Questions & Answers Sessions

Please type your questions in the Question Box. We will try our best to answer all your questions. If we don't, feel free to email Erika Podest (erika.podest@jpl.nasa.gov), Jungie Liu (junjie.liu@jpl.nasa.gov), Jackie Ryan (jacqueline.ryan@jpl.nasa.gov) or Karen Yuen (karen.yuen@jpl.nasa.gov)

Question 1: Will snow and oceans show as black? Could we still see pine trees, or will it come back black, due to snow?
Answer 1: Snow is highly absorbing at the near infrared band, so it appears black. Snow can reduce the amount of light reaching the canopy, weakening the SIF signal. That said, SIF signals from non-dormant photosystems are detected in evergreen needleleaf forests during winter and spring in the presence of snow (e.g., https://doi.org/10.1002/ecy.4402; https://www.jstor.org/stable/48803310). https://esajournals.onlinelibrary.wiley.com/doi/full/10.1002/ecy.4402

Question 2: I am doing a SIF study for different biomes in India. Where can I get flux tower GPP data for different biomes to compare with SIF-generated GPP values?
Answer 2:You can find the fluxtower data at the FluxNet website: https://fluxnet.org/sites/site-summary/. India is also included within the AsiaFlux regional network (https://asiaflux.net) that includes a limited number of sites. You may want to contact tower Principal Investigators (PIs) from AsiaFlux directly for data access and to learn about sites not included within AsiaFlux.

Question 3: Correlation between SIF and GPP tower data within each season does not appear to be strong other than in the fall I believe. This seems to suggest that we cannot reliably interpret changes within a season (even in the summer) as outside the noise?
Answer 3: It is generally true that correlation will decline moving from seasonal to sub-seasonal scale as sunlight becomes a less dominant driver of photosynthesis, but this depends on the location and frequency of the SIF data collected. Locations with uniform vegetation and more frequent sampling are less likely to see degraded correlation within a season. Improving the correlation is referred to at the end of the

notebook. The best comparison is when the tower has photospec (which is relatively uncommon). Filtering by biome type is suggested.

Question 4: What is the difference between Daily_SIF_740nm and SIF_740nm?
Answer 4: Daily_SIF_740nm is the daily mean SIF value which accounts for the changes in solar radiance throughout the day, while SIF_740nm represents instantaneous SIFvalues retrieved from the 740nm band at the local satellite overpass time.

Question 5: What are specific characteristics of each retrieval band? Is there a preference between 757nm over 740 nm?
Answer 5: 740nm is closer to the far-red peak in the SIF spectrum and thus will have a stronger SIF signal. However, the signal reported at 740nm is a scaled value, based on known and stable ratios between SIF at 757nm and 740nm. Measurements at 757 are directly from the instrument.

Question 6: Why do the resulting data visualizations appear as sparse pixels that don't cover the entire study area (assuming we define specific geographical boundaries)?" What methods are used to compensate for the missing data (gaps) in the final map products?"
Answer 6: Ideally, SAM data will appear as a perfect box centered on a pre-specified location. However, in many cases the box can have gaps due to factors such as clouds, aerosols, water bodies, or elongated due to the timing of the SAM acquisition and the position of OCO-3 in its orbit relative to the target location. In cases where data availability is insufficient, this issue can be mitigated through the use of gap filled products (e.g., L3 SIF data).

Question 7: Regarding historical baseline data for regional studies, since satellite imagery isn't available for periods like the early 1900s, could you recommend any key repositories for declassified aerial photography or historical topographic maps that are freely accessible for scientific use?
Answer 7: This will be dependent on the region of interest and the country of inquiry. Early 1900's may be difficult to find.
Historical Topographic maps of the continental United States by USGS are available at: https://ngmdb.usgs.gov/topoview/viewer/#4/40.01/-99.93

As for aerial photography, there does not appear to be a single source that is free and anything that is free appears to be maintained either by country, region or city.

Question 8: Have the measurements been directly acquired from sensors? The lesson seems more advanced now :)
Answer 8: Correct, the SIF data used in the demos are based on actual observations from OCO-3 and from surface sensors.

Question 9: Is it possible to integrate a second variable, such as Land Surface Temperature (LST) or Soil Moisture, with the SIF data to understand the underlying causes of observed changes in vegetation health, beyond just identifying when the changes occur?
Answer 9: Yes. In the first part of the presentation, we showed one example of using OCO-3 SIF and ECOSTRESS evapotranspiration (ET) to quantify water use efficiency. The co-located OCO-3 SIF and ECOSTRESS ET data is publicly available here: https://disc.gsfc.nasa.gov/datasets/ECOCO3_1.0/summary?keywords=ECOCO3_1.0

There are many such studies that combine SIF with other data to understand the underlying mechanisms affecting plant health. Here is one example: https://agupubs.onlinelibrary.wiley.com/journal/19448007

You can find the full publication list for OCO-2 and OCO-3 here:
https://ocov2.jpl.nasa.gov/science/publications/
https://ocov3.jpl.nasa.gov/science/publications/

Question 10: How can we use ECOSTRESS temperature with SIF from OCO?
Answer 10: ECOSTRESS measures land surface temperature (LST) and using OCO-2/3 SIF with ECOSTRESS LST we can determine more detailed information about the vegetation such as water use efficiency. This webpage has more details: https://ocov3.jpl.nasa.gov/oco-3-news/release-of-new-collocated-oco-3-and-ecostress-data/

Question 11: Conda
Answer 11: The repository for the course now has scripts for both Mac and Windows to install the dependencies using conda. They are called “setup-conda.sh” and “setup-conda.ps1” respectively.