



Questions & Answers Session

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 Pawan Gupta (pawan.gupta@nasa.gov) or Melanie Follette-Cook (melanie.cook@nasa.gov).

Question 1: At what time does JPSS overpass the equator?

Answer 1: NOAA-20 (JPSS-1) has equator crossing times of ~12:40 pm and ~12:40 am local solar time. 50 minutes earlier than SNPP.

Question 2: When both have the same specification then why do we have the need for two VIIRS?

Answer 2: The launch of the NOAA satellites (currently SNPP and NOAA-20, in the future JPSS3, JPSS3, etc) are planned to provide long-term, continuous observations. The launches and observation periods overlap to provide opportunity for comparisons and to ensure continuity. Each satellite in this series is expected to carry the same instruments (of which VIIRS is one) for the same reasons. The expected lifetime of each satellite is about 5-7 years therefore to ensure long-term data we need more satellites.

Question 3: Are VIIRS data available on GEE?

Answer 3: Some VIIRS datasets are available, but I don't believe any aerosol datasets are: <https://developers.google.com/earth-engine/datasets/tags/viirs>

Question 4: On slide 17, the difference in the bands was specified, they are very similar, but is the difference significant or are the third decimal differences not significant and makes the products almost comparable, and how would you make a continuous time series when combining the two sources?

Answer 4: For RGB, they are almost identical and should not make differences. Any differences in spectral bandwidth are usually taken care of in retrieval algorithms. For example, AOD is reported at 550 nm and it should be identical for MODIS and VIIRS.

Question 5: Is there a way to query the LAADS DAAC data through code (an API)?



Answer 5: Not really but you can download from the archive without searching. There is also an option to access data using OpenDap server.

<https://ladsweb.modaps.eosdis.nasa.gov/opendap/>

Question 6: Will VIIRS aerosol products be available via OPeNDAP so that tailored URLs can be constructed to pull specific datasets?

Answer 6: Yes, <https://ladsweb.modaps.eosdis.nasa.gov/opendap/>

Question 7: Does this portal allow near-real-time data download? Also, let me know if we can automate the downloading for continuous monitoring / forecasting purposes.

Answer 7: The following link provide details on NRT data sets and respective ways to download the data

<https://earthdata.nasa.gov/earth-observation-data/near-real-time/download-nrt-data/viirs-nrt>

Operational data streams can be behind 2-3 days. NRT data stream uses the same algorithm, but it uses slightly different data. 1-3 hour latency. Worldview will be available in NRT for display and visualization.

Question 8: Are the NOAA AOD/ADP products on a fixed grid (same cell size everywhere and/or same centroids for every overpass)?

Answer 8: No, they are pixel based data. The locations of the pixels will change from day to day. Resolution for VIIRs will change given the location on the swath by a factor of 2.

Question 9: For 5 yrs temporal change, which month data is to be taken so that 5 yrs analysis can be done?

Answer 9: Recommend all the months of the year for that type of temporal analysis.

Question 10: For a daily average data which of the data should one use. MODIS, Aqua, Terra or combined?

Answer 10: Daily averaged over Terra and Aqua will give you a more accurate value. This will allow at least two measurements per day.

Question 11: With the NASA L2 AOD data there is an aerosol type flag that has dust and also 2 smoke flags. Are they the same as the NOAA dust & smoke flag i.e. calculated in the same way?



Answer 11: No. NASA L2 has an Aerosol flag, and basically says the model used to retrieve. NOAA has a different algorithm and different product to detect dust/smoke

Question 12: The VIIRS DB aerosol product seems to retrieve AOD over both land and ocean. But, I believe for MODIS, DB products retrieved AOD over land only. Could you please provide some insights on this?

Answer 12: True. MODIS DB came along late in the satellite mission life. Operational algo was DT. The DT ocean product is very accurate. VIIRS aerosol DB gives AOD over land and ocean. The algorithms are different.

Question 13: In the second algorithm (calculation of PM_{2.5}), where do we define the area that we want to run the analysis?

Answer 13: In the code, it takes input of AOD from the file (which has the area (slope and intercept). This is for qualitative purposes. You should always use locally derived slope and intercept for better accuracies.

Question 14: Is there an advantage to running the ipynb files in Google Colab instead of Jupyter?

Answer 14: No, no advantage. They should run using Jupyter if the NASA ARSET git repository can be accessed. You may have to make changes on the file path to your local machine.

Question 15: Mapping, export (csv) and this kind of activities can we do in panoply?

Answer 15: Yes, Panoply can be used to create maps of these data as well as export as a csv. The file and data format may be different than these python scripts.

Question 16: How is level 3 data produced and how is it decided which algorithm will be used?

Answer 16: L3 are produced from both algorithms (DT and DB). L3 is derived by averaging L2 data over different time and spatial scales. Ex, daily mean, or monthly average.

Question 17: Instead of the index can we have the actual values? What would be the units of measurement?

Answer 17: AOD is unitless.



Question 18: Do we have to install necessary libraries each time we run the code in Google colab?

Answer 18: No, if re-running the code, the first two cells (accessing the git repository/Google file stream, and loading the libraries) only need to be run once each session. It saves that information.

Question 19: Where can we find the methodology on calculating the area-specific slope to convert AOD to PM_{2.5}?

Answer 19: We have training materials (webinar recordings, ppts) on the ARSET webpage under past series. Link: <https://appliedsciences.nasa.gov/join-mission/training/english/satellite-remote-sensing-particulate-matter-air-quality>

Question 20: In order to establish PM_{2.5} data by utilizing AOD data, should I have ground measurements to establish a regression model? What if the ground data doesn't exist in that area?

Answer 20: You will need ground measurements to form regression equations. In other methods, global or regional models can be used to scale the AOD to PM_{2.5}, so you may not need ground measurements. See more details here - <https://appliedsciences.nasa.gov/join-mission/training/english/satellite-remote-sensing-particulate-matter-air-quality>

Question 21: Does the AOD demonstrated include the columnar integrated value? If so, how do we get the AOD value corresponding to the height we need? Does this value include optical thickness of clouds or PM >2.5 micrometers?

Answer 21: Yes, AOD are columns integrated from surface to top of the atmosphere. It will be the entire column (not by atmospheric layers). There are other sensors/data products (i.e. CALIPSO) which may have vertical profiles of AODs, but its coverage is limited.

Question 22: How do you compare VIIRS data with Sentinel 5p data?

Answer 22: Temporally, they make measurements within 5-minutes of each other. Depending on data product resolution and application, a spatial and temporal collocation of data required for the comparison.

Question 23: Is it possible to run the jupyter from my computer as against google drive? And what is the disadvantage of doing so?



Answer 23: The codes should run using Jupyter if the NASA ARSET git repository can be accessed. You might need to change the file paths where the fileList.txt and data files are located, and/or where you are saving the maps/files. See previous question on this as well.

Question 24: Can we detect the impact of Tropical cyclones over the Bay of Bengal on Aerosol properties through VIIRS?

Answer 24: Models are often preferred in these types of analysis. Also, remember aerosol (from VIIRS) data is not available under cloudy sky.

Question 25: In order to match with ground measurements, should I convert the data time which is originally using UTC into regional time to follow ground measurement time?

Answer 25: Yes. Always ensure they are representing the same time standard.

Question 26: How often is a city captured by either MODIS or VIIRS in a month?

Answer 26: Typically, MODIS will capture every 1-2 days. VIIRS is daily. But VIIRS aerosol data may not be available all the time due to potential cloud cover. 8-10 days in a month is a typical frequency for VIIRS.

Question 27: Can you please mention the time of measurement in both Terra and Aqua?

Answer 27: Terra is 10:30 Local solar time, Aqua is 13:30. Its equatorial crossing time.

Question 28: How do we get the AOD value up to a particular height for estimating PM_{2.5}? Is the AOD in LAADS DAAC column integrated value? Does it contain optical depth of particles other than Pm_{2.5}?

Answer 28: See previous (Q21) answer.

Question 29: Is there any algorithm that might be used to get PM_{2.5} from AOD for quantitative analysis?

Answer 29: Yes, there are many research attempts and products available globally and regionally. NOAA has an algorithm that converts AOD to PM 2.5 (Aerosol Watch). NASA does not have an operationally PM_{2.5} product.



Question 30: Please point me to references where I can find the intercept and slope values for converting AOD to surface PM_{2.5} concentration (and/or AQI) for a particular region, for example, the Midwestern US.

Answer 30: Unfortunately, there is no such database. A literature survey with more detailed topics.

Question 31: What are the advantages/disadvantages of using the data that are in GEE instead of how you did today in the demonstration today (ipynb files and Google Colab)?

Answer 31: GEE uses the cloud for the processing. You do not have to download the data. It also has GIS capabilities. Not all Level 2 & 3 are available in GEE.

Question 32: Can comparison of AOD between CALIPSO and VIIRS possible? If yes, what parameters need to be considered?

Answer 32: Yes, there are published studies on the topic.

Question 33: Is there some documentation on the NOAA aerosol detection product (smoke/dust) explaining how it is calculated?

Answer 33: Yes, in the ppt, we have a slide and a link to a presentation to the algorithm and a link to the documentation.

Question 34: How can I get repositories of fire hot spots and early warning systems of fires by running a code like the one you demonstrated?

Answer 34: Fire data are available in NRT from NASA FIRMS.

LINK: <https://earthdata.nasa.gov/earth-observation-data/near-real-time/firms>

Question 35: Is there difference between terra and aqua modis (is it only ascending and descending pass)?

Answer 35: Both sensors are identical. Same channels, resolution. The time of measurement is different. Calibration per channel may be different. Data record is different. One has been up longer.

Question 36: Do you know when NASA has planned the MODIS Aqua and Terra shutdown or the end of these missions and their data delivery?

Answer 36: 3-5 years of MODIS is expected, it depends on the fuel left.



Question 37: How can we relate VIIRS AOD products and Carbon emission from fire?

Answer 37: VIIRS AOD include emissions from fire. There are many factors so that needs to be considered.

Question 38: How is better quality in VIIRS data achieved?

Answer 38: Each VIIRS pixel where AOD is retrieved and reported, a corresponding quality assurance flag is reported. This flag will allow users to select data filters as per their need.

Question 39: Can we run a deep blue algorithm to retrieve AOD? If we can, where can we access the algorithm?

Answer 39: The algorithm is run by NASA and data are produced. The algorithm itself may not be available in the public domain.

Question 40: If AOD measurements are poorly correlated with ground-based, air-breather-level ambient measurements, why are more AOD data being collected? Tuning the AOD results to ground-based monitors through data processing isn't very scientific. AOD and ground-based data are different measurements - how are the limitations of AOD data for assessing health exposure being clearly communicated? More data isn't always the best solution!

Answer 40: We collect atmospheric aerosols data to study their impact on the earth-atmosphere system in many different ways. There are uncertainties in the retrievals, which are improving over time.

Question 41: Is there a program or script available to easily pass VIIRS SDR (and/other downloaded VIIRS NetCDF data) into a raster that could be used in another program? I mean extract the different bands in the NetCDF. If yes, could you share the link?

Answer 41: Yes, when you download the nc data, there is a post processing option before you order the data where you can set these parameters as well as the file format.

Question 42: Can we say that there is a quality difference between data from VIIRS SNPP and VIIRS NOAA?

Answer 42: The sensors are identical. The dataset can differ on the calibrations, but they are processed using the same algorithm.



Question 43: Is it possible to download the data from NASA or NOAA using these python notebooks? Are they only reading the files we already saved into google drive or github?

Answer 43: No, these notebooks do not download data. To download the data, you can use the websites discussed during the webinar. Right now, these codes only read the files we have placed in the Github repository. If you want to use different VIIRS files, you would need to:

1. Edit these codes to access your own google drive instead of the ARSET repository
2. Create a fileList.txt file that contains the filenames of you files (one on each line)
3. Edit the codes to access your data files and fileList.txt file

These are minor edits overall.

Question 44: How do I change minimum, maximum longitude and minimum, maximum latitude in the code from Colabratory?

Answer 44: I'm not sure which code this is referencing, but you can search for these terms within the codes to see where they are. Look for the boundaries data in the code.

Question 45: These codes only process one day data. How to use these if we have to process long term data? Like to look into the average AOD over a city for the last 10 years.

Answer 45: Right now these codes are written to prompt a user as to whether they want to process each file listed in fileList.txt. You can remove this prompt, and the codes will loop through each file. You can change this file list. These changes are minor adjustments.

Question 46: Trying to make my question more clear: does NASA or NOAA provide python scripts to automate the download of data for VIIRS or MODIS?

Answer 46: Not a python script but there are scripts available in LADSWEB. OpenDap Server is an option you may want to explore. AI access.

Question 47: Do you have a link or script to extract VIIRS SDR band into raster?

Answer 47: No. The LADS website should give you the option to download in raster.



MODIS to VIIRS Transition for Air Quality Applications

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Question 48: Are there any high resolution datasets available/in planning for the future from VIIRS, for urban/microscale studies? As in the past we have seen Monsoon Asia Integrated Regional Study (MAIRS) datasets from MODIS (then distributed via Giovanni 3).

Answer 48: The highest res in VIIRS is 750m. Eventually VIIRS will be available in Giovanni, but at a coarser resolution initially.

Question 49: Scripts are exclusively run in colaboratory? Can they be run in jupyter notebooks directly in anaconda i.e.?

Answer 49: The codes should work as long as they can access the NASA ARSET git repository. You will likely have to change some of the paths (i.e. where the maps/csv files are saved).

Question 50: How can we validate the data that it is reliable for a specific region?

Answer 50: The science teams do their own validation and you can find that information from their corresponding websites and publications. It is a good idea to do your own validation in your area with ground measurements. Spatial-temporal collocation is necessary to compare satellite and ground measurements.