



## Questions & Answers Session 1

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 Amita Mehta ([amita.v.mehta@nasa.gov](mailto:amita.v.mehta@nasa.gov)).

Question 1: In terms of Image processing, how different is to process an image from Landsat 7/8, compared to a Sentinel 2A/2B image?

Answer 1: Level 1 to Level 2 conversions are different for different missions. So we will see next week that in SeadAS you can do Landsat 8 image processing through GUI but Sentinel are not available right now in SeaDAS. For each mission, level 1-2 conversion is special. That's where there's mission specific metadata going in. Africa can also add to these answers.

Question 2: How would one incorporate reflectance from the substrate in optically shallow waters, when attempting to predict water quality?

Answer 2: from satellite data Chl-a is used as proxy for HABs, but we cannot identify species clearly. However, there is work trying to map Phycocyanin: however, you need specific bands that most optical sensors do not carry. It has to be a specific width, and one of the sensors Amita presented used to have this information, but it isn't currently collecting data. That's a limitation, and that's why chl-a is used as a proxy. Species identification is usually done in situ because we don't have the spectral info to identify most of the time. But if you have appropriate spectral bands, in theory, you could ID phycocyanin.

Question 3: What is the solution for Landsat 7 imagery data gap problem? for which region, the problem exists? Which satellite is good for precision farming (NDVI)?

Answer 3: When there is an imagery gap, there's an overlap between 7 & 8 and you can use 8. There's lines that appear in Landsat 7 ETM+ images. There's no way around it - you can remove certain parts of the image. 7 & 8-based NDVI are available, but you have to be aware of the gaps. Those lines that appear in ETM+. Once you're aware of that, wherever there is actual data, you can interpret that as actual data (NDVI in this case).

Question 4: Could there be mathematical derivations to segregate the water quality parameters from each and every sensor, even if we have accessed data from a combination of sensors?



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Answer 4: Actually, what we did was - this was just one sensor we looked at - MODIS Aqua. In principle, you could have a derivation for each one. Each has different spatial and temporal resolution. Mathematical expression of relationship would be derived for each sensor separately. It's the final that you could combine from different sensors.

Question 5: How does one open the .nc files for the ocean color exercise? My computer cannot open them once they download. Is there a program required for these?

Answer 5: SeaDAS. NetCDF files - there is a software. For now, keep the file, we'll open them using SeaDAS next week. You can use any GIS software - QGIS (open source), python, R software - also a software by NASA called Panoply you can download. Panoply information: <https://www.giss.nasa.gov/tools/panoply/download/>

Question 6: Can I use Landsat 8 and Sentinel 2A to determine sediment in river water body.

Answer 6: yes, it is possible, please check:

[https://www.researchgate.net/publication/325650885\\_Historical\\_and\\_Operational\\_Monitoring\\_of\\_Surface\\_Sediments\\_in\\_the\\_Lower\\_Mekong\\_Basin\\_Using\\_Landsat\\_and\\_Google\\_Earth\\_Engine\\_Cloud\\_Computing](https://www.researchgate.net/publication/325650885_Historical_and_Operational_Monitoring_of_Surface_Sediments_in_the_Lower_Mekong_Basin_Using_Landsat_and_Google_Earth_Engine_Cloud_Computing)

Note: you do need initial in situ measurements, then you can use that information with satellite images that come now and in the future. In the last week, we'll work with in situ data to do those calibrations, but it can be site specific.

Question 7: Following the exercise handout, the Giovanni page wants me to select two variables before it will plot. I've selected Chlorophyll a concentration (MODISA\_L3m\_CHL v2018) as per the handout. What else needs to be selected?

Answer 7: One variable should work if you're trying to do time series or map. If you're doing differences, then it will ask for two variables. For the time average map, if it's asking for more than one time, you can select two consecutive months.

Question 8: How can we distinguish between harmful algal blooms to the most common similar i.e water Hyacinth in satellite data?

Answer 8: Related to q2. Mentioned phycocyanin - a pigment in cyanobacteria. But to distinguish between different HAB species, that's still more challenging and you'd need in situ observations to do that differentiation. We do as much as we can to differentiate between algals and HABs using chl-a and phycocyanin.



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Question 9: For next week, using SeaDAS. Will we need to use the science data processing code?

Answer 9: Not going to use the science data processing code, but we'll show how to do that in the third week.

Question 10: Could we create innovative products based on the data that is collected from this tool? That is could we be able to integrate multiple applications together to fetch the final derived solutions for apps?

Answer 10: You can have innovative products based on data collected. It's possible, you just have to be careful how you interpret your results. Once you validate, you can derive relationships between in situ data and combination of band products if you like.

Question 11: we only have to download the OC and the SST?

Answer 11: Yes, we'll use them in week 2.

Question 12: can this tool be useful for the big pollution issues other than HABs for rivers (flowing water)other than lakes? Can we determine the chlorophyll content of inland lakes using this data?

Answer 12: Yes, you can use this type of information to monitor sedimentation and chlorophyll in inland lakes. But you need to be careful of spatial resolution. Maybe Landsat and Sentinel 2 will be more appropriate than MODIS or VIIRS. It does depend on size of reservoir. Recommended you have 3 clear pixels in your water body. For small water bodies, Landsat & Sentinel 2 would be better.

Question 13: Can we determine the chlorophyll content of inland lakes using this data?

Answer 13: Yes - in the last week, we'll see how to do specifically that. Using Landsat data, again, you have to be careful of spatial resolution and algorithm. The products we're seeing today are ocean color products and already generated information that has been generated for the ocean. Even though we have data for large lakes (like Victoria), the algorithms that are behind it are created for the ocean. That's why calibration is needed and the SeaDAS app we'll see later has the capability to do that calibration later with in situ data. Yes, you can use satellite data to monitor chlorophyll in inland water bodies. Algorithms are based on ocean color data, and in situ data came from SeaBASS data, etc, not inland lakes. You can use that for inland lakes, but you need more accurate information. Then you can derive an algorithm using satellite data and in situ data.



Question 14: Can the following water parameters be detected too through remote sensing - conductivity, total suspended solids, nitrate, sulphate, total dissolved solids, turbidity, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, ammoniacal nitrogen and phosphate?

Answer 14: Total suspended solids - yes, you can look at it from satellite data. (See the [Intro to HABs ARSET training!](#)) As long as it affects color properties of the water, it's possible to monitor. Otherwise it isn't possible. For e.g., chemical oxygen won't affect optical properties, so it won't be able to measure from satellites. So Phosphate-sedimentation that changes the color of the water - something that doesn't change color (oxygen, etc.) you cannot. Total dissolved solids, only if they change color of the water. Dissolved organic matter will change color. Color can change from a number of parameters. So in situ data is important to clarify what's going on. Just remote sensing, by looking at color, may not give you accurate information if they're all presenting high quantities.

Question 15: What is the least spatial extent of an inland lake at which its water quality data can be downloaded on Giovanni?

Answer 15: You will not see most of the lakes because the data is Level 3 at 4 km resolution. Any lake that is bigger may appear as 1 grid box, so Giovanni isn't ideal for small lakes. Lake Victoria is a big lake, so you can see it. Great Lakes can be seen. But for smaller lakes, you won't see them in Giovanni. In OC, swath Level 2 data, you may be able to resolve more lakes. But even then, the data, if it's more than 1 km<sup>2</sup> you can maybe see it. But to derive info, it's better to use Landsat data if you have small lakes.

Question 16: Can this tool help determining the toxic metals, or high metallic pollution concentration in fluvial bodies?

Answer 16: Again, it depends on if it changes the color properties of the water. You would need in situ observations to determine if it's due to metals or other constituents in the water.

Question 17: does the depth of water deep or shallow affect determining the HABs and chlor proxy?

Answer 17: Good question - yes, usually how the products are derived is you don't use the pixels along the shores because they interfere with the bottom of the water body. Instead of measuring chlorophyll or sedimentation, you're measuring the bottom of the water body. So, those matter, but we're assuming we're measuring what's on the surface of the water. When a satellite sees reflectance - if it's surface reflectance, there's no problem. But if the water is so shallow water can go in, and get reflected by



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the bottom of the water body, you're misinterpreting the reflectance. A good parameter to use for this is the KD490, which measures how the light dissolves in the water column. You can see how the water is travelling, most likely from where you're getting your measurements. But we assume you're measuring from the surface of the water. Make sure it's pure water where you're looking and there's no water from along the shore.