Aerosols and Air Quality over India

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Indian Space Research Organisation (ISRO)

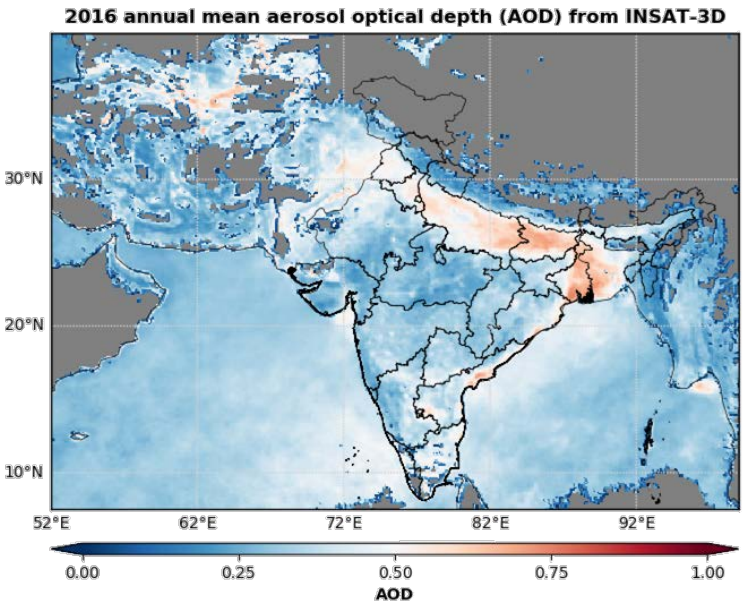
AOD: INSAT-3D (2016-2019)

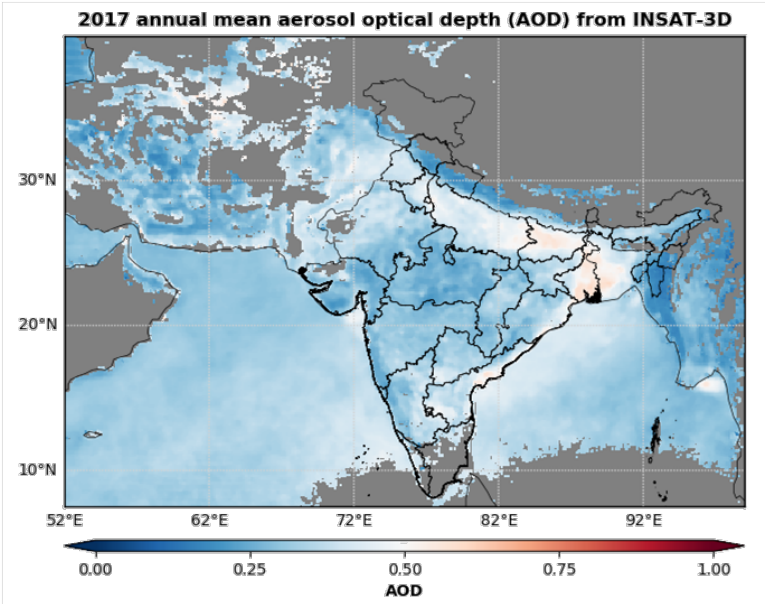
Geostationary:
INSAT-3D
(2013)

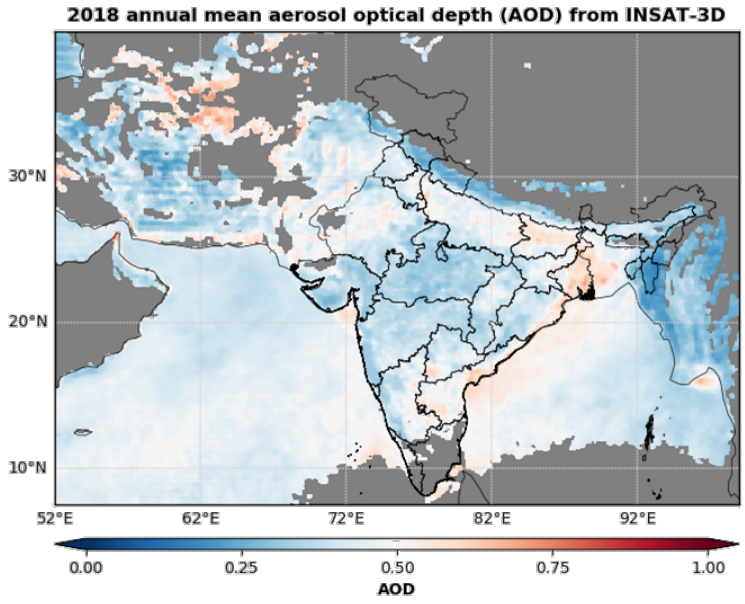
AOD:
30min
10km x 10km

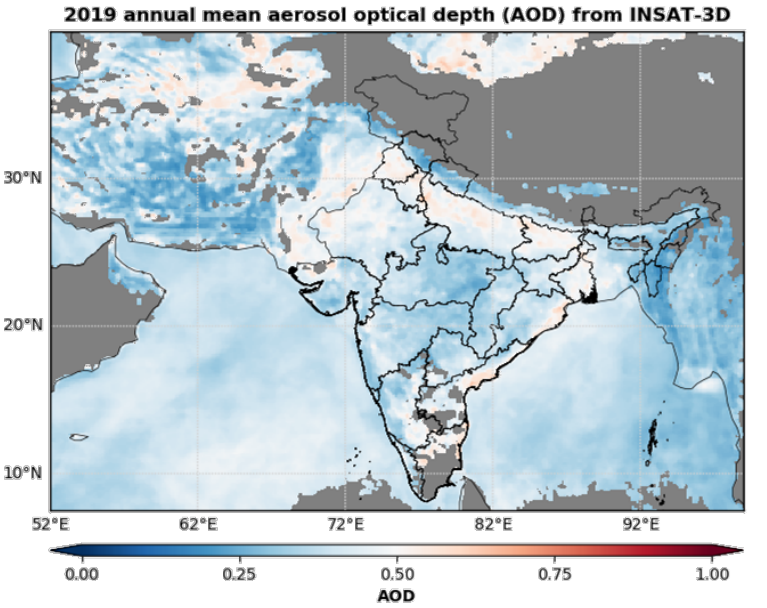
INSAT-3DR
(2016)

(INSAT-3D & 3DR : provide data at an interval of 15min)



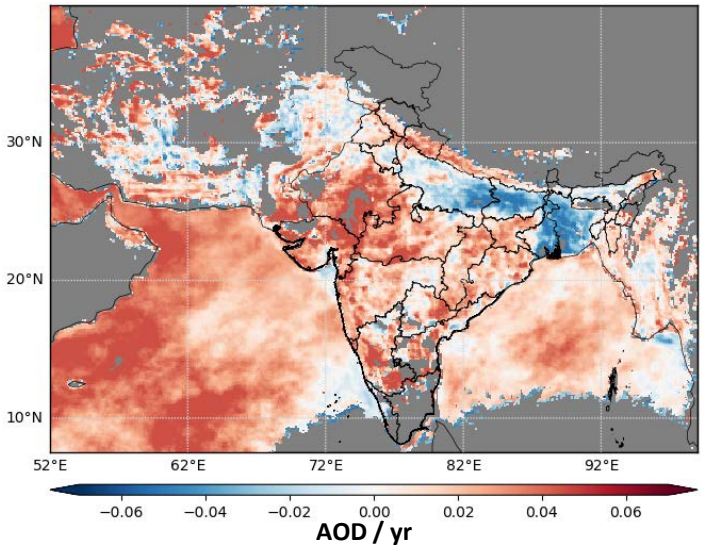




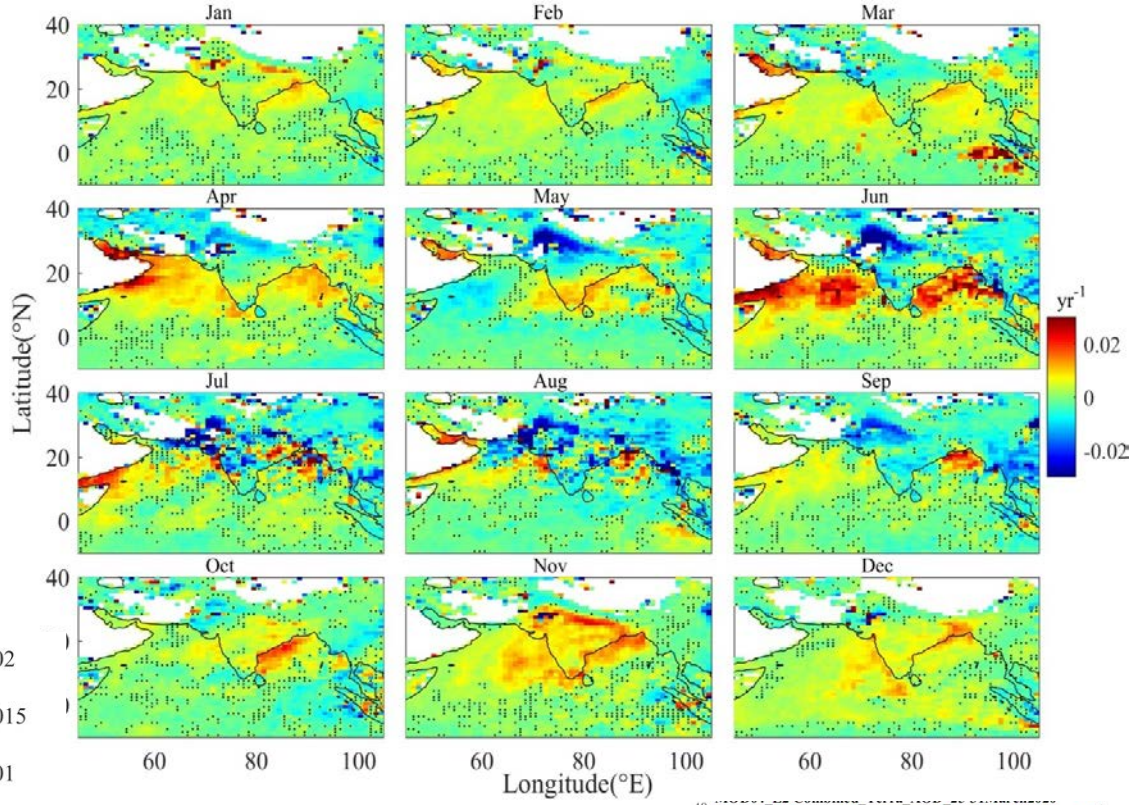


Aerosol trends over India

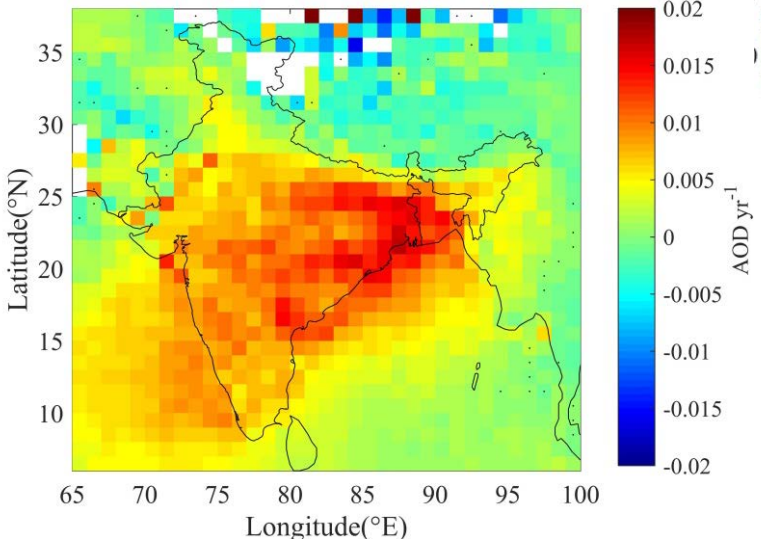
Trend in AOD (INSAT-3D : 2014-2019)



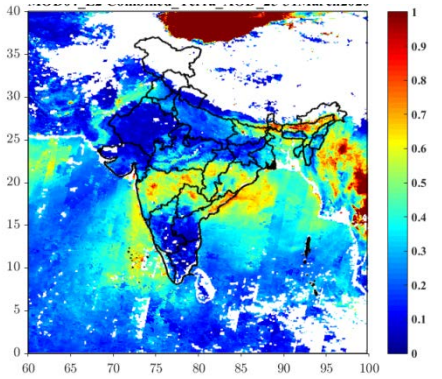
Trend in AOD (Terra): Monthly



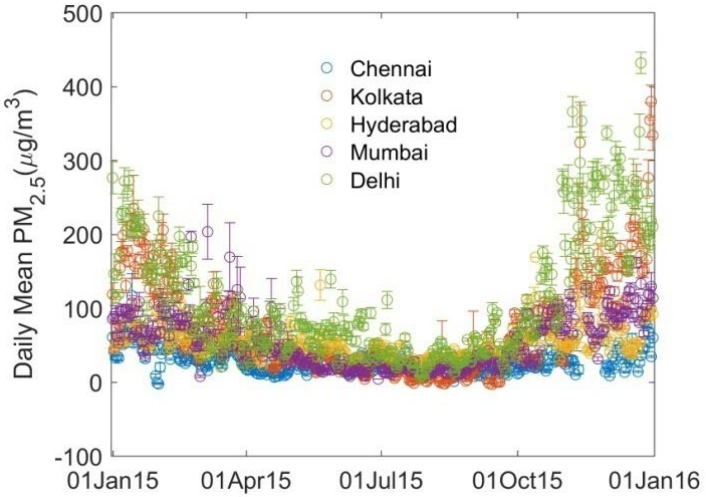
Trend in AOD (Terra: 2001-2019)

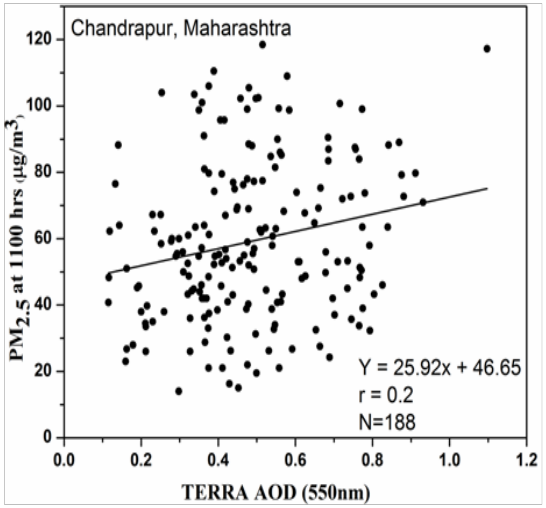


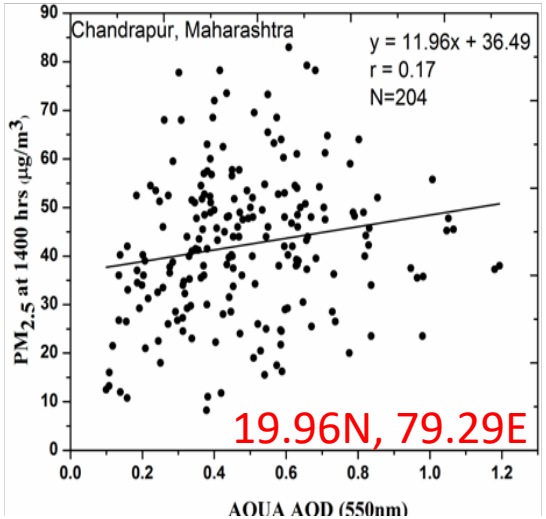
AOD during lockdown



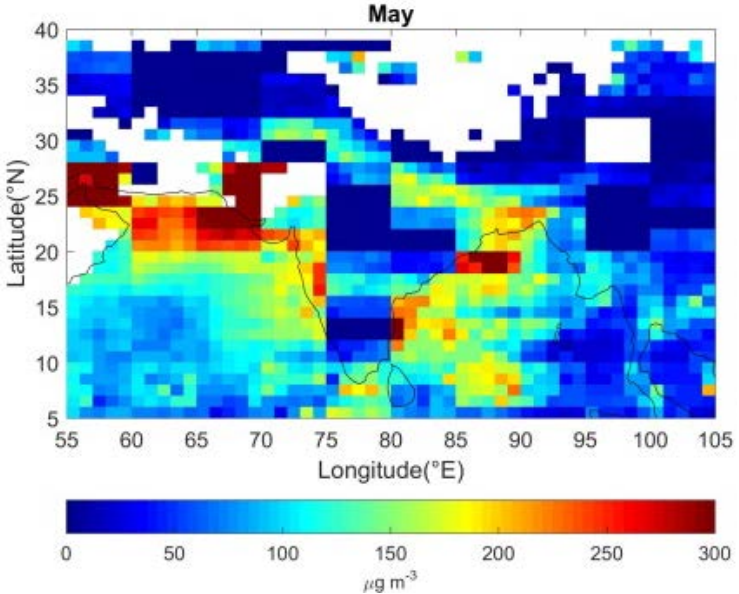
Satellite retrieval of $PM_{2.5}$

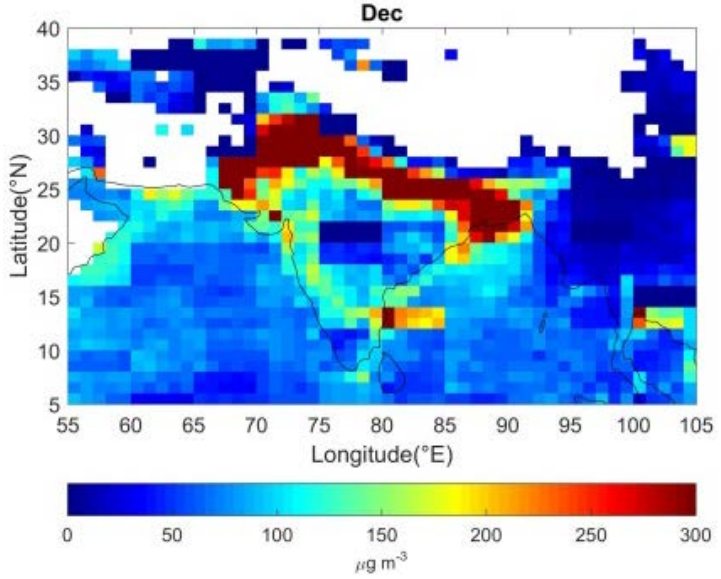




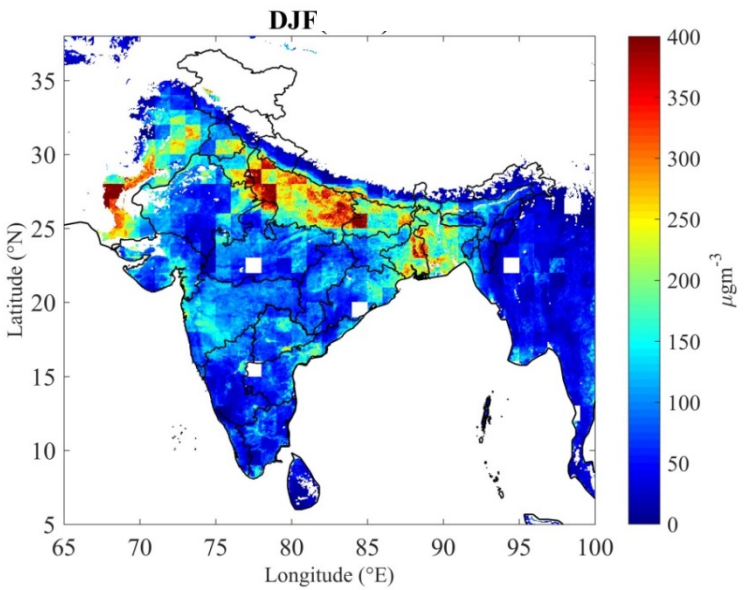


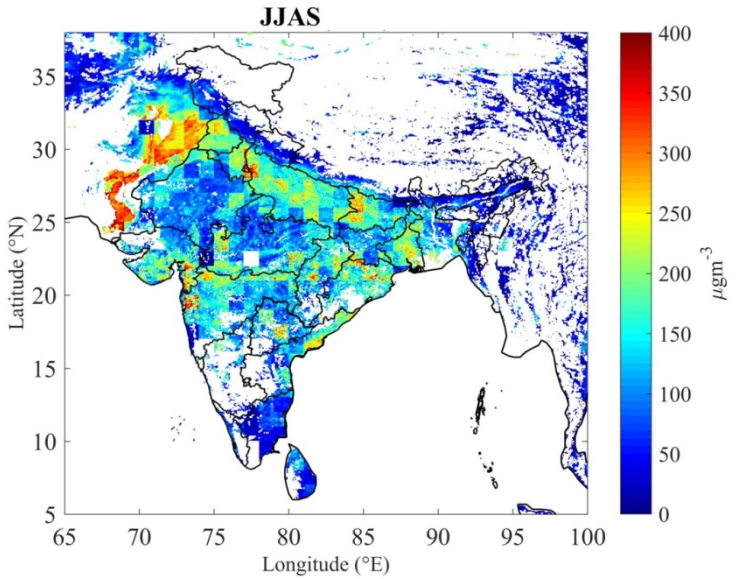
Ambient 2.5µm PM concentration retrieved using satellite observations from MODIS and CALIPSO on a daily basis: implemented several methods

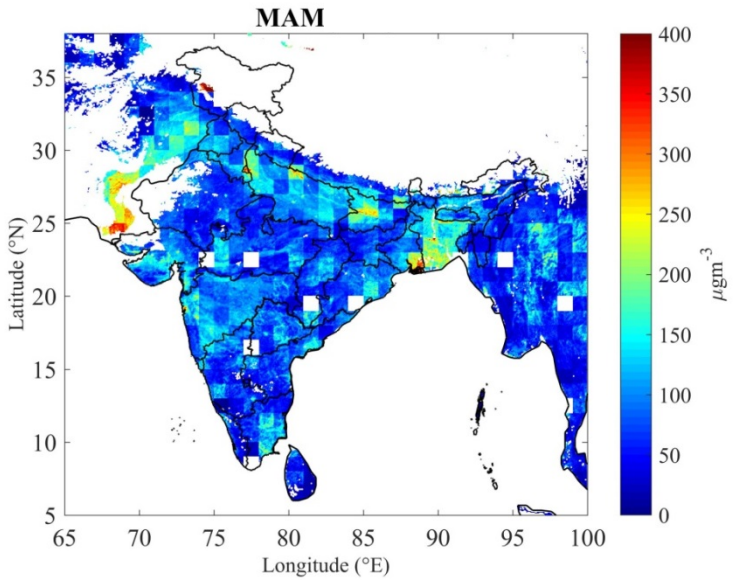


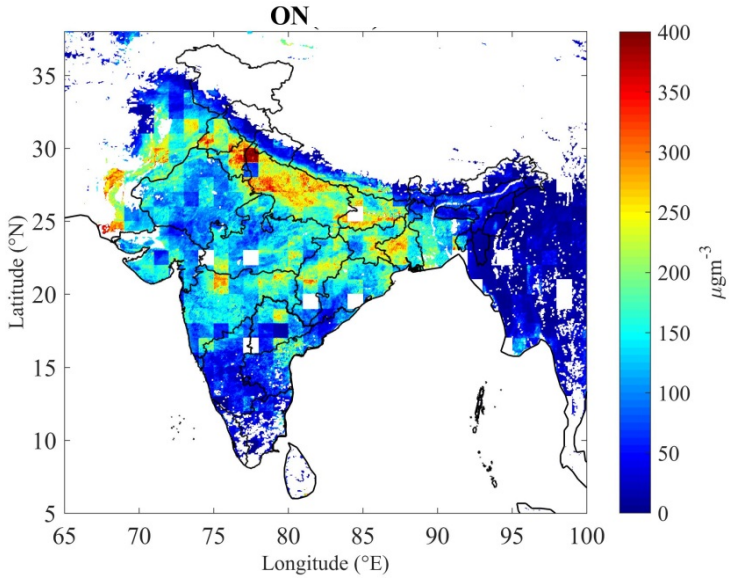


Satellite retrieved $PM_{2.5}$ over India





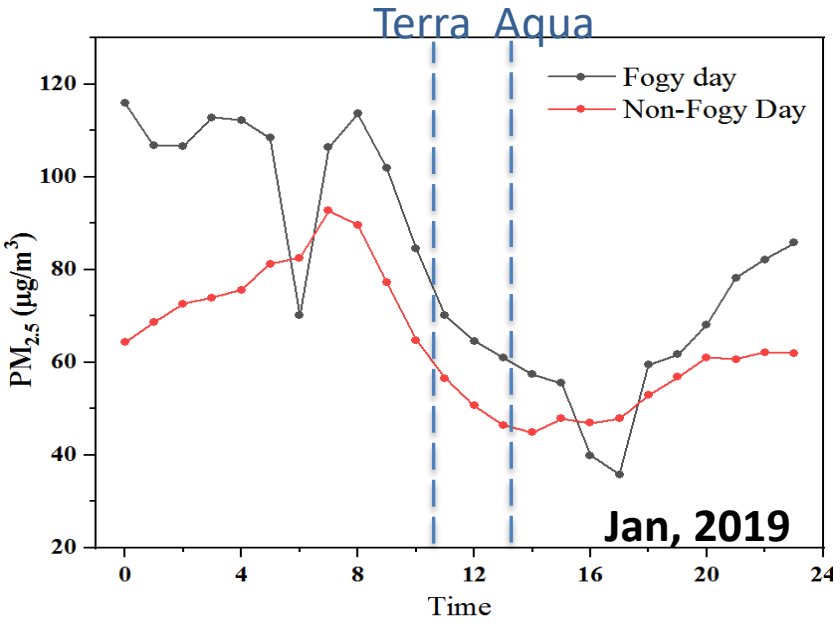


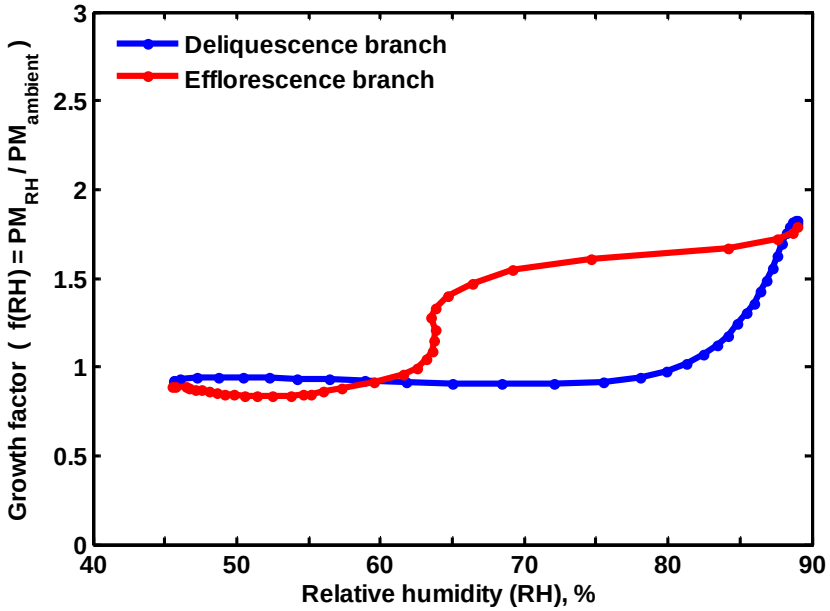


Prijith et al. (in preparation)

$PM_{2.5}$ Retrieval and Validation - Challenges

Observational setup at Shadnagar, Hyderabad (17.07°N, 78.20°E)





Mahalakshmi et al. (in preparation)

Total Columnar Ozone: INSAT-3D and OMI/AURA

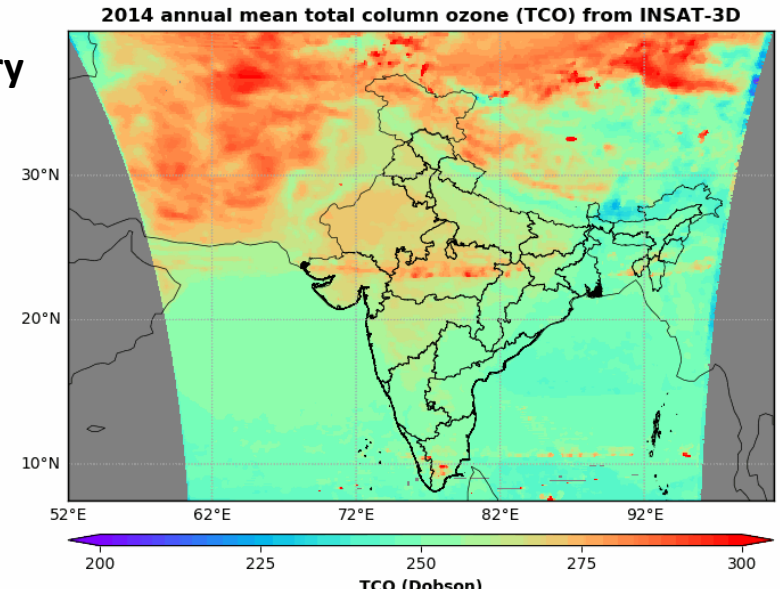
INSAT-3D (2014 – 2019)

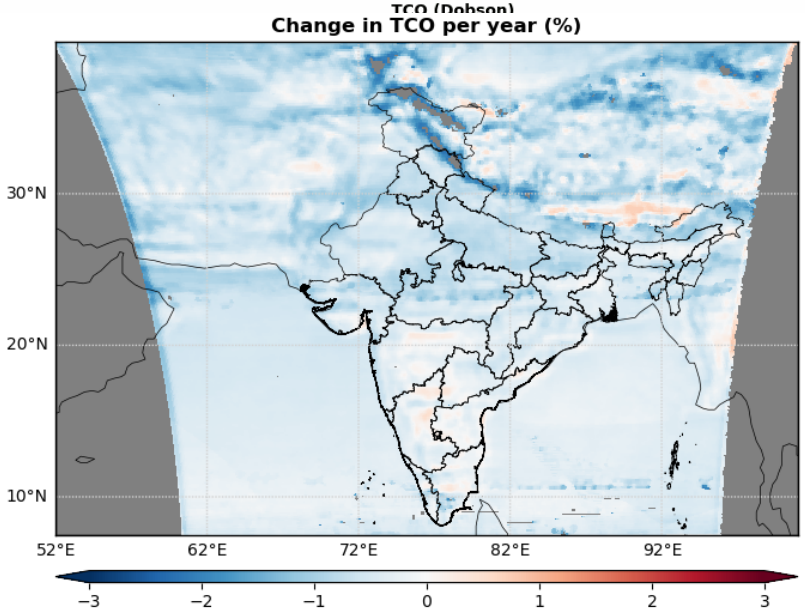
Geostationary

INSAT-3D &3DR

hourly

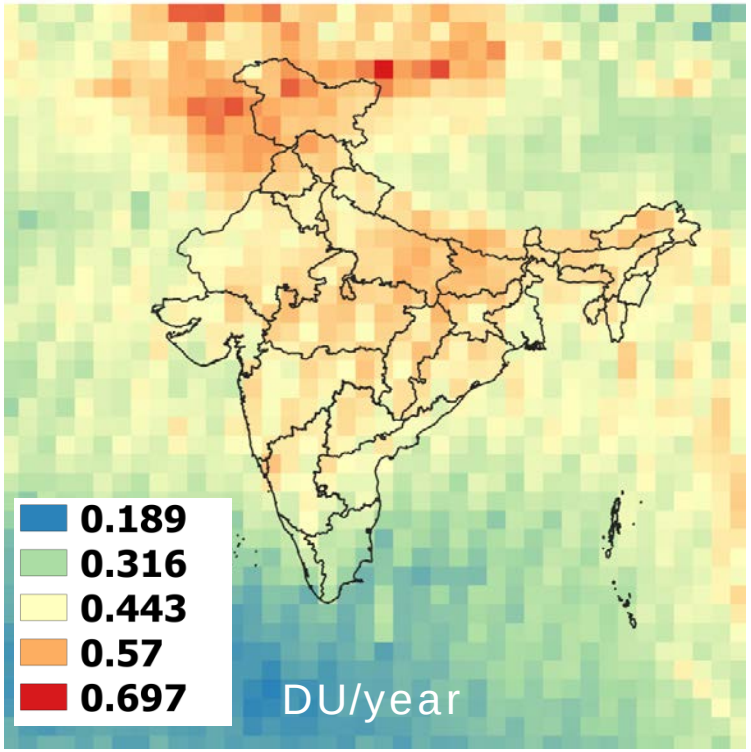
10kmx10km





OMI (2005 – 2018)

Trends in Total Columnar Ozone from OMI payload onboard AURA (Polar)

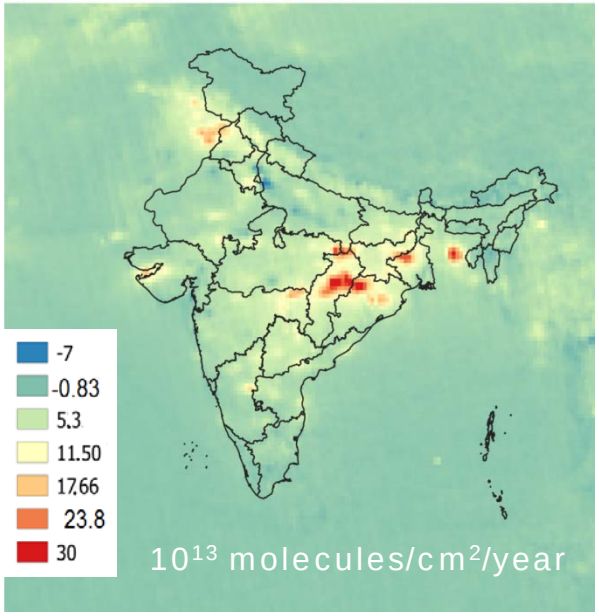


OMI: ~0.5DU/Y *13Y = ~5 DU increase

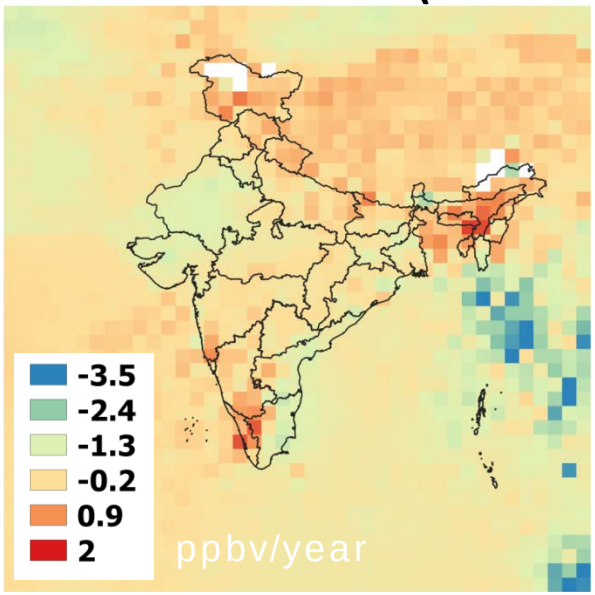
INSAT-3D: ~0.25%*6Y = 1.5% = ~4DU increase

Ozone Precursors: NO_2 and CO (OMI & MOPITT)

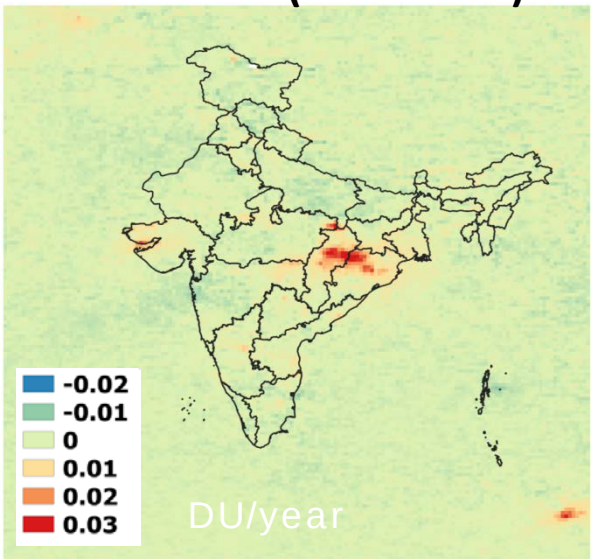
Trends in Tropospheric NO_2 (2005-2018)



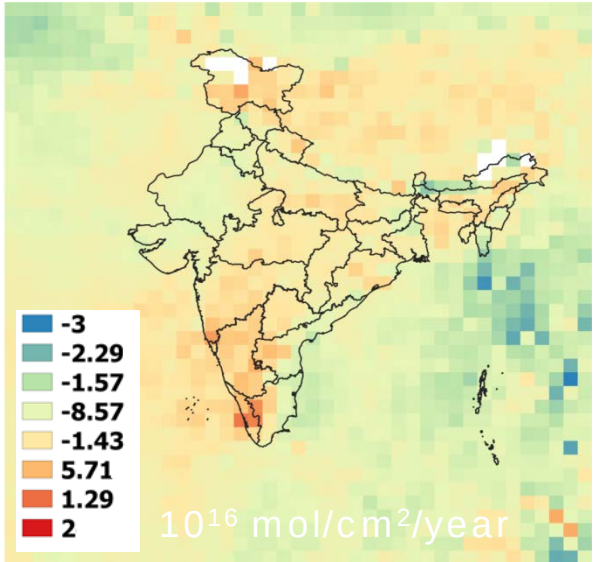
Trends in CO at 900hPa (2005-2018)



Trends in PBL column SO2 (2005-2018)

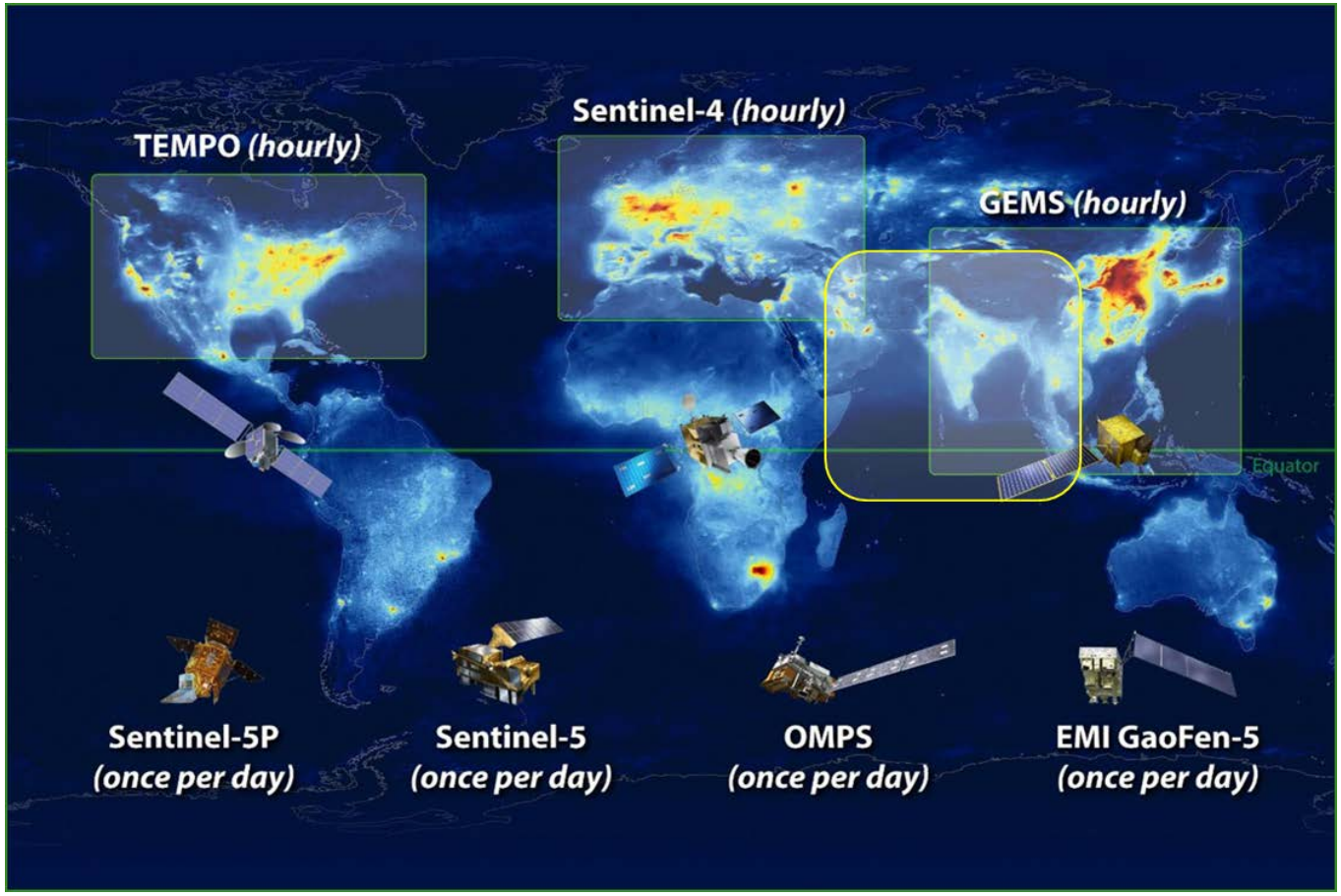


Trends in Total Columnar CO (2005-2018)



Madhav et al. (in preparation)

Geostationary Air Quality (Geo-AQ) constellation



Geostationary:

INSAT-3D & 3DR (2013 & 2016 onwards)
Aerosols, Ozone and clouds.

GISAT :
Aerosols, O3, CO2, CH4, clouds, surface properties

NO2, SO2, CHOCHO

Polar:

Oceansat-3 (2020-21 expected) : AOD, clouds and surface properties.

HYSIS (2019): AOD, CO2, Ch4, NO2, O3, .. , clouds, water vapor and surface properties.

Summary and future plans

(1) INSAT-3D & INSAT-3DR:

AOD and Columnar Ozone data over 7-years since 2013

Initiated the data harmonization with the existing data

(2) PM2.5 retrieval:

Challenge remains : inferring surface aerosol mass from column-integrated AOD

Methodology is being developed, especially for Hazy/foggy conditions

Aerosol growth factor

A unified methodology is required

(3) GISAT :

"Geostationary satellite Constellation for observing Air Quality"

Inter-comparison with GEMS – to meet Global air quality needs

HYSIS & Oceansat-3 data will compliment the GISAT measurements

Dataset validation/harmonization

Thank you for

your attention.

http://www.isro.gov.in