# Questions & Answers Part 3

Please type your questions in the Question Box. We will try our best to get to all your questions. If we don't, feel free to email Sarah Strode (sarah.a.strode@nasa.gov), Pawan Gupta (pawan.gupta@nasa.gov) or Melanie Follette-Cook (melanie.cook@nasa.gov).

**Question 1: I'm interested in viewing methane satellite data and mapping. is the process similar to the PM data/mapping shown in this webinar?**
**Answer 1:** The plotting function shown here can be adapted to plot maps of other gridded (level 3) data. TROPOMI is one of the satellites which has methane data (http://www.tropomi.eu/data-products/methane) (currently only L2 swath data available) and it can be read by scripts provided in our TROPOMI NO2 training (https://appliedsciences.nasa.gov/join-mission/training/english/arset-high-resolution-no2-monitoring-space-tropomi). The codes are tested for NO2 data but can be easily modified to work with CH4 data from TROPOMI.

**Question 2: Is the resolution of VIIRS (around 750 meters at nadir) too wide for a small city with a diameter under 100 meters? Supposed we need to estimate air pollution using AOD for those small regions, what could be one of the solutions?**
**Answer 2:** VIIRS AOD data at 750 m is available from NOAA, the NASA VIIRS AOD data are at 6km resolution. The 100 meter city diameter appears unrealistic but finer than 750 meter operational AOD products are not yet available. There are some dense ground networks in selected cities which can help evaluate pollution level at those scales. There are also some land mapping satellites such LANDSAT, Sentinel and commercial, which can be used for case study analysis to assess very fine spatial scales.
More detailed information on using VIIRS is available in the ARSET training on ARSET - MODIS to VIIRS Transition for Air Quality Applications, available at https://appliedsciences.nasa.gov/join-mission/training/english/arset-modis-viirs-transition-air-quality-applications

**Question 3: A small single Question: In slide 29, do not you mind to review the concepts that are measure with the different Colors. You mentioned that orange is dust, What does the other Colors mean?**
**Answer 3:** Refer to the legend of the bar charts in slide 29. BC stands for black carbon, DU for dust, OC for organic carbon, SS for sea salt, and SU for sulfate.

**Question 4: Any performance comparison between GEOS FP and GEOS CF for surface PM2.5 and O3?**
**Answer 4:** There has not been a published comparison between CF and FP aerosol output. An evaluation of CF can be found in the Keller et al. paper referenced in session.
https://agupubs.onlinelibrary.wiley.com/doi/full/10.1029/2020MS002413
Ozone is only available from GEOS CF.

**Question 5: How can I obtain the documentation that helps me calculate the Index, for example of NO2 or different PM?**
**Answer 5:** I am not sure about the context of index in this question. If you are referring to AQI then see the EPA link -
https://www.airnow.gov/aqi/aqi-basics/using-air-quality-index/

**Question 6: How is Aerosol Index Calculated? How is it interpreted?**
**Answer 6:** Aerosol Index is a calculated quantity in the UV part of solar spectrum. It is calculated between two wavelengths and is a way to qualitatively indicate the presence of absorbing aerosols within the atmosphere. It is sensitive to the height of the aerosols (e.g., the same aerosol plume will have a higher AI at a higher altitude).
https://earthobservatory.nasa.gov/images/1043/toms-aerosol-index#:~:text=The%20TOMS%20aerosol%20index%20is,optical%20depth%20and%20aerosol%20index.)

The equation is here for the OMI sensor-
https://amt.copernicus.org/articles/10/4121/2017/amt-10-4121-2017.pdf

**Question 7: Could you please explain the "to do" parts in the scripts for downloading the data in session 2 notebook.**
**Answer 7:** In the drive, the outputs were provided as .csv files. If you wanted to use a different time period or location, then you would have to download and extract the GOES-CF output. The additional resources provided at the end of the second Session 3 notebook provide an example method for doing this.

**Question 8: How can I obtain the documentation that helps me calculate the emissions, for example of NO2 or different PM? It is difficult to program in python without knowing the formulas.**
**Answer 8:** The emissions used in GEOS-CF are described in the GEOS-CF File Specification document. Information about aerosol emissions is available in the GEOS-FP output (tavg3_2d_adg_Nx collection).

https://gmao.gsfc.nasa.gov/GMAO_products/NRT_products.php
(scroll to GEOS-FP for most recent version)

**Question 9: Can I take any data from Earthdata via OpenDAP?**
**Answer 9:** Refer to the link:
https://earthdata.nasa.gov/collaborate/open-data-services-and-software/api/opendap/opendap-servers
This provides a list of datasets available through OpenDAP. Not all data are available in this form.

**Question 10: Can these data products be used as benchmark data for setting up a neural network?**
**Answer 10:** It depends on your application or research area.

**Question 11: Is the data in context here already filtered (for example excluding values with cloudy pixels)?**
**Answer 11:** Most of the model outputs are unfiltered since there are model outputs for all grid cells. Depending on your research, filtering of model output consistent with satellite data filtering is something to consider. Model outputs are not affected by clouds but satellite retrievals of air pollutants get affected and should be filtered.

**Question 12: Is this data available for every country in the world?**
**Answer 12:** GEOS output is global and the grid boxes cover all locations.

**Question 13: I noticed when doing the analysis of the daily cycle, that some null values appeared. Is some kind of quality assurance done to the data collections used, before they are published to polish biases from those missing data?**
**Answer 13:** Each dataset will have different characteristics of missing data. Depending on your application, you may need to consider or address the effect of missing data to avoid biases. There are meta (or attributes) associated with each parameter in the file, which provide specific details such as valid data range, unit, missing/fill value used, etc. Users should pay attention to these meta data before using the actual data value to ensure quality and accurate use of the data.

**Question 14: Could you use Deep Learning to predict time series using MERRA 2 data?**
**Answer 14:** This is beyond the scope of this webinar series. MERRA-2 has been used in combination with Deep Learning to address certain science questions or improving local and regional accuracies.

**Question 15: Would comparing the model output from MERRA-2 with ground observations from low-cost AQ sensors for PM2.5 be pragmatic? What other attributes should we consider when comparing those values?**
**Answer 15:** It would be possible to do that type of comparison. It would be important to think about the agreement between the low cost sensors and the government managed ones. In reference to session 2, MERRA-2 has a resolution of 50 km and resolution as well as temporal scaling plays a role with comparison as well. Some factors are also out of our control as well.

**Question 16: How we can relate this products with ArcGIS? Do we need a special training for this?**
**Answer 16:** In reference to ArcGIS, there are tools from NASA GES DISC that can output data to GeoTIFF and NetCDF files. More details here - https://pro.arcgis.com/en/pro-app/2.8/help/data/multidimensional/a-quick-tour-of-netcdf-data.htm#:~:text=ArcGIS%20Pro%20reads%20netCDF%20files,for%20data%20conversion%20or%20import.