1. Our analysis using almost two decade of satellite measurements reveals that higher pollution levels are expected during and after Diwali celebration.
2. The increased loading due to fire crackers and associated emissions are normally expected to ~ 20 to 40% for PM2.5 mass concentration levels and ~ 5 % for AOD. However, long range transport from elsewhere could either enhance or suppress these depending on the region and passage airmass trajectories before reaching Delhi.
3. Our study reveals that Northwestern part of NCT exerts a large impact on the high loading conditions over Delhi.
4. HYSPLIT trajectory and CWT analysis along with the spatial pattern of fire detection (biomass) and its spatial density reveal that 2016 severe air pollution episode/event during Diwali was caused due to the advection of highly absorbing biomass burning aerosols from upwind regions (NW quadrant).
5. Local pollution due to anthropogenic activities along with festivities may have only played a minor role during this episode.

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Table 1. Description of the data used for the analysis

Parameter Name	Source	Spatial Resolution	Temporal Resolution
PM 2.5	7 stations operated by CPCB at Delhi, India	Point sources	24 hours average
Aerosol Optical Depth at 550 nm (AOD)	MODIS-Terra	1^{o} x 1^{o}	Daily
Angstrom Exponent (AE)	MODIS-Terra	1^{o} x 1^{o}	Daily
UV Aerosol Index (UVAI)	OMI	1^{o} x 1^{o}	Daily
Absorption AOD at 500 nm (AAOD)	OMI	1^{o} x 1^{o}	Daily
Fire Count	MODIS-Terra	1km	Daily

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Table 2. Comparative analysis of a) PM2.5 b) AOD c) AE d) UVAI and e) Fire Counts with respect to climatology and 2016 pollution episode

Parameter	Climatology (2000 to 2015)					
	Mean ± Std				Percentage Change (%) w.r.t pre Diwali	
	Before Diwali		After Diwali			
	10 days	3 days	10 days	3 days	10 days	3 days
*PM 2.5	158.81 ± 54.39	157.97 ± 45.83	190.33 ± 35.36	225.97 ± 21.40	19.84	43.05
AOD	0.56 ± 0.03	0.58 ± 0.05	0.58 ± 0.06	0.61 ± 0.06	3.54	5.38
AE	0.95 ± 0.11	1.03 ± 0.10	1.09 ± 0.10	1.05 ± 0.08	15.03	1.64
UVAI	1.25 ± 0.10	1.26 ± 0.15	1.23 ± 0.08	1.23 ± 0.13	-1.80	-2.11
AAOD	0.0313 ± 0.003	0.0311 ± 0.01	0.0330 ± 0.004	0.0314 ± 0.006	5.46	0.97
Fire Count	99.38 ± 30.64	101.59 ± 22.30	70.47 ± 26.30	83.85 ± 37.67	-29.09	-17.46
	Year 2016 Only					
PM 2.5	183.26 ± 73.39	284.16 ± 20.72	448.26 ±146.75	448.36 ± 91.59	**144.61**	**57.79**
AOD	0.36 ± 0.09	0.46 ± 0.06	0.9 ± 0.30	0.98 ± 0.21	**153.50**	**114.22**
AE	1.15 ± 0.17	1.22 ± 0.21	1.14 ± 0.40	1.39 ± 0.27	-1.16	**14.14**
UVAI	1.67 ± 0.42	1.65 ± 0.15	2.76 ± 0.83	2.57 ± 0.13	**64.95**	**55.11**
AAOD	0.0256 ± 0.01	0.0256 ± 0.005	0.0533 ± 0.027	0.0531 ± 0.017	**116.36**	**107.72**
Fire Count	119 ± 95.06	169.67 ± 110.46	70.6 ± 125.96	37.67 ± 53.58	-40.67	-77.80

*PM2.5 values are available from 2011

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Figure Captions

Fig.1. Long term trend of Aerosol Optical Depth over Delhi during October & November using MODIS Terra.

Fig.2. PM 2.5 variability over different stations in Delhi before and after Diwali during 2016. The thin grey line shows the date of Diwali.

Fig.3. Inter comparison between the climatological anomaly and 2016 anomaly of a) PM2.5 b) Aerosol Optical Depth (AOD) c) UV Aerosol Index and d) Absorption AOD over Delhi

Fig.4. Comparison between the long term variation of a) PM2.5 b) Aerosol Optical Depth c) UV Aerosol Index and d) Absorption AOD before, after and in Diwali dates over Delhi

Fig.5. Role of long range transport on PM2.5 concentration over Delhi. The color bar represents the PM2.5 levels observed at Delhi. The black trajectory corresponds to the mean trajectory for low loading conditions, whereas the red trajectory corresponds to high loading condition. The blue dots represent biomass burning during 2016.

Fig.6. Trend in Fire counts based on level3 (MOD14A1) fire products from MODIS (Terra) (2000-2016)

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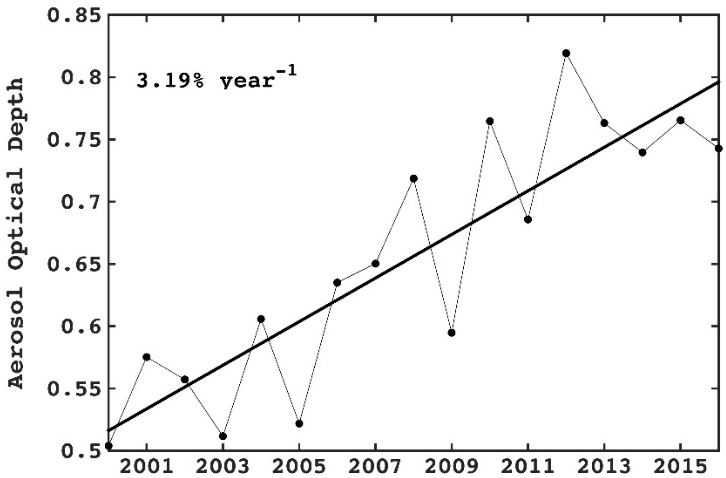
Figures



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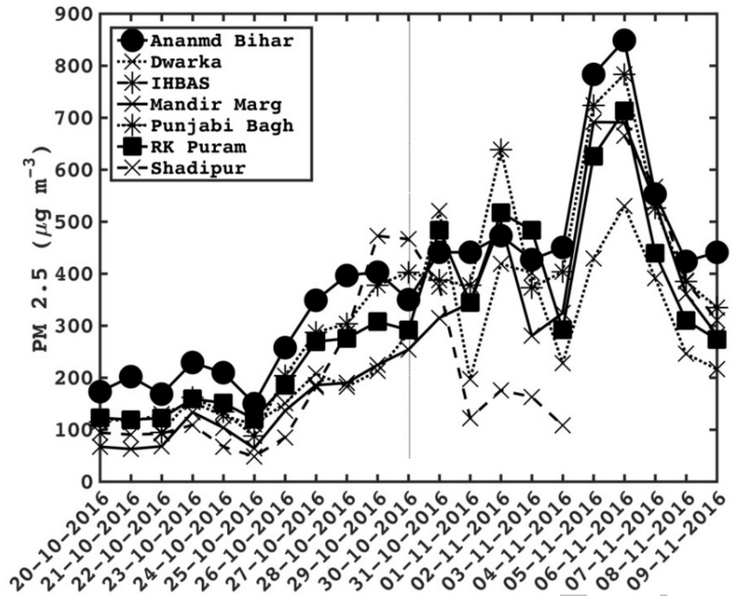

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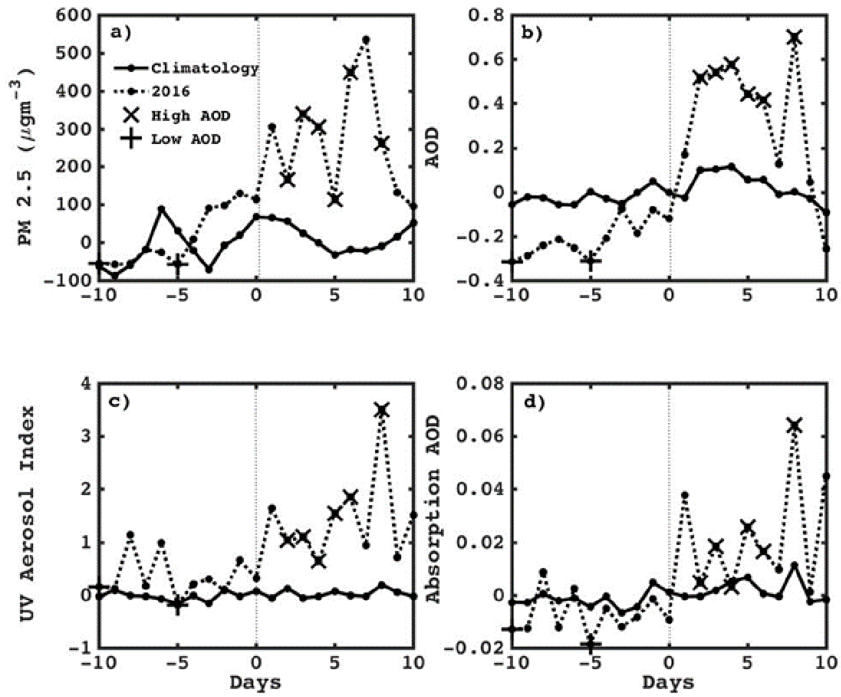

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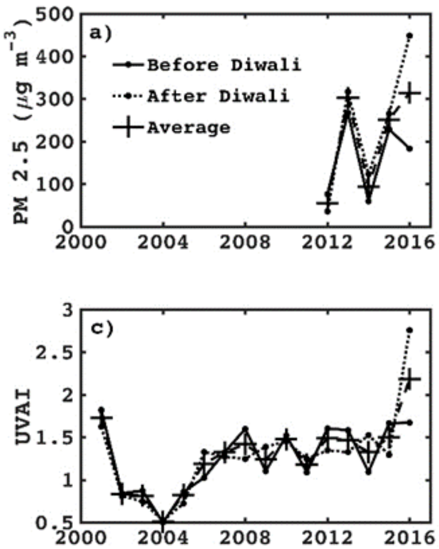

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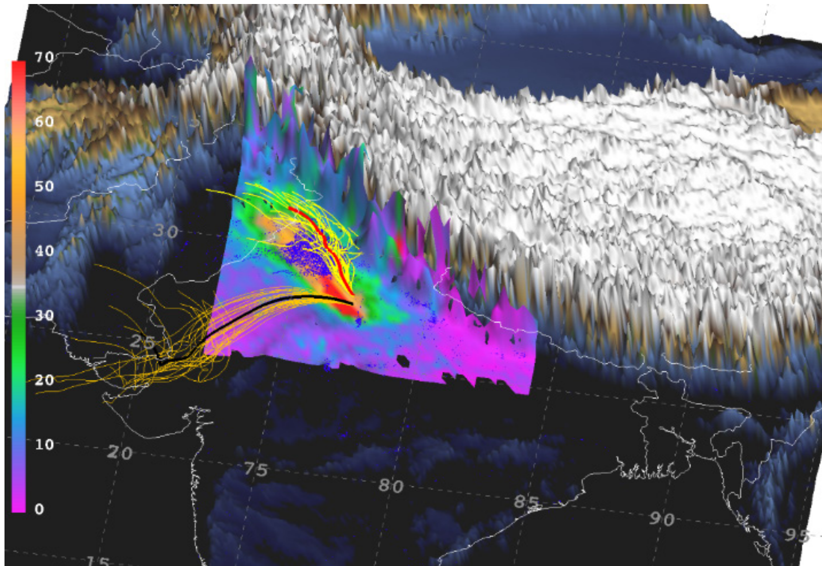

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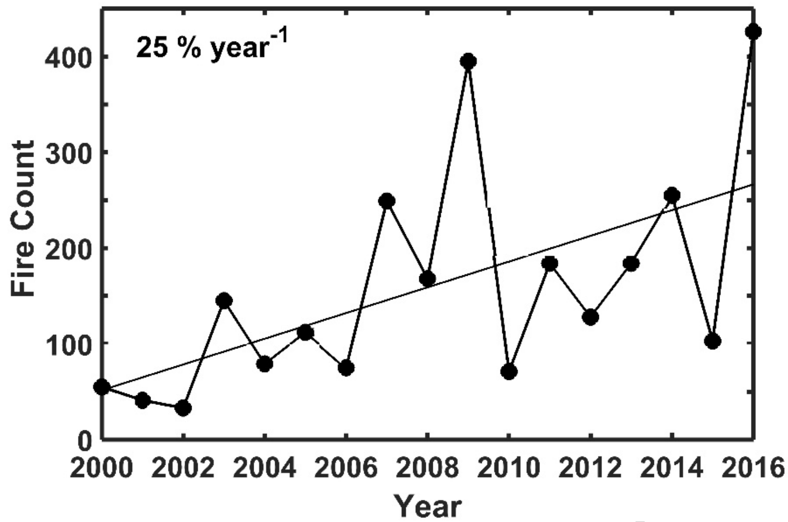

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