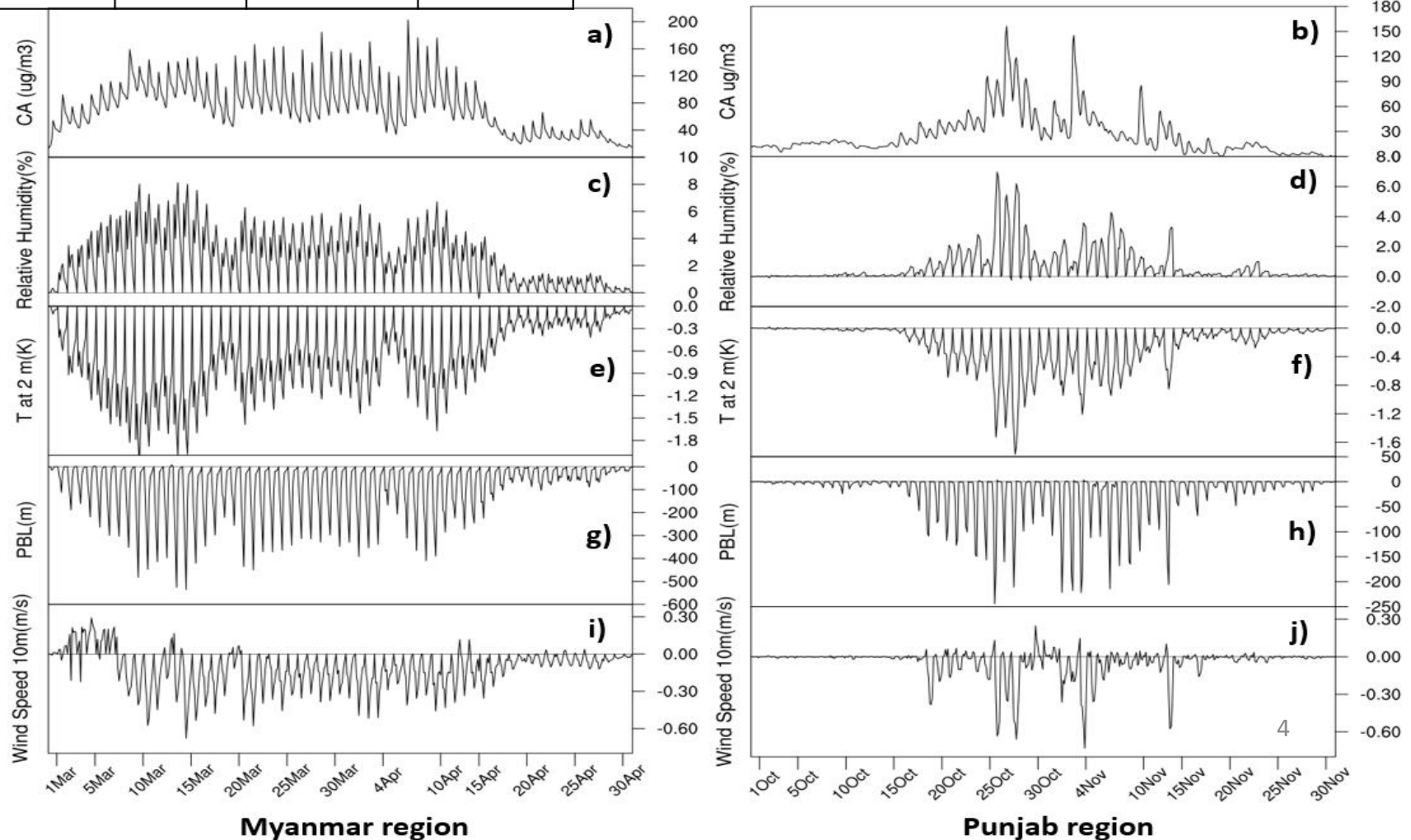


Figure 4: Effect of OBB carbonaceous aerosols concentration (a-b), impact on 2m relative humidity (c-d), 2m-Temperature (e-f), PBL height (g-h) and 10m wind speed (i-j) for Myanmar and Punjab respectively.

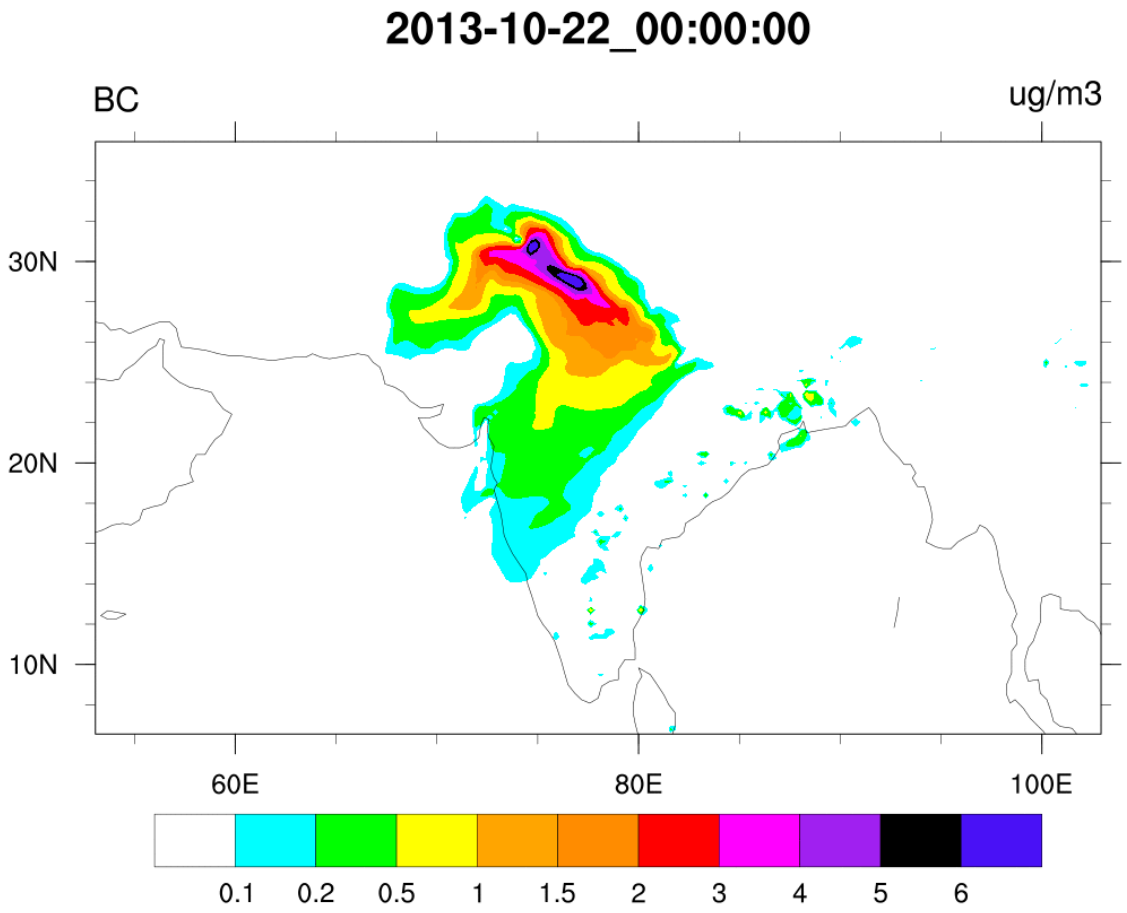


Figure 5: Model and satellite capture of smoke over IGP region due to open biomass burning.