



Questions & Answers Part 2

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 Sean McCartney (sean.mccartney@nasa.gov) or Amita Mehta (amita.v.mehta@nasa.gov).

Question 1: How can SWOT altimetry be leveraged to detect and monitor the influence of the 18.61-year lunar nodal cycle on tidal heights and wetland hydrology in mangrove-dominated deltas like the Sundarbans?

Answer 1: SWOT observations are not recommended for this, as the length of the data record will not resolve long period tides.

Question 2: I thought on Tuesday it was said there are observations every 21 days?

Answer 2: It is true that a single pass will occur over a given location every 21 days. However, an alternative pass may pass over that same location between repeats, providing observations at higher temporal sampling.

Question 3: Is WISP valid over the USA only?

Answer 3: Yes. SWOTviz is global however.

Question 4: What is the difference between node and reach?

Answer 4: SWOT River products are provided along predefined stretches of a river (a reach) and along points of a river (nodes), using a prior river database. The measurements are computed with the use of an algorithm that determines which pixels from the L2_HR_PIXC product should be attributed to each reach, then aggregates the pixel measurements accordingly. The locations of the reaches are defined by river centerlines and are typically around 10 km long, with boundaries chosen in consideration of features such as confluences and dams.

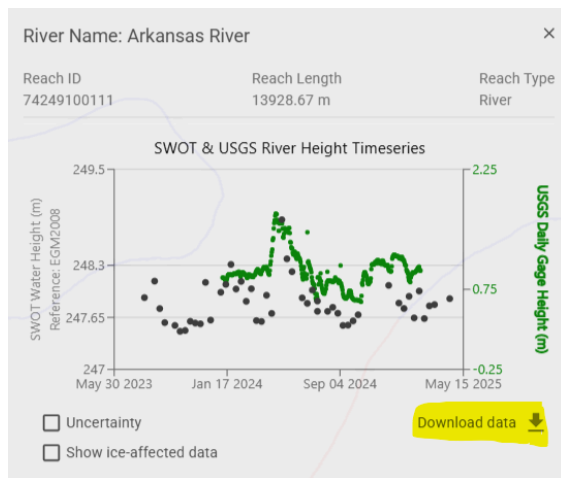
Question 5: How is the reach vector dataset generated? Is it based on the National Hydrology Dataset (NHD)?

Answer 5: The details of the vector dataset generation can be found in the [SWOT user handbook](#) and the [River Vector Product Description Document](#). SWORD: <https://www.swordexplorer.com>



Question 6: How to get the historical data from WISP? From when has it data?

Answer 6: WISP displays data throughout the entire record of available SWOT data, but within the pop-up charts we apply some basic filtering removing 'bad' and 'degraded' quality data. All valid SWOT elevation data available through Hydrocron is accessible in WISP through the data download feature. We also display USGS water stage data collected at a gaging station, which has historic and real-time data available through the links provided on the pop-ups and downloads. Historic records for USGS remote sensing of river discharge data in Alaska, and for satellite altimetry from [Global Water Measurements](#) can be accessed by clicking the download data button on the pop-up.



Question 7: I'm wondering how to change elevation data to the datum we are using. In this case of Finland the datum is called N2000 (we change the datum regularly because of post-glacial land uplift-update of datum app. every 30 years).

Answer 7: We cannot give instruction on transforming the data to that specific datum, but the relevant information on SWOT's reference frame can be found in [this document](#), and the [accompanying webinar](#) provided on the PO.DAAC YouTube.

Question 8: What data product is WISP visualizing?

Answer 8: WISP is visualizing SWOT Level 2 Hydrology Data on SWOT-observable river reaches, river nodes, and lakes. WISP also displays real-time water level data collected at [USGS gaging stations](#), as well as [satellite-based river discharge in Alaska from historic altimetry data](#), and altimetry data from [NASA's Global Water Measurements site](#).

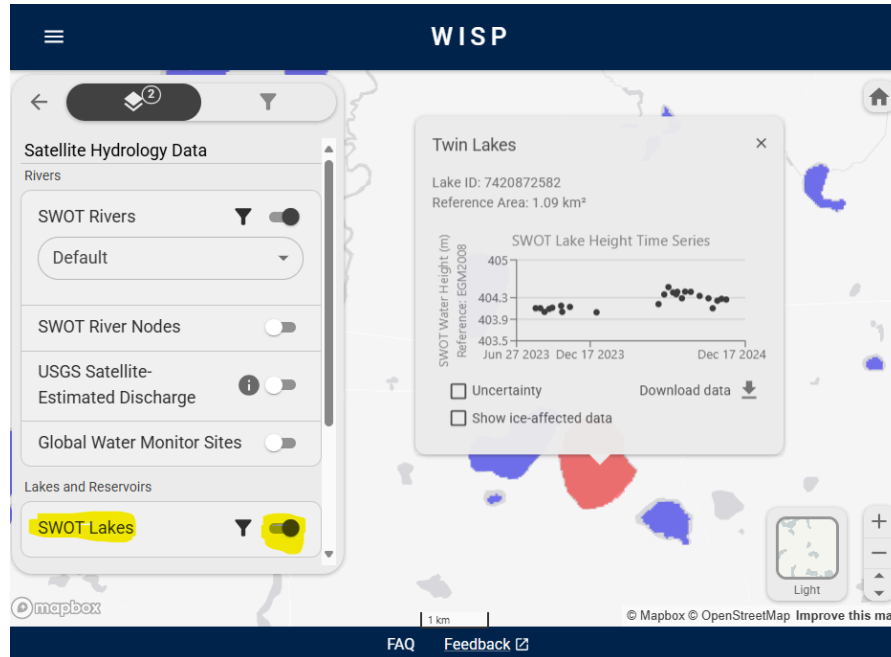
Question 9: Is it possible to access the cloud burst data using SWOT?



Answer 9: It is possible to access it. We do not display that data within WISP, but there are tools to access this using the [SWOT Cookbook](#). Refer to Part 1 of this webinar series.

Question 10: Does the WISP portal provide real-time data over lakes?

Answer 10: Yes! We do apply some basic filtering of SWOT data in the pop-up charts, but lake data is available.



Question 11: Can WISP be integrated into ArcGIS?

Answer 11: We did not design WISP to have an API, but you can integrate Hydrocron data within ArcGIS and there are shapefiles that you can download from PO.DAAC to integrate into ArcGIS or other GIS software.

Question 12: In WISP, there is a huge gap between the SWOT water height (m) and USGS daily gage height (m). Why is there a gap?

Answer 12: We are displaying a relative time series of SWOT and USGS data in reference to different datums. The result shows two different time series instead of a combined correction, resulting in gaps.

Question 13: In the case of large lakes with important changes in depth, how do WISP calculate the lake water height? Is it an average of pixels?



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Answer 13: WISP directly takes SWOT data from Hydrocron and the elevations are an average of data taken from a lake surface. The [product description document](#) and [user handbook](#) can also provide additional information.

Question 14: In SWOT Viz, there are regions with densely packed river reaches and regions with almost negligible river reaches? What can be the reason for this? If this case is correct, can we get information where the regions are having no river reaches?

Answer 14: SWOT produces river data products anywhere there are reaches defined in the SWORD dataset (<https://www.swordexplorer.com>). SWORD reaches are defined based on where rivers were visible in Landsat, based on similar approaches to the [GRWL dataset](#). SWORD and GRWL were both produced at Tamlin Pavelsky's lab at UNC. The actual density of the river network is a function of climate, though: there are typically more visible 50 m rivers in places with greater precipitation, e.g.

Question 15: Is the WSL from the mean sea level?

Answer 15: SWOT measures Water Surface Elevation (WSE), and is defined as meters above sea level, defined relative to the EGM2008 geoid.

Question 16: In SWOT Viz, are there lake levels or just data over rivers?

Answer 16: Lakes are planned to be added to SWOT Viz in future, but are not available at present.

Question 17: When I use SWOT Viz, I often get empty data and the comment "More lake data coming soon". Is there a way to see that before having to click each item?

Answer 17: Lakes are planned to be added to SWOT Viz in future, but are not available at present.

Question 18: Can you explain what granules mean in SWOT context?

Answer 18: It varies based on the data product. There is a lot of really useful information about this in the product handbook.

https://www.earthdata.nasa.gov/s3fs-public/2024-06/D-109532_SWOT_UserHandbook_20240502.pdf

Question 19: When will SWOT Viz incorporate version D of the SWOT data? In the current version C, most datapoints are flagged as "suspect". Will this change in version D?



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Answer 19: This is TBD. Currently, I believe that new overpasses are being produced for Version D, but the “reprocessed” data for Version D going back to the beginning of the mission will not be fully available for a little while. When we transition SWOT Viz for Version D depends upon how quickly the SWOT data are reprocessed for Version D, but likely we’ll do this in the Autumn 2025. And yes, we expect fewer datapoints to be flagged suspect, and more to be flagged good, with Version D.

Question 20: So what is the difference between WISP and SWOT Viz? What is the minimum reach width both of these can cover?

Answer 20: WISP has more features but is only available in the US. SWOT Viz is more lightweight, but is available globally. The science requirement for SWOT is 100 m wide rivers, and the goal is 50 m wide rivers. Both applications show rivers predefined within the SWOT River Database (SWORD), which includes rivers as narrow as 50 m or sometimes slightly narrower.

Question 21: How are the Data Quality defined as Bad, Good, and Suspect?

Answer 21: The data quality flags are set by the river processing, mostly using SWOT observation metadata specific to each observation. So they use SWOT data to indicate the flags. For info on the flags, see the User Handbook, as well as possibly the Product Description Documents for more detail.

Question 22: Are the water level elevations shown in SWOT Viz referenced to mean sea level (MSL), or another vertical datum?

Answer 22: SWOT measures Water Surface Elevation (WSE), and is defined as meters above sea level, defined relative to the EGM2008 geoid. Refer to the previous questions.

Question 23: Can the data from SWOT Viz be downloaded and does it have the ability to help evaluate floodplain prone areas?

Answer 23: SWOTViz data can be downloaded. It is also dependent on the evaluation you are trying to make.

Once you are looking at the data there is a download link.

It is a vector data product.

Question 24: In SWOT Viz, is the data quality from the SWOT water pixel cloud data?

Answer 24: The data quality flags that were displayed were flags set for reach and node products.



Question 25: I noticed that data are mostly suspect, does this influence the accuracy of readings and if so, to what extent does it affect?

Answer 25: The data being classified as suspect is intended to let the user know that the data has some sort of trait that is advised to be treated with caution. Be sure to reference newer data with older data. It is not intended to be negative.

Question 26: Why was the Miles Lake greyed out in the SWOT Viz? Are there no SWOT data for the lake and why is that so?

Answer 26: Lakes are planned to be added to SWOT Viz in future, but are not available at present. Refer to previous questions.

Question 27: Any thoughts on the future of SWOT? Timeline of if/when smaller river/stream systems could be added?

Answer 27: We hope that SWOT keeps flying for many years! Some of the smaller rivers are planned to be added to SWOT in the future as well. You could contact the SWOT Explorer team here: <https://www.swordexplorer.com/>. For a smaller river to be processed within the Level 2 vector hydrology data, it has to be contained within the SWOT database.

Question 28: Will SWOT data also include glacial lakes?

Answer 28: There are a number of glacial lakes that are available in the SWOT lakes product, but the SWOT prior lake data is based on lakes that contain a certain amount of water year round, which isn't the case for all glacial lakes. These glacial lakes can be explored in the unassigned lake data products and the pixel cloud data products.

Question 29: What's the latency for river stages? I mean, how long do we have to wait after the SWOT overpass and the level's availability within this Viz app or elsewhere?

Answer 29: The required specified date is 45 days, but it does not always take that long. SWOT Vizz pulls observations and data from Hydrocron. Based on previous experiences, the data can be finalized in about a week.

Question 30: Can you suggest any resource to deal with SWOT uncertainty? (I plan to process the data myself.)

Answer 30: The answer might depend on exactly what you want to do with the uncertainty. In addition to the product documentation, there is additional information



that you can look at as well. This presentation includes potential filters to consider:
[04 Wed AM Stuurman riverWSE](#).

Question 31: Is it possible to get lake water surface elevation (WSE) from SWOT Viz?

Answer 31: It will have the capacity in the future to do so.

Question 32: I am not able to use the SWOT Data viewer, are not all rivers available? I tried for northern Ontario, but I am unable to view the data.

Answer 32: If it is in reference to SWOT Viz, some rivers are just not available, which could be the case for your application. WISP data is limited to the US.

Question 33: How can we estimate reach discharge from the SWOT elevation data?

Answer 33: If you are waiting for the river discharge estimates from SWOT elevation data, that effort is currently ongoing and will be available later this year. Although the data is not available yet, an [explanatory video](#) can be found on the PO.DAAC YouTube channel wherein Hind Oubanas describes the derivation of discharge from SWOT elevation observations.

Question 34: Can you give more information on the temporal resolution of SWOT observations on land? What is the highest resolution possible and where?

Answer 34: There is some info in the SWOT river database that includes the number of passes for a given river and the temporal resolution is a product of the amount of observations for a given river system. For the case of the US, most systems are observed around 2 to 3 times per 21 days period. It is also dependent on the water body as well, and waterbody size. Higher latitudes give the highest temporal resolution.

Question 35: How can we download data for all available U.S. lakes at once? Is it possible to do that? Which website is the easiest and most efficient for downloading this type of data? Also, do the datasets generally cover the same time period across all lakes?

Answer 35: WISP displays US lake data, but at this time does not support bulk downloads. To download all of this data at once, we recommend using the [Hydrocron API](#). Here is an example of bulk downloading SWOT data with the API:
https://podaac.github.io/tutorials/notebooks/datasets/Hydrocron_SWOT_timeseries_examples.html.



Question 36: Following up on question 8 (i.e., What data product is WISP visualizing?), I would like to know the actual product since there are several Level 2 SWOT data products.

Answer 36: We will include those exact citations in the final document.

RiverSP:

Question 37: I saw that WISP covers big rivers like Rio Grande in New Mexico. I am wondering if there are any resources for small rivers like Santa Cruz which I see are not covered by WISP.

Answer 37: WISP is only displaying links in the SWOT river database. There will be options in the future to include those additional products. There may also be a chance that the river systems are too small to display in the overall product.

Question 38: Given SWOT's 21-day revisit cycle, how suitable do you think it is for capturing transient coastal processes like storm surges or river plumes?

Answer 38: It measures a given reach on average 2-3 times per 21 day cycle, so no it is not able to resolve ~hourly tidal processes. However, note that the orbit was chosen to be non-tidal-aliased. So you capture the tide at different points in the tidal cycle with each new SWOT overpass. As I showed earlier, the slope at different points in the tidal cycle is resolvable and possibly useful for such applications.

Question 39: What tools do you use to convert SWOT elevation to USGS gauge elevation?

Answer 39: Within WISP, we are not converting SWOT elevation to USGS gauge elevations. If you want to convert data, you can use the VDatum tool created by US National Oceanic and Atmospheric Administration (NOAA):

<https://vdatum.noaa.gov/docs/services.html>. Here is a workflow using GDAL as well, created by Katie McQuillan: [SWOT Validation/Scripts/usgs_to_swot tutorial.ipynb at main · kmcquil/SWOT Validation · GitHub](#).

Question 40: Does SWOT need atmospheric corrections?

Answer 40: Yes. SWOT has an onboard radiometer and this data is also available on PO.DAAC. The LR products are distributed with a dynamic atmospheric correction, which varies depending on which product the user is pulling.

Question 41: Based on the review of some recent works on SWOT, it can be observed that the meridional component of the currents does not provide



significant contributions, unlike its zonal component, which offers more precision. Why is there this difference between the two components?

Answer 41: With SWOT, we are resolving fronts that have previously not been resolved. I would tread with caution calling them geostrophic velocities, but this is an active area of research.

Question 42: Why are some data flagged as 'suspect'? I have looked on a yearly basis, but I found mainly 'suspect' data, and large variation in the elevation. It is true that weather is chaotic, but how could we manipulate the data for meaningful analysis? Shouldn't we be having weather multilayer integrated in SWOT Viz? Is the data functional with QGIS (i.e., GeoTIFF)?

Answer 42: Yes, most data are currently flagged as suspect. We expect this will change for Version D data, available this year. However, most suspect data are indeed usable. There are no plans to support staging of other data in SWOT Viz; for now it will remain a lightweight app. HydroWebNext is a visualization app created by the French space agency CNES that includes SWOT data that may be able to combine visualization for multiple datasets. You can download data from SWOT Viz and view in QGIS, but not as GeoTiff, as SWOT Viz only displays vector data (reaches and nodes).

Question 43: What is the datum used to give the SWOT water surface elevation?

Answer 43: Addressed multiple times. (EGM2008)

Question 44: What improvements are expected in future Level 2 (L2)/Level 3 (L3) data releases, especially for coastal accuracy?

Answer 44: L3 LR data is currently being provided by AVISO. There are continuous updates to this product such as masking in coastal regions. Those improvements will also be reflected in the Version D update to the data.

Question 45: Are there any applications (or plans) to display water heights SWOT data inland and ocean from WISP and/or SWOT Viz teams? This may be useful to correct for tidal changes in coastal water bodies.

Answer 45: SWOT Viz and WISP do not currently have plans to display ocean data products or rasters.

Question 46: Is it possible to predict the cloud burst accessing real time data, like quantum computing?

Answer 46:



Question 47: In the current SWOT node version C, only 40% of the data is good quality after applying generic quality flag and bitwise flag and it reduces the temporal sampling by 60%, so my question is in the upcoming version is it going to enhance or if yes than how much more good data we can expect

Answer 47: With improvements to the algorithms used in future versions (such as the forthcoming Version D), we generally expect the amount of data flagged as good to increase.

Question 48: In SWOT Viz there seems there are no discharges. Will discharges be added?

Answer 48: Yes SWOT discharge should be displayed in SWOT Viz in future.

Question 49: The stream networks are split, why? How do I combine the data of a split stream network to a single river?

Answer 49: Yes, in some cases, it was ideal to split the river centerline. For details on the rationale and process, see Elizabeth Altenau's paper on SWORD, linked from the "About" page at SWORD Explorer <https://www.swordexplorer.com/>

Question 50: Does SWOT data support non-perennial rivers?

Answer 50: SWOT will produce river vector products over all rivers in SWORD; some of these are non-perennial, but not a lot.

Question 51: Is it possible to see lat long values over the swotviz

Answer 51: We will consider adding this feature.

Question 52: If SWOT is as precise as traditional altimetry, particularly the measurement at Nadir, can it predict the trajectory of the floats?

Answer 52: The sea surface height derived from the Nadir radar altimeter observation is comparable to that of the reference missions (i.e., Sentinel 6A). From these observations, one can derive geostrophic velocities as is traditionally done from along track altimetry observations.

Question 53: Regarding interpretation of SWOT measurements: if you look at a Reservoir like Lake Mead, which falls across multiple swaths, how would you interpret the two elevations that seem to be nearly simultaneously derived? (around 376m and 356m)

Answer 53: This current version of SWOT data (Version C), may be subject to geoid errors, which could cause consistent discrepancies between different pass elevations.



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Or SWOT data may be subject to other errors, for example if one of the swaths is too far or too close in the cross-track distance, that observation may be prone to high errors. Ideally the cross track distance is between 10 km and 60 km on either side.

Question 54: If we need a more frequent repeating cycle dataset, what would be the solutions? I think there are some trials to apply ML or AI approaches to predict those between dataset. Could you provide insights into current trends and widely adopted technologies in AI-based data enhancement methods for improving spatial and temporal datasets across these fields?

Answer 54:

To improve the temporal resolution of SWOT– I think the strategies may be different depending on the local hydrology of the system, and the current and desired frequency of the observations. Some options might be to integrate SWOT elevations, either through data assimilation or other techniques, into models that run at higher temporal resolutions, such as a daily hydrologic model. Multi-sensor fusion is another approach, for example, integrating SWOT data with other products, such as the [Dynamic Surface Water Extent product \(DSWE/DSWx\)](#) to obtain more frequent observations of changing surface water dynamics.