



## 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 Sujung Go ([sujung.go@nasa.gov](mailto:sujung.go@nasa.gov)) and/or Pawan Gupta ([pawan.gupta@nasa.gov](mailto:pawan.gupta@nasa.gov))

**Question 1: Regarding the various spatial resolutions in different latitudes, are the final products resampled to a grid with unique grid size or not?**

Answer 1: No, GEMS level 2 products are not resampled to a grid with unique grid size.

**Question 2: I couldn't open your provided GEMS NetCDF data on ArcGIS using the multidimensional Tool (NetCDF to Raster Layer). Please let me know the possible solution.**

Answer 2: In this training session, we are showing how we can read the GEMS level 2 datasets with Python code or how we can open the GEMS level 2 datasets with the Panoply tool. Either way will help to analyze GEMS datasets. Unfortunately, our team does not have experience with ArcGIS.

**Question 3: Does the PCA method stand for Principal Component Analysis (PCA)?**

Answer 3: Yes, PCA method stands for Principal Component Analysis.

**Question 4: Since L1C data is available only offline. How do you get a copy?**

Answer 4: Currently, you can get the GEMS L1C data based upon the request to NIER. NIER (**Point Of Contact:** [waju77@korea.kr](mailto:waju77@korea.kr)) will send you the copy of the datasets.

**Question 5: Can GEMS be used to measure pollution events in Africa?**

Answer 5: No, GEMS measurement covers the Asia-Pacific region from Japan to India. Longitude ranges from about 75E to 145E, Latitude ranges from about 0N to 60N.

**Question 6: Can we access GEMS products on the Google Earth Engine (GEE) platform in the near future?**

Answer 6: Currently, GEMS team do not have any plans to provide GEMS data other than through NIER.



**Question 7: Hi, that was very interesting. I would love to be able to play with some of the Python examples you demonstrated. How can we get access?**

Answer 7: The code will be made available through the NASA ARSET Github page at [https://github.com/NASAARSET/GEMS\\_AQ](https://github.com/NASAARSET/GEMS_AQ).

**Question 8: How can we download PM 2.5 data from NESC (the website listed was nesc.nier.go.kr) for a particular region over India? I want to download the pm 2.5 data for the last 10 years. How can I do that?**

Answer 8: We are not sure what exactly NESC is referring to. GEMS launched in 2020, so long term datasets are not possible. MODIS (2000 onward) and VIIRS (2012 onward) data is better for longer datasets. Furthermore, satellites typically provide information about Aerosol Optical Depth (AOD), which is related to PM2.5 but is not the same. You can look at part 2 of this training to learn more: <https://appliedsciences.nasa.gov/join-mission/training/english/arset-inside-look-how-nasa-measures-air-pollution>.

**Question 9: how can we convert the AOD data to an excel file?**

Answer 9: We are currently providing the code to read GEMS datasets. We don't have GEMS code to output AOD data into a excel file. But, we have a VIIRS code which can output netcdf file parameters into a csv file. That code can be easily modified to work with GEMS data. Here is link to VIIRS code - [https://github.com/NASAARSET/VIIRS\\_NOAA](https://github.com/NASAARSET/VIIRS_NOAA)

**Question 10: Is the NO2 plot for tropospheric or for the total column?**

Answer 10: The plot itself was the total column, but you are also able to plot the tropospheric amount as well.

**Question 11: Are the data freely available and open access, in the sense we can use it for any purpose similar to the Copernicus program? Is there a specific license type that they come with or need to credit when publishing the data?**

Answer 11: The data is freely available and open access through the NIER homepage. The data distribution is not identical to the Copernicus program. We will look further into information about licensing.



**Question 12: What is the expected resolution of GEMS products in South East Asia?**

Answer 12: Refer to slide 6 of the presentation and it provides an approximate resolution of 5km x 5km.

**Question 13: Do you have an estimation on when the user guide will be available on NIER website?**

Answer 13: We plan on having it available sometime early next year.

**Question 14: On the slide with the regional data collection, it indicated that certain areas were only monitored during part of the year. Why is that? And during those periods when for example FW data isn't collected, is the satellite monitoring a different area?**

Answer 14: GEMS measures backscattered solar radiance and as a result of this, sunlight is needed for accurate measurements. Therefore, depending on the sunlight availability, season coverage varies.

**Question 15: What is the best way to estimate or measure the uncertainties of the data sets for PM2.5 and other data? Is it possible to know the interferences with our data?**

Answer 15: Products such as ozone and NO<sub>2</sub> provide uncertainty within their NetCDF files. We will look into this question further in regards to PM<sub>2.5</sub>.

**Question 16: There is a severe problem that such advanced research studies like investigating air quality in the developing world such as Africa are minimal or nonexistent. For example, how can such a study be conducted in my country? I am available to be part of the study when I get support and partnership.**

Answer 16: Groups such as the African Society for Air Quality (<http://as4aq.org/>) and the Clean Air Monitoring and Solutions Network (<https://camsnet.org/>) coordinate partnerships with researchers studying Air Quality in Africa. Furthermore, the upcoming NASA MAIA mission will conduct global studies of aerosols and the relationship between health and air quality in cities around the world, including several in Africa (<https://maia.jpl.nasa.gov/>, [https://maia.jpl.nasa.gov/investigation/#target\\_areas](https://maia.jpl.nasa.gov/investigation/#target_areas)).

**Question 17: Do you or will you have the Tropospheric ozone monitor in the GEMS website?**



Answer 17: GEMS team is providing the tropospheric ozone in the NetCDF files.

**Question 18: Are there any references for GEMS L1B radiance and irradiance?**

Answer 18: GEMS team is working on GEMS L1B and L2 user guide.

**Question 19: Is there any option to select longitude and latitude range for downloading the data or do we have to download it for the whole globe?**

Answer 19: GEMS is not a global dataset, as it is only limited to Asia. Scan profile can be found through the title of the NetCDF file. The file contain data for entire scan. Users will have to subset for specific region after downloading the data.

**Question 20: Does RH (Humidity) affect or interfere with the measured values? Are there other interferences so we can consider them in our study of the data?**

Answer 20: GEMS makes ambient measurements, which includes effects of RH on atmospheric parameters. Products such as aerosol optical depth are affected by relative humidity.

**Question 21: Any thoughts on adding a "time" dimension or global attribute to the netCDF files?**

Answer 21: GEMS team currently do not have plans to add a specific time variable. GEMS provides hourly datasets.

**Question 22: In the presentation, you mention different references to validate the GEMS L2 product. Were the same references used to validate GEMS L1 products?**

Answer 22: No. The validation of GEMS L1 is more complicated than GEMS L2. Typically L1B data checked for consistency using other sensors and often calibrations are performed to ensure consistency and accuracies.

**Question 23: Can we plot the data on UNIX (AIX) based softwares (e.g. GrADS)?**

Answer 23: We have tested the Python code through Linux and it will work. We are not sure about GrADS software.

**Question 24: Question on data latency, how frequently will the GEMS product be updated and available for users to access after GEMS captures the image?**

Answer 24: GEMS products are updated daily through NIER.



Accessing and Analyzing Air Quality Data from Geostationary Satellites  
October 11-25, 2022

**Question 25: Does NIER or another organisation plan to provide an in-depth training on the GEMS data, either remotely or on-site in the future?**

Answer 25: You can reach out to the GEMS team for their plans on training. Also, if you would like to see more training on GEMS data from ARSET, please use the training survey to make that request.