



Supplement to ESA / NASA / JAXA Cooperation on COVID-19

12 June 2020

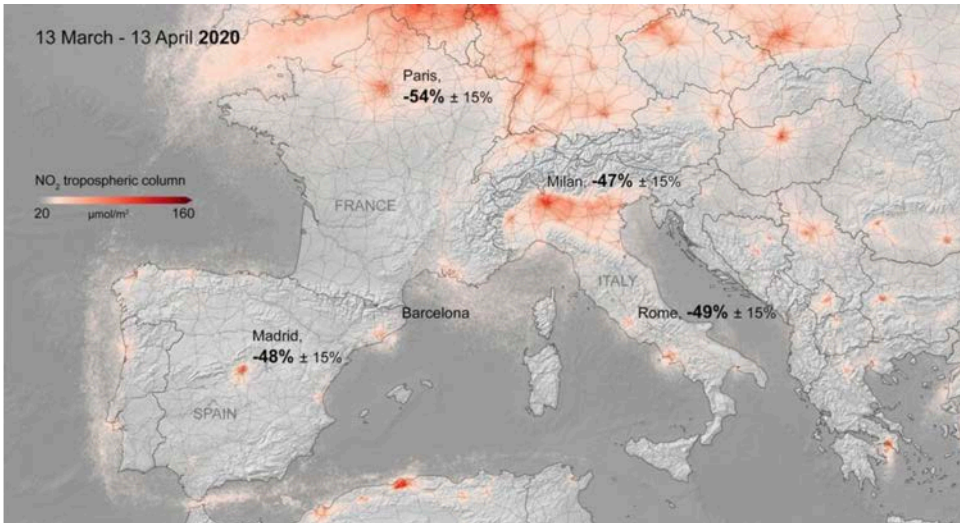
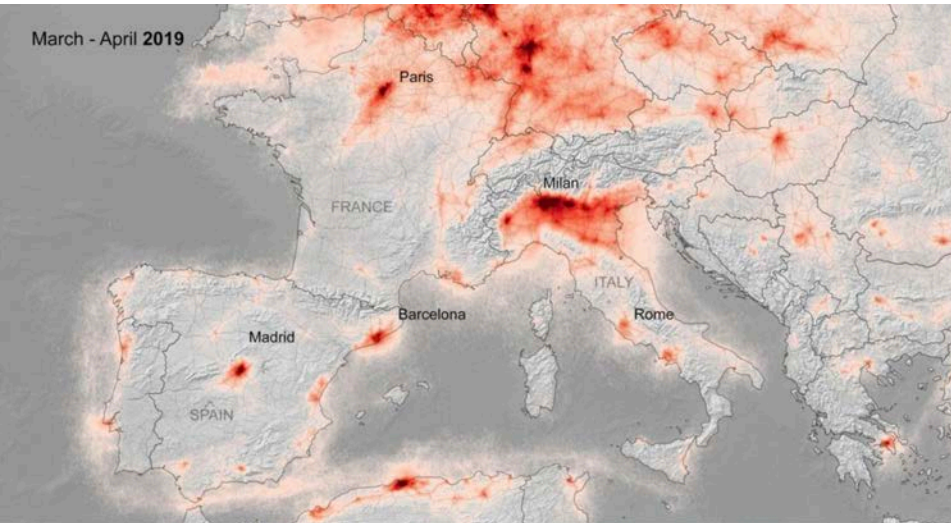
Barry Lefer, Ken Jucks, David Crisp – NASA
Claus Zehner – ESA
Kuze Akihiko – JAXA

S5P TROPOMI NO₂ - Europe



http://www.esa.int/ESA_Multimedia/Images/2020/04/Nitrogen_dioxide_concentrations_over_Europe

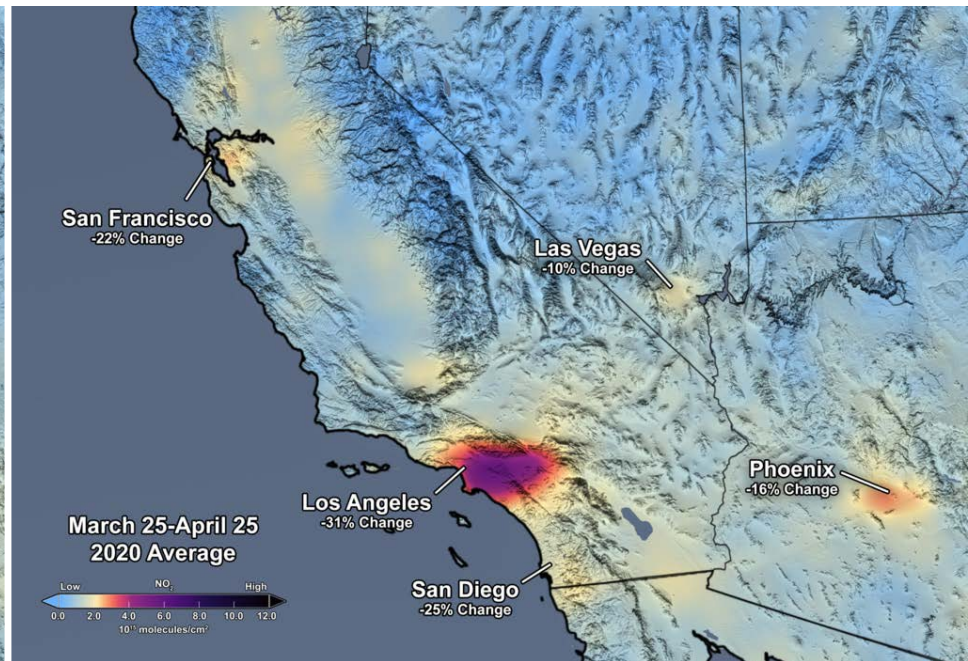
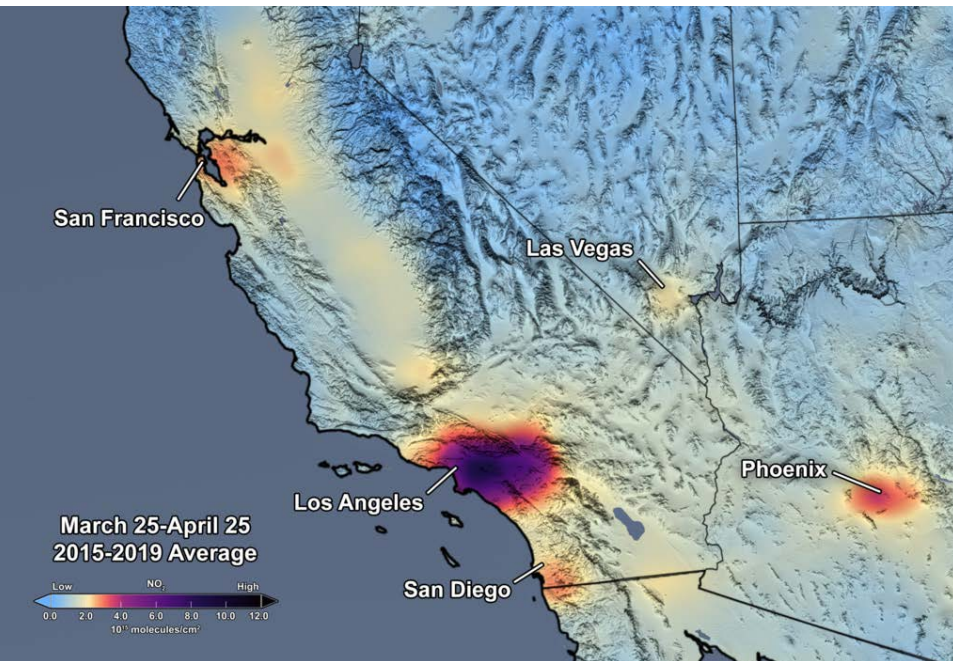
http://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-5P/Air_pollution_remains_low_as_Europeans_stay_at_home



OMI NO₂ – Southwestern U.S.



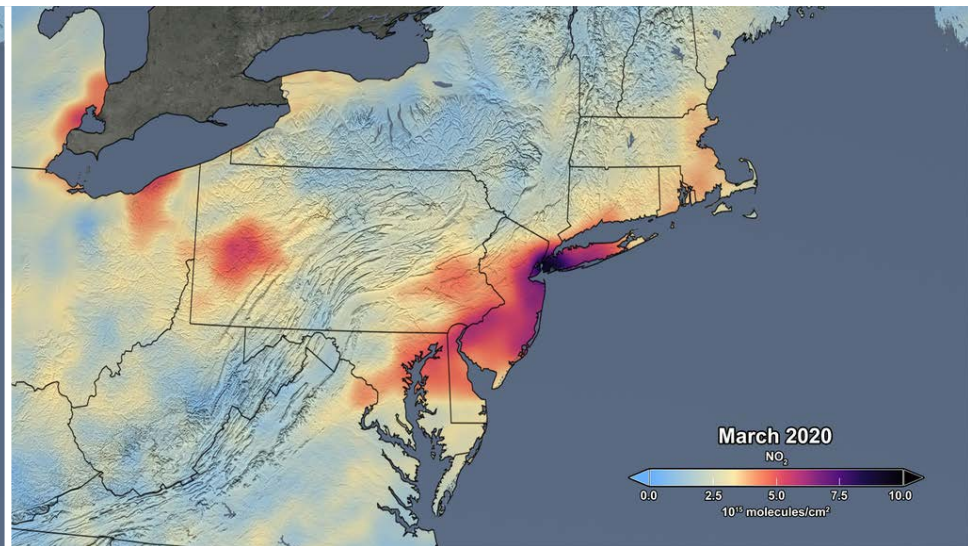
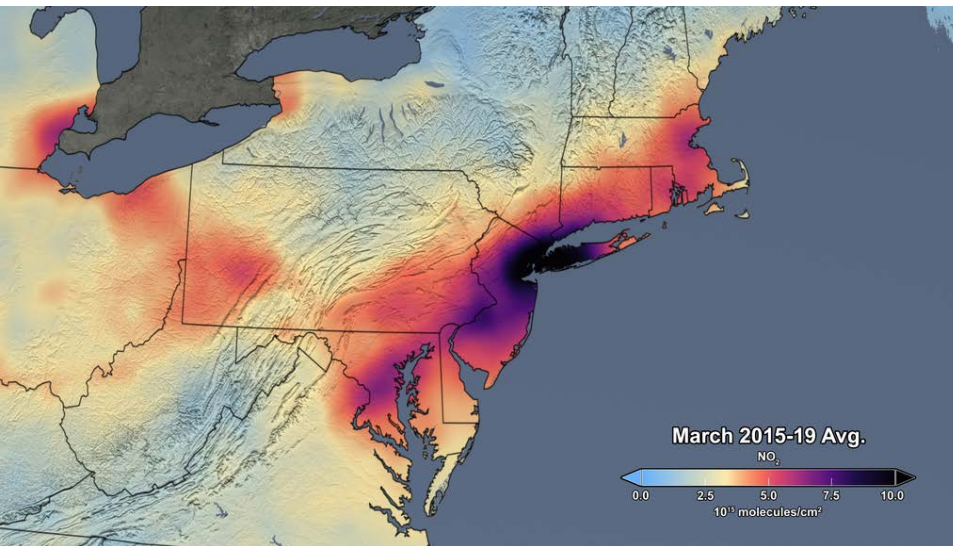
<https://airquality.gsfc.nasa.gov/news>



OMI NO₂ – Northeastern U.S.



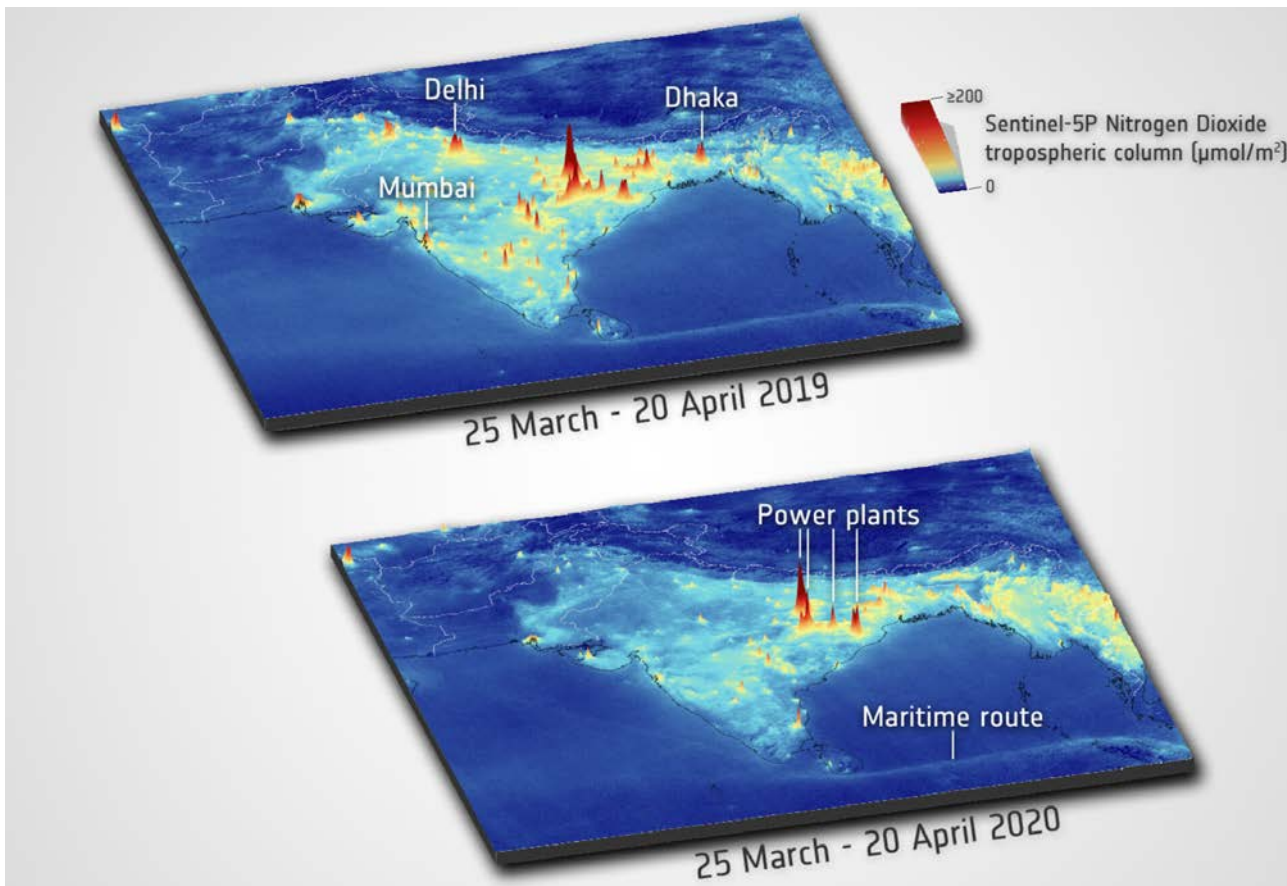
<https://airquality.gsfc.nasa.gov/news>



S5P TROPOMI NO₂ - India

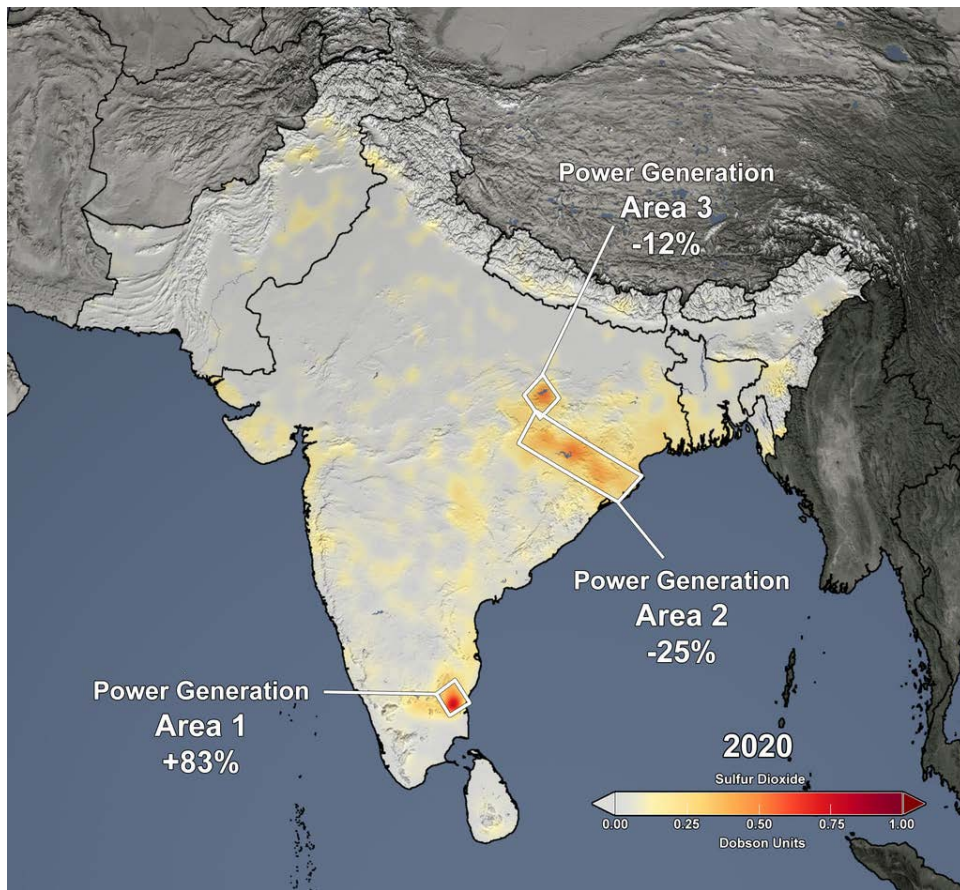
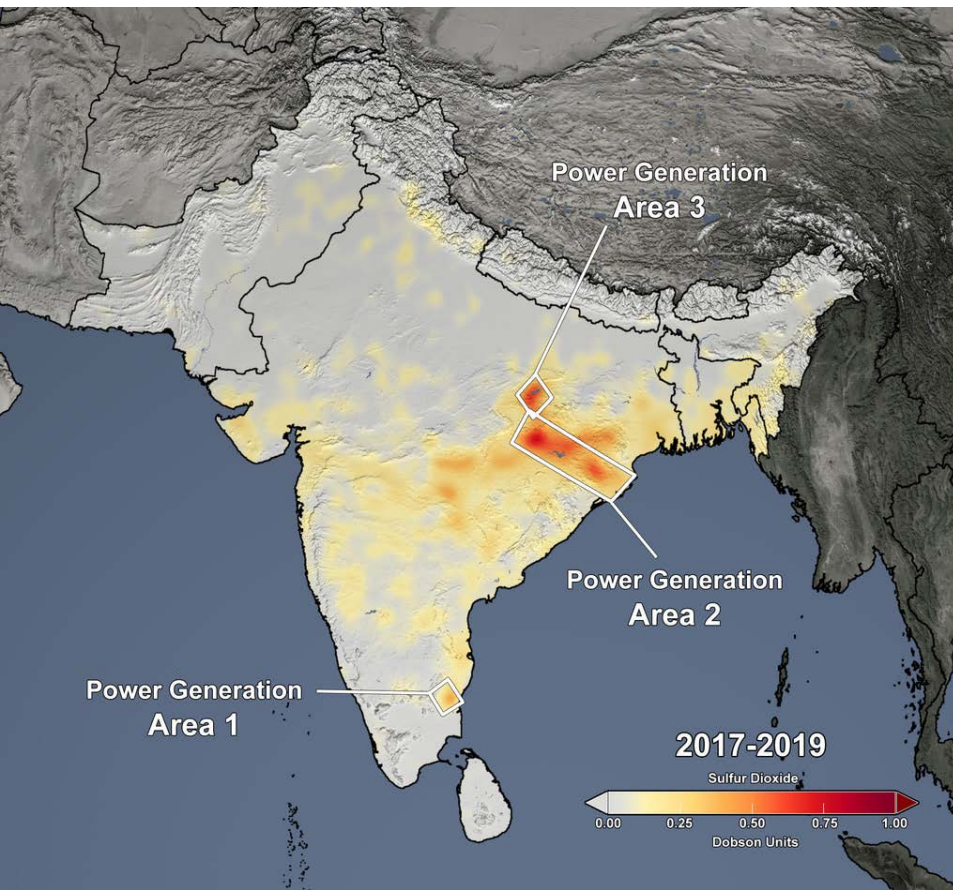


https://www.esa.int/ESA_Multimedia/Images/2020/04/NO2_concentrations_over_India



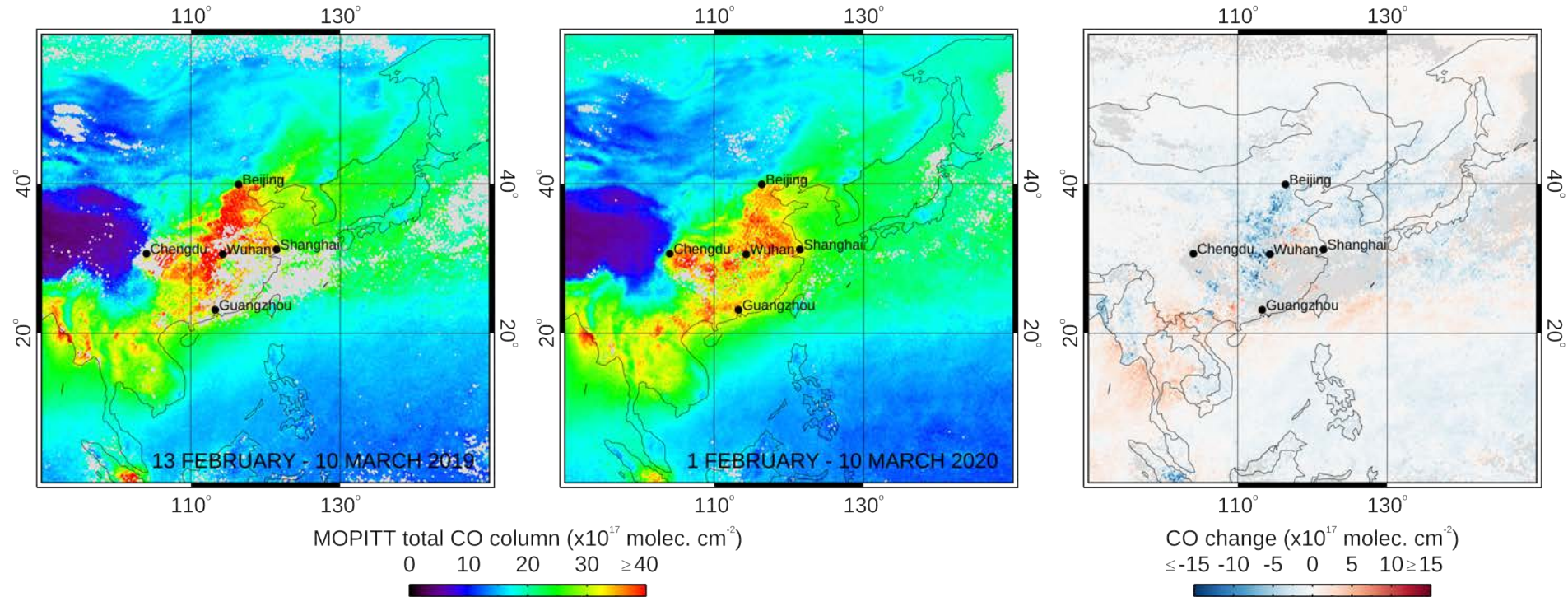
OMI SO₂ – India for 15 March to 25 April

<https://airquality.gsfc.nasa.gov/news>



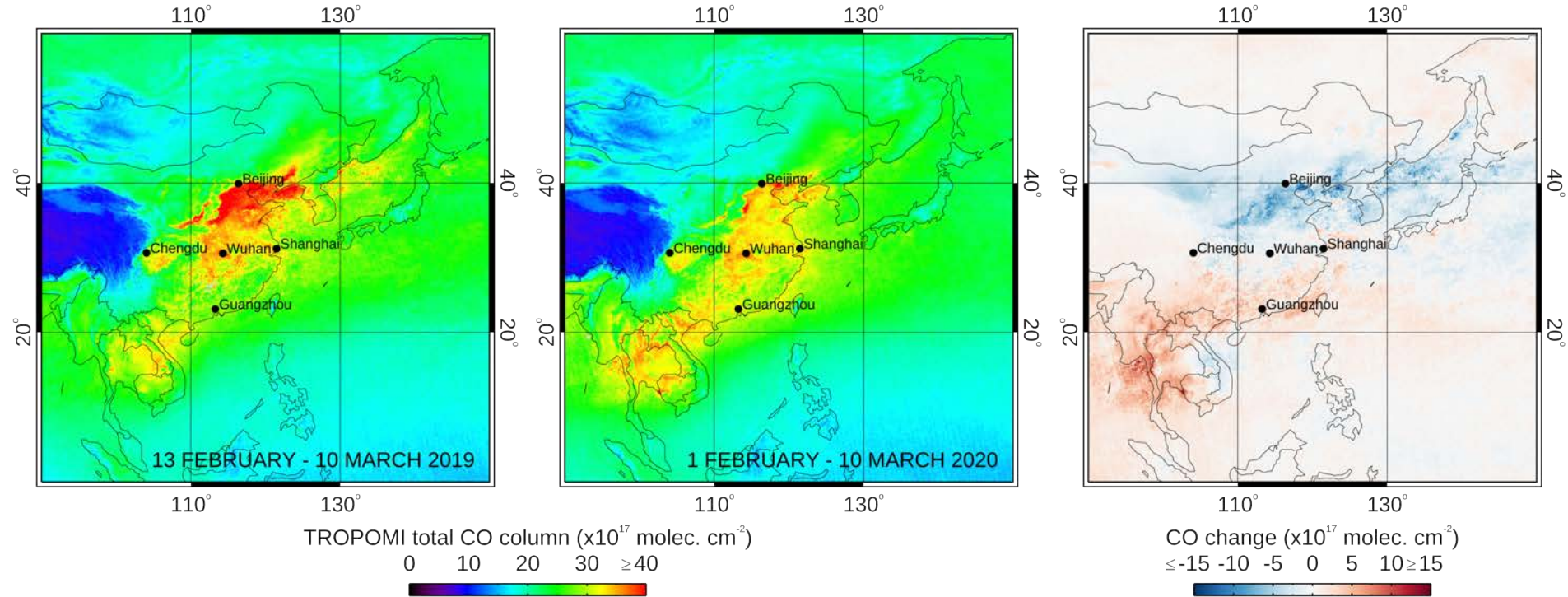
MOPITT CO – Asia for 6 days after Chinese New Year

<https://www2.aom.ucar.edu/news/covid-19-impact-asian-emissions-insight-space-observations>



S5P CO – Asia for 6 days after Chinese New Year

<https://www2.aom.ucar.edu/news/covid-19-impact-asian-emissions-insight-space-observations>





Atmospheric Chemistry and Dynamics Laboratory (Code 614)
Global Nitrogen Dioxide Monitoring Home Page

Home [README/FAQs](#) News Publications Personnel Data Access & Links

AURA OMI average tropospheric NO₂ maps
Please README to better understand the data
(You may need to enable popups on your browser)

NO₂ images will be displayed by clicking on a diamond or

NO₂ time series data (csv files) are now available

For a bigger picture, select a region

Or a video of a region

NASA Official: Nickolay A. Krofokov (Nickolay.A.Krofokov AT nasa.gov) Web Content: Keith D. Evans (UMBC/JCET) (evans AT umbc.edu) Last Updated: 2020-06-04 [Privacy Policy & Important Notices](#) [Contact Us \(evans AT umbc.edu\)](#)

OMI NO₂ 15-day running average – Los Angeles

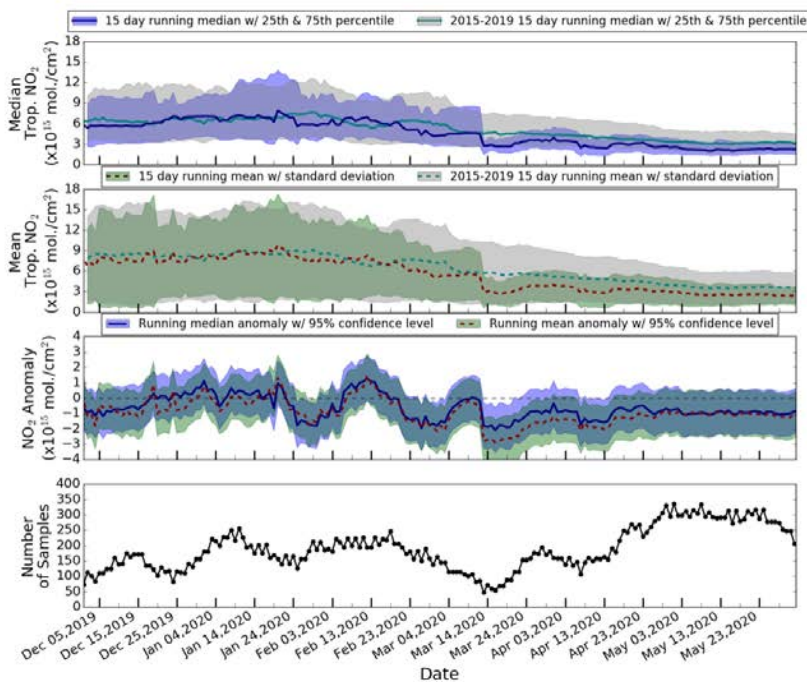
https://so2.gsfc.nasa.gov/no2/pix/htmls/Los_Angeles_data.html



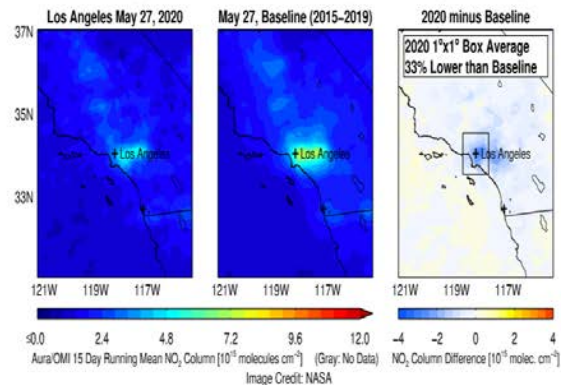
Plots & Movies Data (csv file)

Los_Angeles OMI data

Aura/OMI NO₂ for Los Angeles, USA (118.25W, 34.05N)
1° Latitude x 1° Longitude box around city center

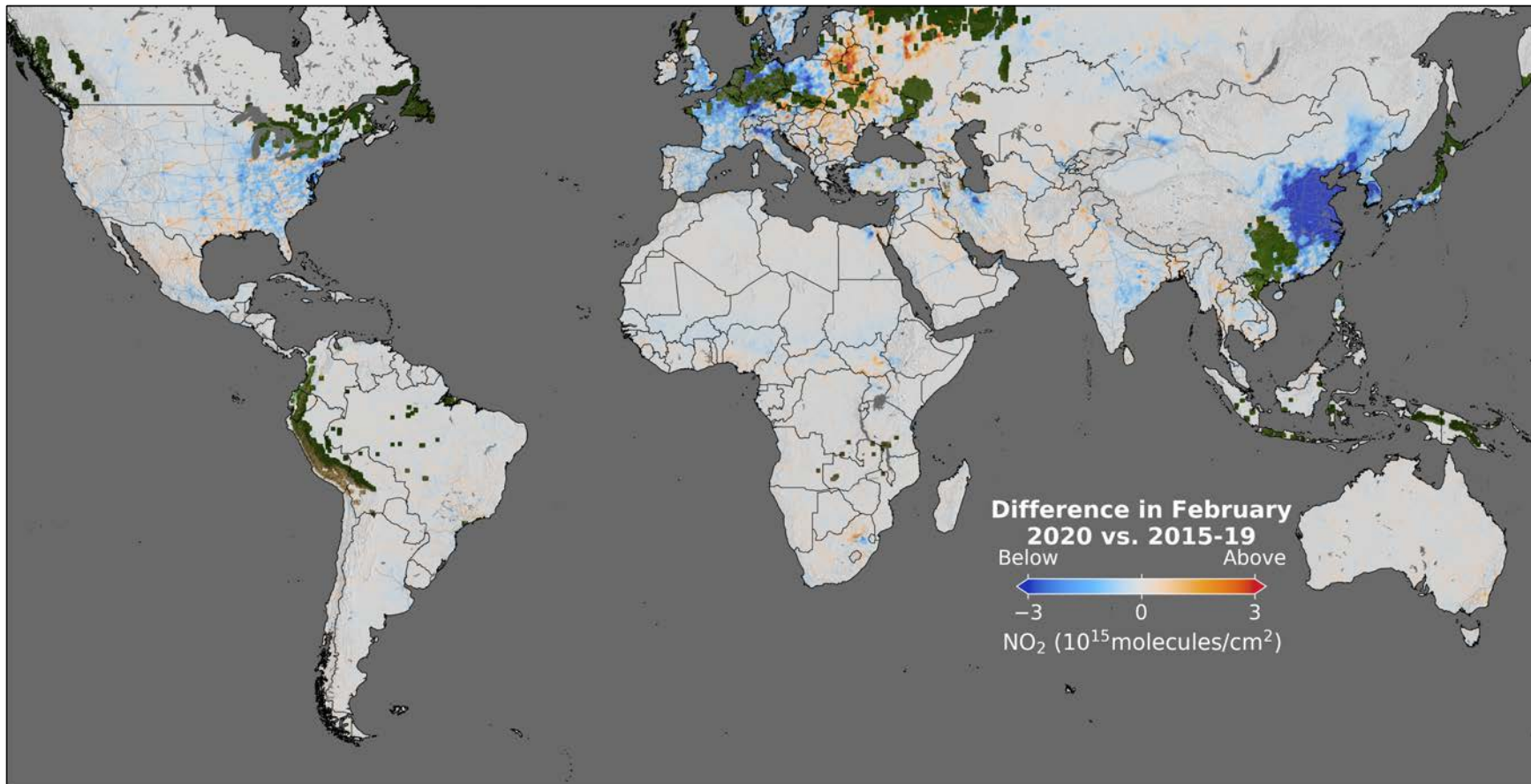


Click image for recent 15 day running average



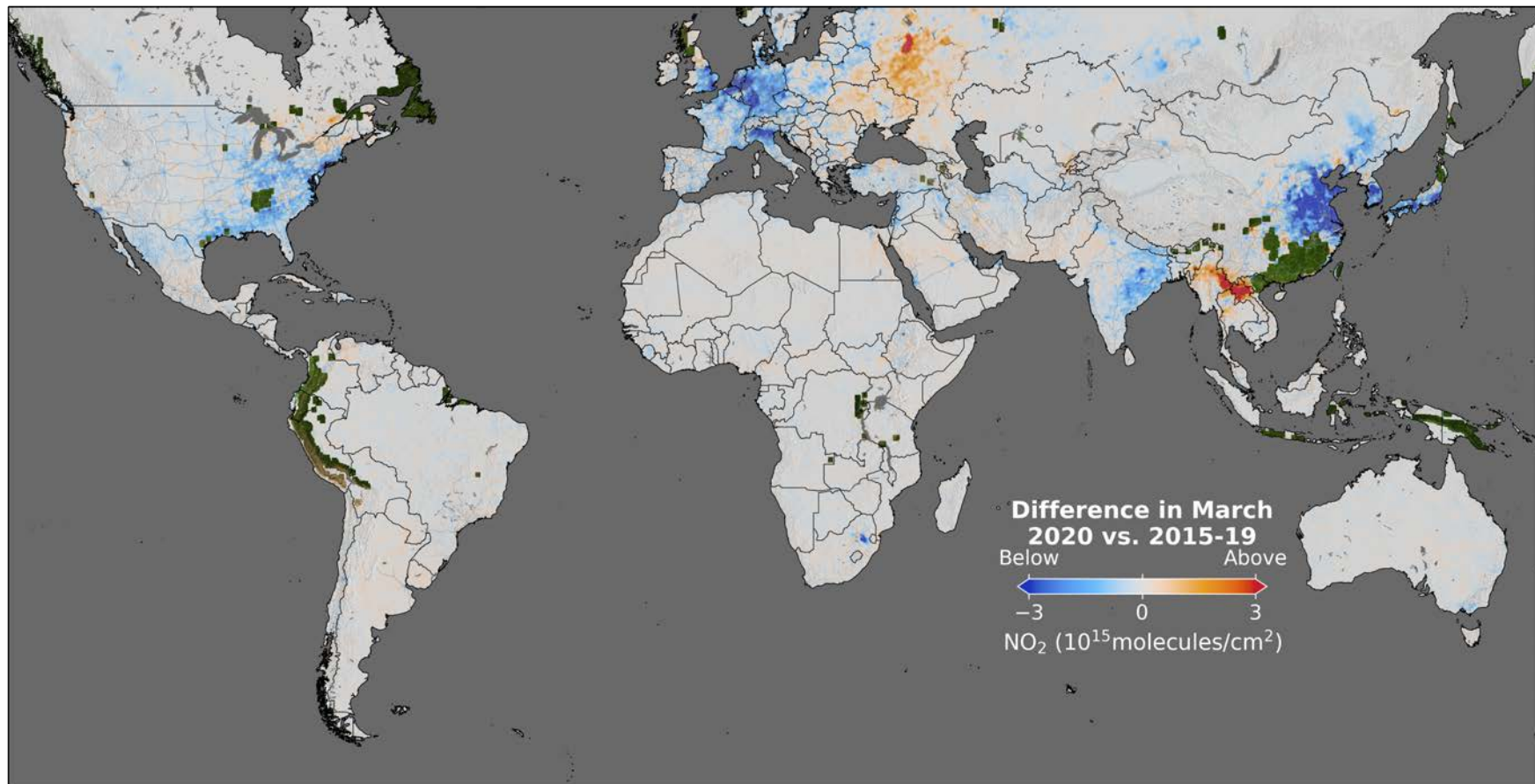
OMI NO₂ – Global February

<https://so2.gsfc.nasa.gov/no2/pix/regionals/Global/Global.html>



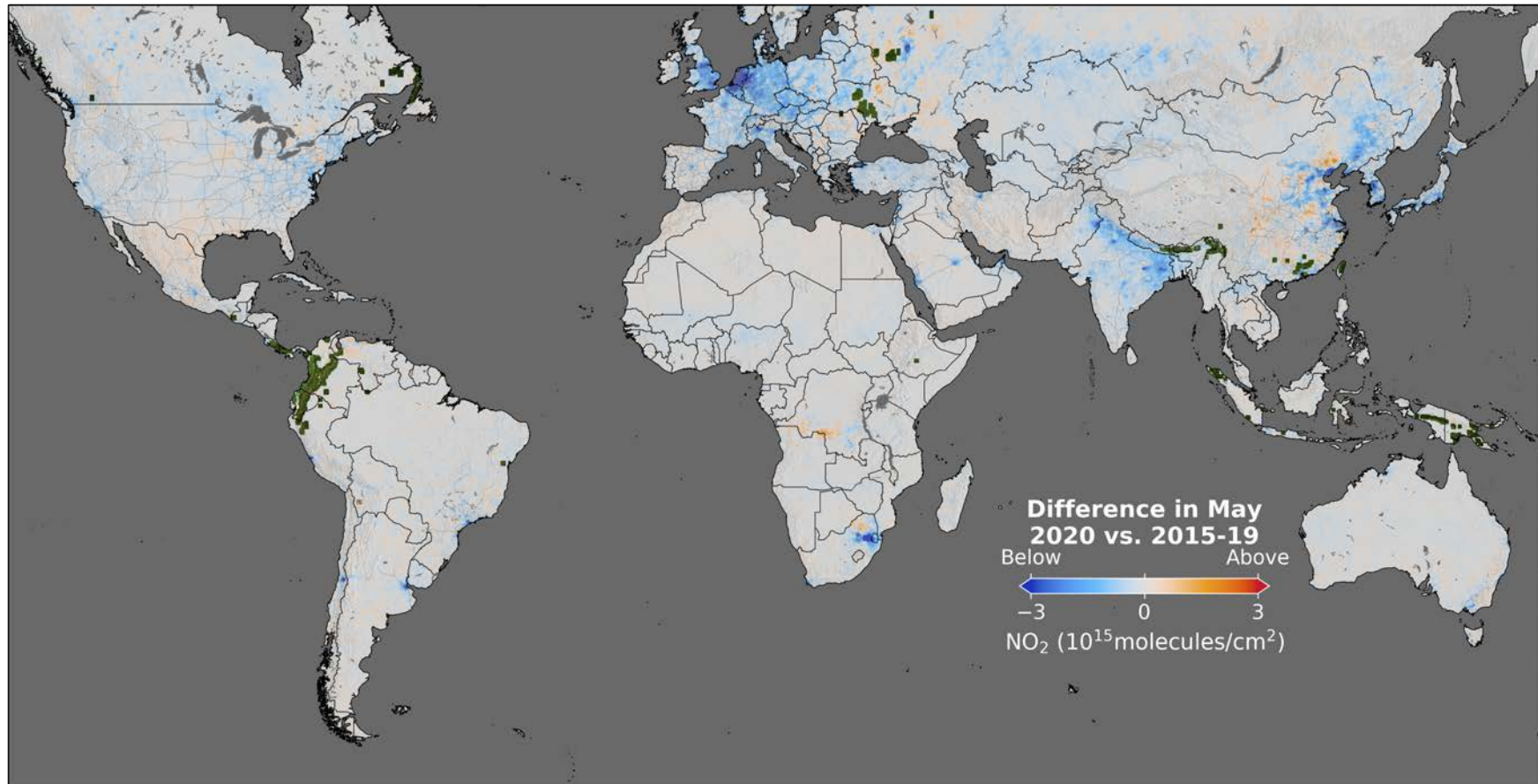
OMI NO₂ – Global March

<https://so2.gsfc.nasa.gov/no2/pix/regionals/Global/Global.html>



OMI NO₂ – Global May

<https://so2.gsfc.nasa.gov/no2/pix/regionals/Global/Global.html>



ESA RACE Dashboard (<https://race.esa.int/>) Rapid Action on Coronavirus and EO



The screenshot shows the ESA RACE Dashboard interface. At the top, there's a navigation bar with 'RAPID ACTION ON CORONAVIRUS AND EO', 'WELCOME', and 'ABOUT'. Below this, there are tabs for 'COUNTRIES' and 'INDICATORS'. The 'COUNTRIES' tab is active, showing a list of countries on the left and a map of Europe on the right. The map displays various indicators for each country, represented by numbers in circles. A 'GLOBAL INDICATORS' section is also visible, showing a satellite image of a port area with a red box highlighting a specific location. Below the satellite image, there are three indicator cards: 'Economic Indicators' with a value of 30, 'Agriculture Indicators' with a value of 2, and 'Environment Indicators' with a value of 4. At the bottom, there's a 'How to use the RACE Dashboard' section with a list of instructions.

GLOBAL INDICATORS

COVID-19 Impact seen by Satellite

Import/production sites status of non-metallic ores
Estimation of indicator through ships detection at ports for non-metallic ores
Port of Gdynia
Pleiades data
2020-03-24

€ **30**
Economic Indicators

2
Agriculture Indicators

4
Environment Indicators

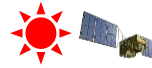
How to use the RACE Dashboard

1. Select **INDICATORS** and **COUNTRIES** from the lists

EDC service for ESA | Legal | Privacy

esdash v1.0 by EOX **FEEDBACK**

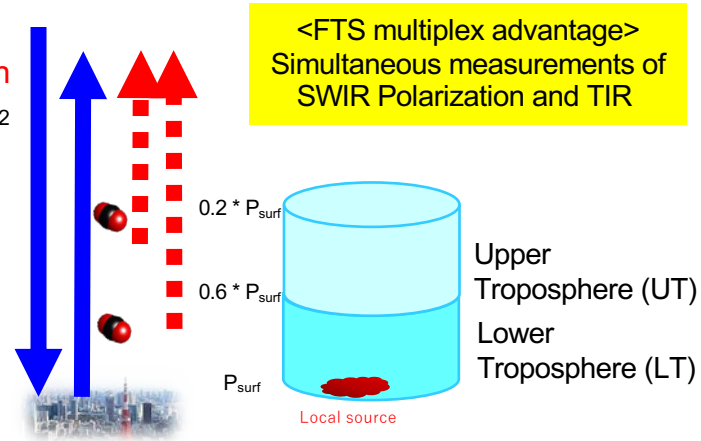
EORC Partial Column Product and GOSAT and GOSAT-2 partial column



GOSAT measures both solar reflected light from the Earth's surface (SWIR) and thermal emission from the Earth's atmosphere (TIR) providing CO₂ partial-column densities of UT and LT.

Independent use of two linear polarization
> Robust under thick aerosol

Cloud Screened with onboard-CMOS-camera



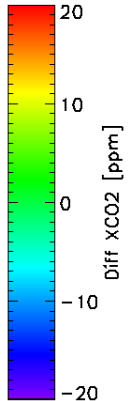
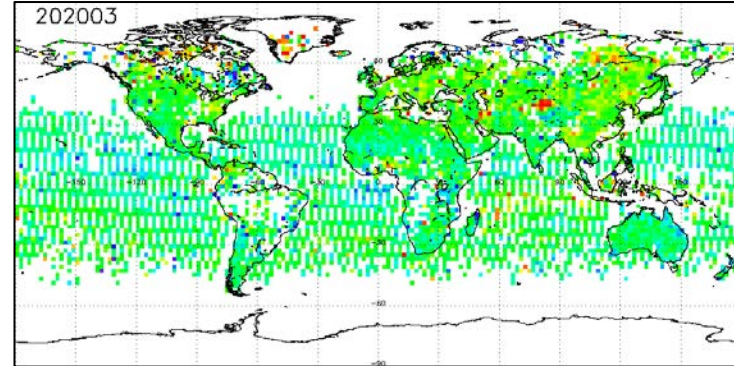
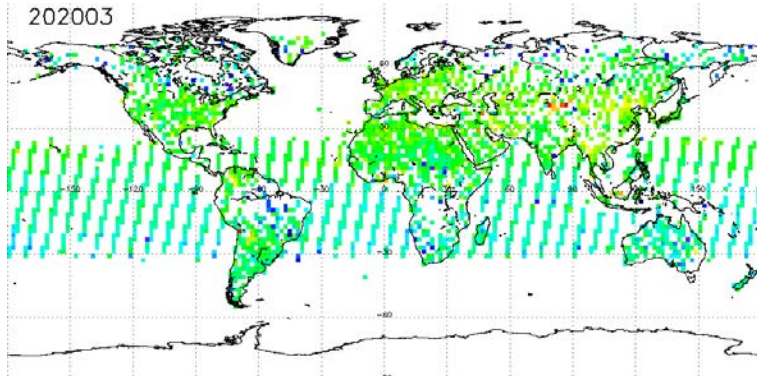
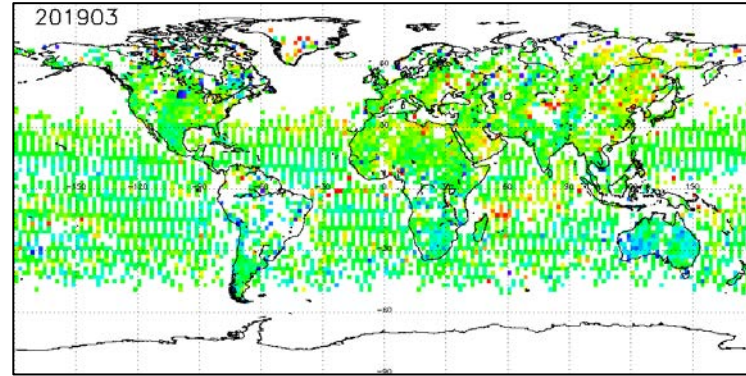
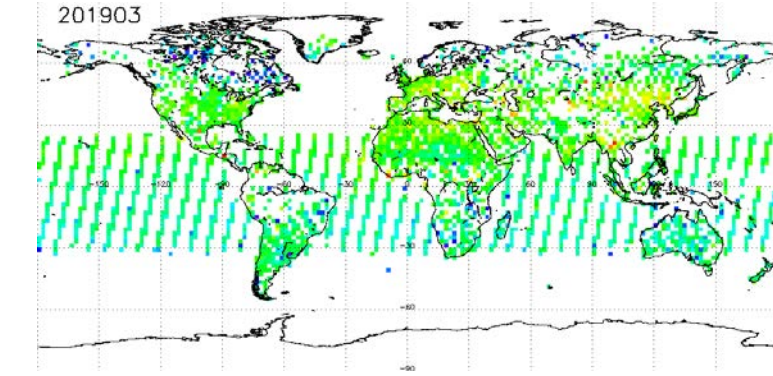
GOSAT and GOSAT-2 Global data

https://www.eorc.jaxa.jp/GOSAT/GPCG/index_GOSAT2.html

GOSAT Trend data at target points

https://www.eorc.jaxa.jp/GOSAT/CO2_monitor/index_Ver.K.V3.html

XCO₂ anomaly: (XCO₂(LT)-XCO₂(UT))



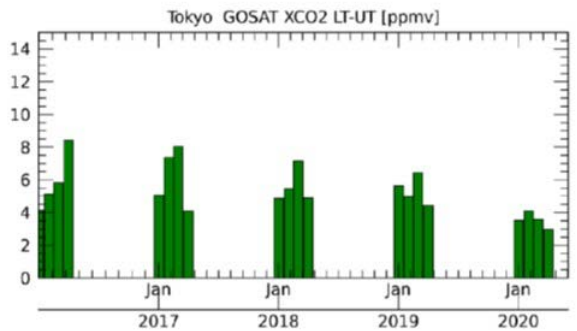
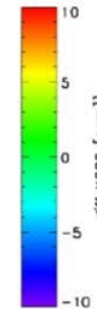
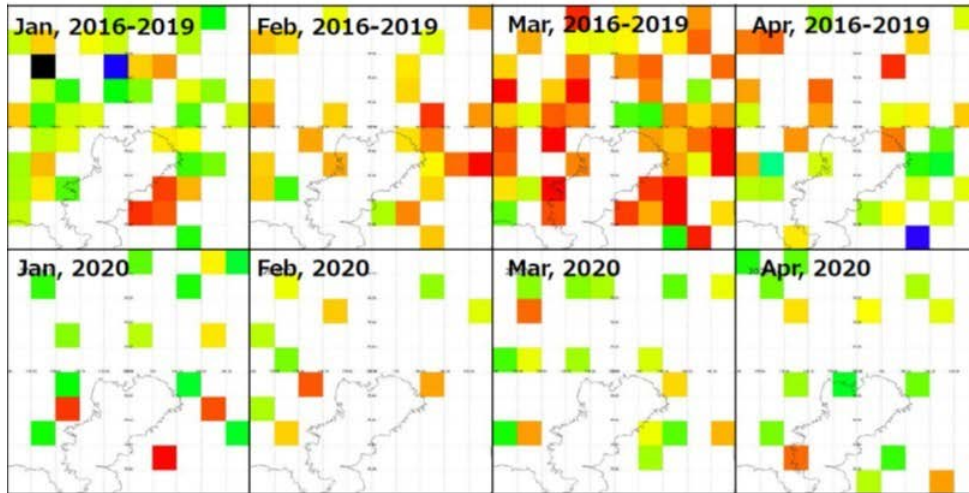
GOSAT

GOSAT-2

XCO₂ Partial column: lower (0-4 km) – Monthly-Area averaged Upper troposphere

Tokyo

0.1x0.1 deg. grid

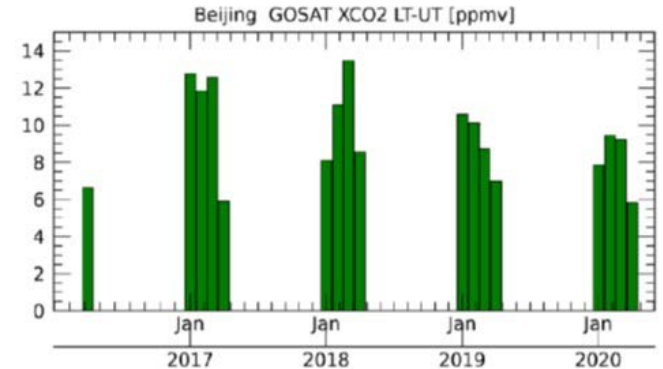
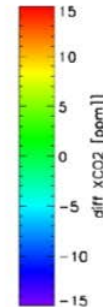
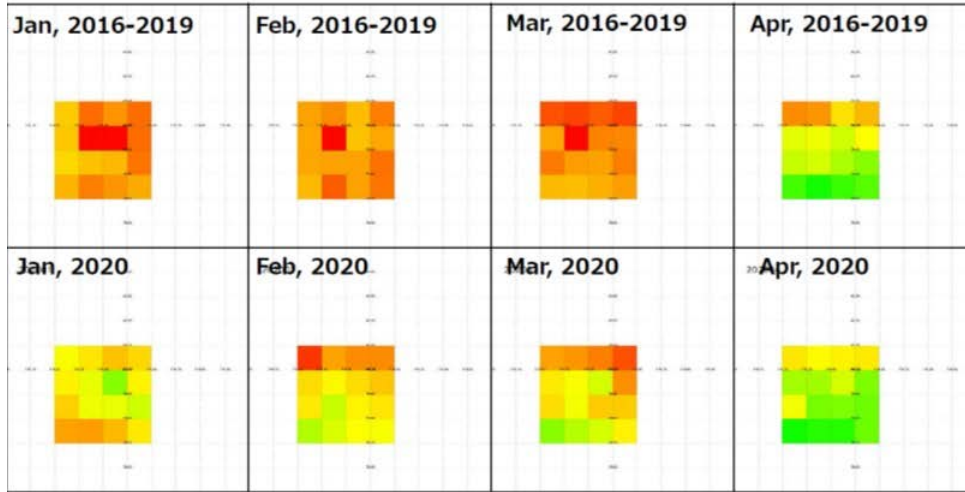


Tokyo, Beijing, Shanghai, New York, Delhi, Mumbai, Dhaka

XCO₂ Partial column: lower (0-4 km) – Monthly-Area averaged Upper troposphere

Beijing

0.1x0.1 deg. grid

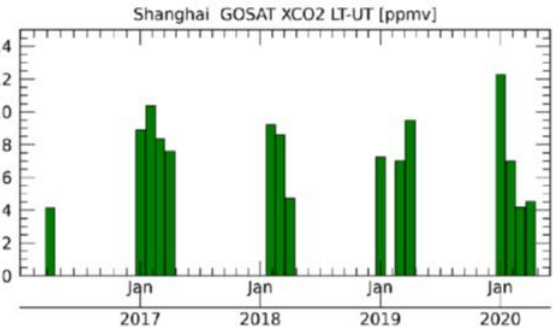
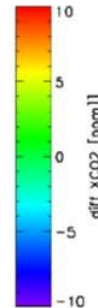
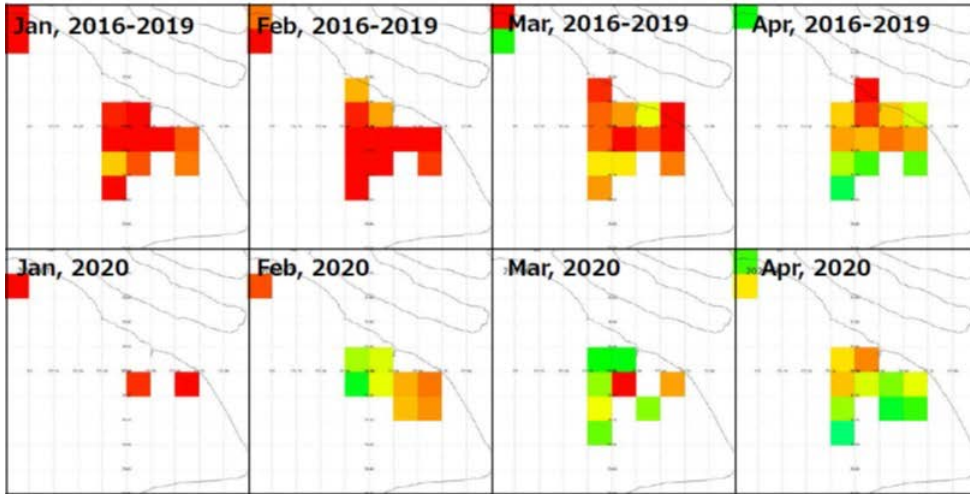


Tokyo, [Beijing](#), Shanghai, New York, Delhi, Mumbai, Dhaka

XCO₂ Partial column: lower (0-4 km) – Monthly-Area averaged Upper troposphere

Shanghai

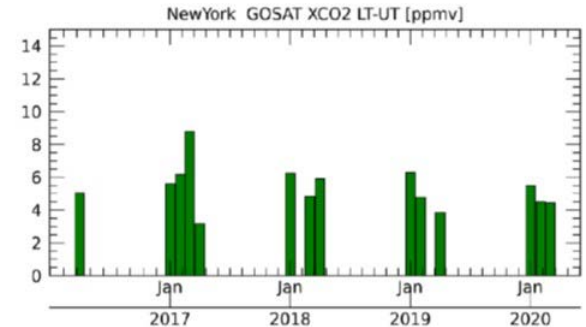
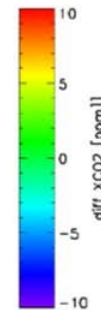
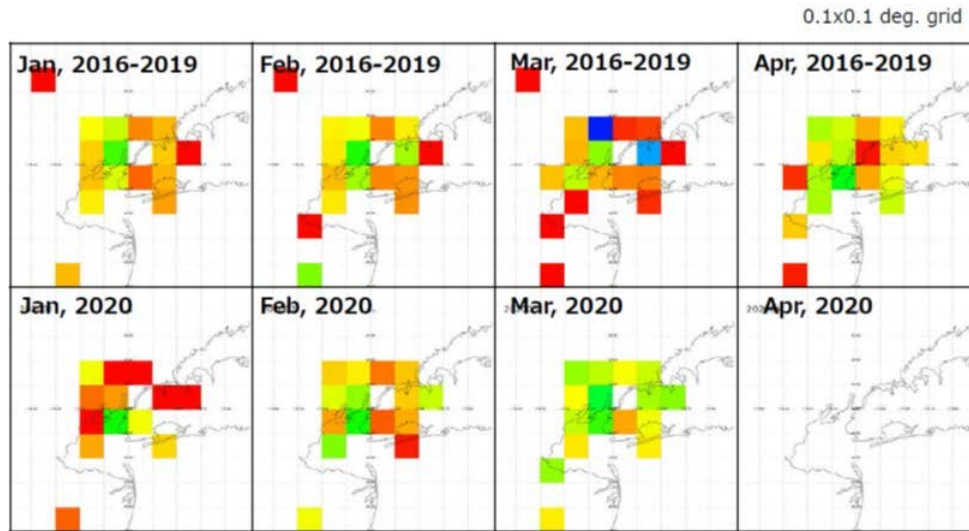
0.1x0.1 deg. grid



Tokyo, Beijing, [Shanghai](#), New York, Delhi, Mumbai, Dhaka

XCO₂ Partial column: lower (0-4 km) – Monthly-Area averaged Upper troposphere

New York

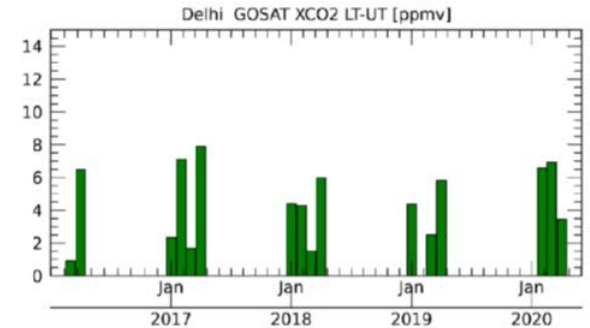
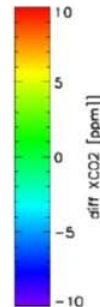
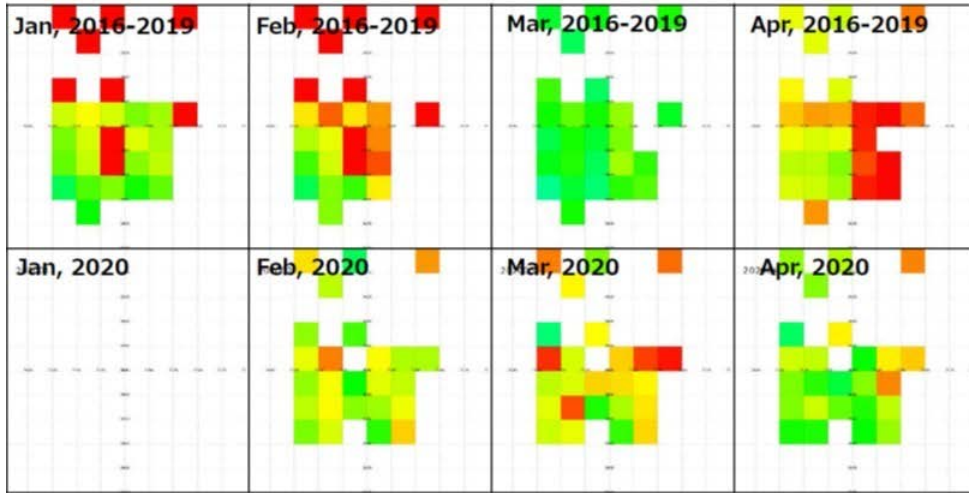


Tokyo, Beijing, Shanghai, [New York](#), Delhi, Mumbai, Dhaka

XCO₂ Partial column: lower (0-4 km) – Monthly-Area averaged Upper troposphere

Delhi

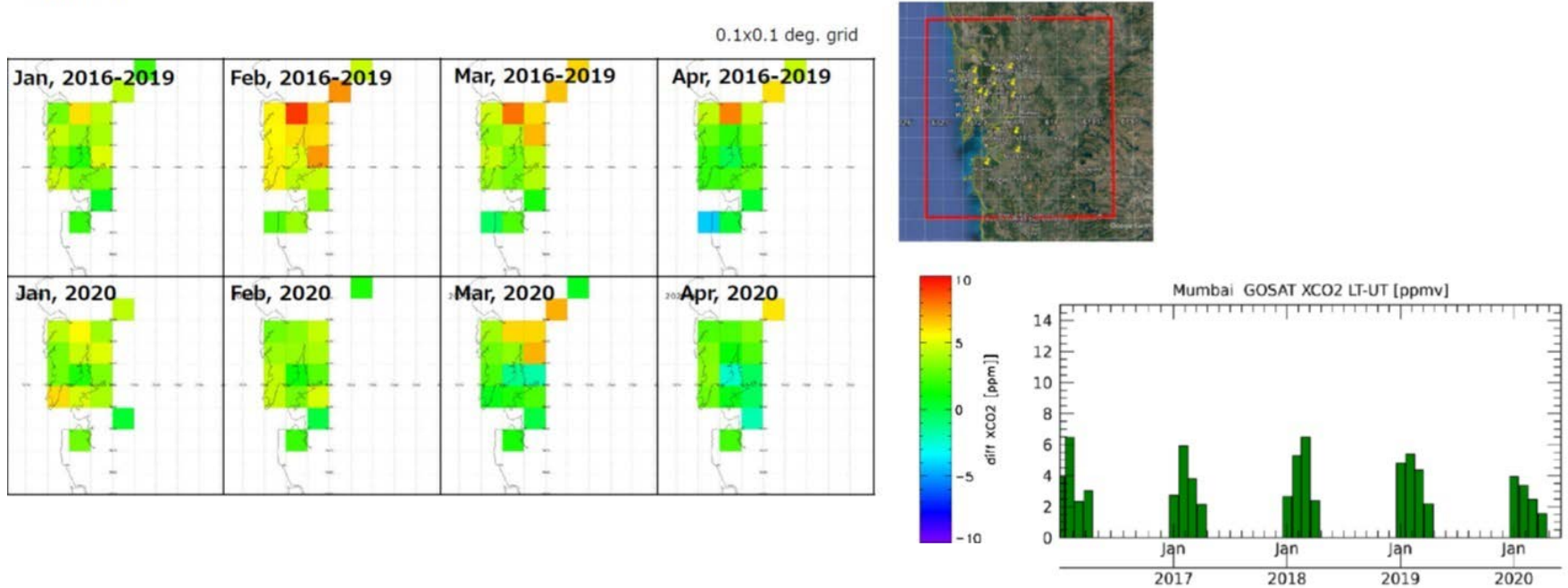
0.1x0.1 deg. grid



Tokyo, Beijing, Shanghai, New York, **Delhi**, Mumbai, Dhaka

XCO₂ Partial column: lower (0-4 km) – Monthly-Area averaged Upper troposphere

Mumbai

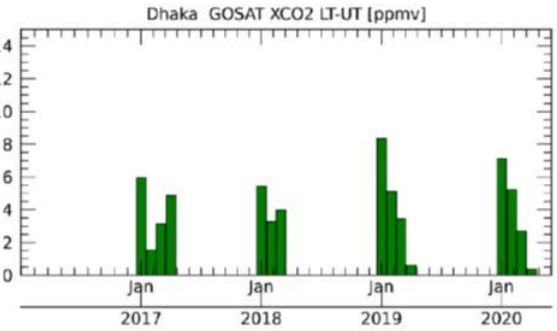
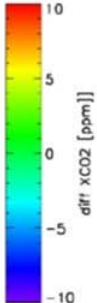
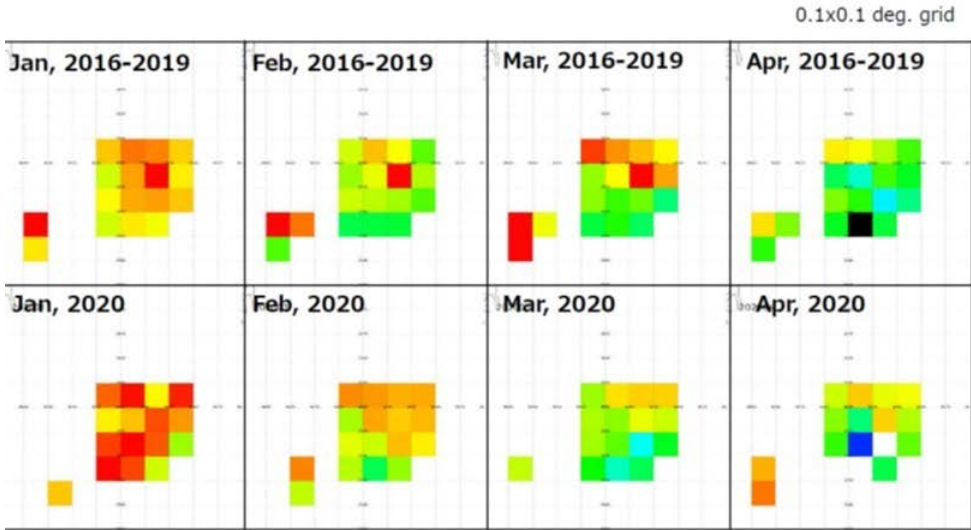


Tokyo, Beijing, Shanghai, New York, Delhi, [Mumbai](#), Dhaka

XCO₂ Partial column: lower (0-4 km) – Monthly-Area averaged Upper troposphere



Dhaka



Tokyo, Beijing, Shanghai, New York, Delhi, Mumbai, **Dhaka**

Some Useful Links



<https://race.esa.int/>

<https://earth.esa.int/web/guest/missions/esa-eo-missions/sentinel-5p>

<https://maps.s5p-pal.com/>

https://so2.gsfc.nasa.gov/no2/no2_index.html

<https://airquality.gsfc.nasa.gov/News>

<https://www2.acom.ucar.edu/news/covid-19-impact-asian-emissions-insight-space-observations>

http://www.esa.int/ESA_Multimedia/Videos/2020/03/Coronavirus_nitrogen_dioxide_emissions_drop_over_Italy

https://www.esa.int/Applications/Observing_the_Earth/Copernicus/Sentinel-5P/Coronavirus_lockdown_leading_to_drop_in_pollution_across_Europe

<https://atmosphere.copernicus.eu/flawed-estimates-effects-lockdown-measures-air-quality-derived-satellite-observations?q=flawed-estimates-effects-lockdown-measures-air-quality-satellite-observations>

<https://airquality.gsfc.nasa.gov/caution-interpretation>

https://www.eorc.jaxa.jp/GOSAT/GPCG/index_GOSAT2.html

https://www.eorc.jaxa.jp/GOSAT/CO2_monitor/index_Ver.K.V3.html

<https://oco.jpl.nasa.gov>

<https://oco.jpl.nasa.gov/oco-2-data-center/>