

PACE Land data Users' Group

Building capacity and community for PACE's advanced terrestrial observations

WELCOME! Feel free to introduce yourself in the chat!

Agenda:

July 1, 2025

- 1) Welcome and Meeting Overview**, Morgaine McKibben (NASA GSFC/SSAI)
- 2) Tutorial Demonstration: Reprojecting PACE Data & Exporting to GeoTIFF Format**
Skye Caplan (NASA GSFC/SSAI)
- 3) Guest Presentation: Development of a Cloud-based Toolkit for PACE OCI Land Data**
Emil Cherrington (Univ Alabama, Huntsville)



PACE Land data Users' Group: Summer 2025

Morgaine McKibben, PhD
PACE Applications Lead
NASA Goddard Space Flight Center / SSAI

July 1st, 2025
PACE Land data Users' Group



PACE Land data Users' Group: Summer 2025

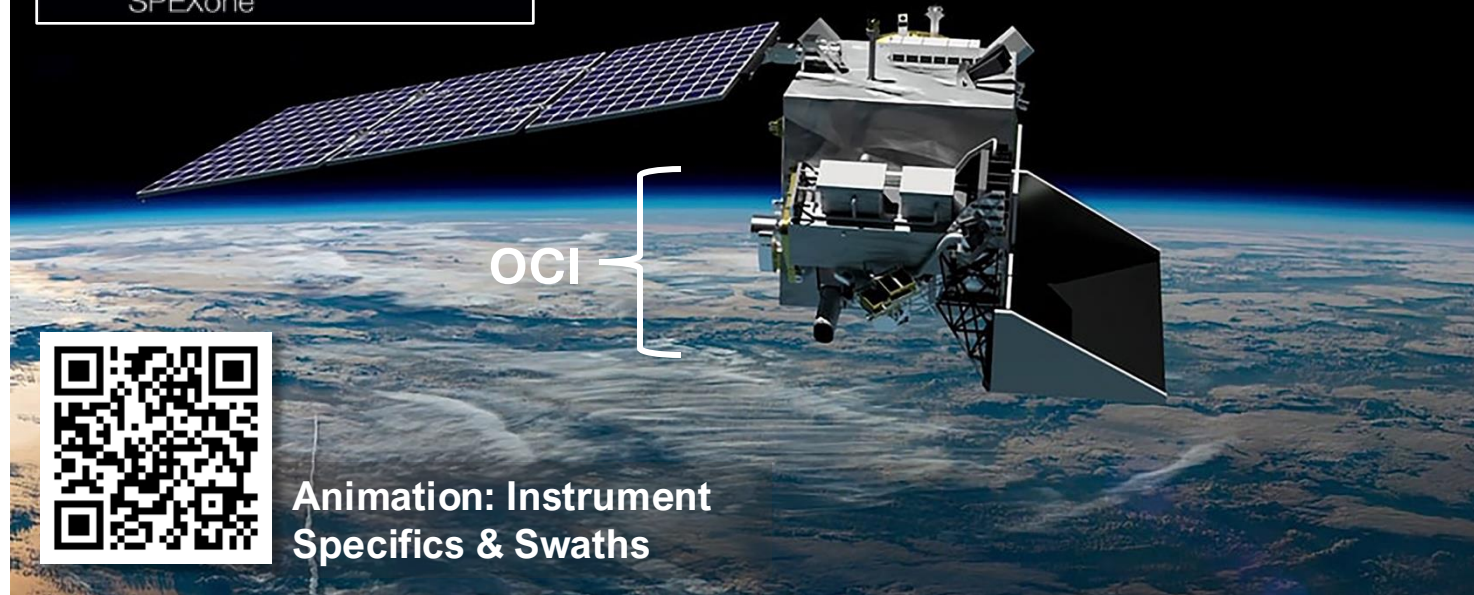
- PACE & this group in a nutshell
- Survey recap from last meeting
- Overview of current capabilities for using PACE data in GIS and GEE environments

Review: Plankton Aerosol Cloud ocean Ecosystem (PACE) Observatory



Launched Feb. 4 2024

First data release April 11, 2024



Watch our first meeting for mission details:

https://pace.oceansciences.org/event_archive/landDataUserGroup.htm

- 1-2 day revisit, global coverage
- ~1.2 km² spatial resolution
- Global, 13:00 local equatorial crossing
- Data products free to all
- **Combined broad hyperspectral + global & high-revisit coverage is unmatched**

3 instruments aboard:

- OCI: Hyperspectral radiometer (UV-VIS-NIR @5nm; 7 SWIR)
- HARP-2: hyperangular/multi-spectral polarimeter
- SPEXone: multi-angular/hyperspectral polarimeter

Science Goals: PACE is advancing & extending ocean biological, ecological, and biogeochemical data records, as well as cloud, aerosol, [and terrestrial!] data records.

PACE provides advanced, hyperspectral-enabled products AND heritage products for land, atmosphere, and oceans.

This meeting focuses on land data products from PACE-OCI (relevant polarimeter products in future as they become available)

NEW, hyperspectral-enabled, only from PACE

- Surface Reflectance (122 bands)
- Photochemical reflectance index (PRI)
- Chlorophyll Index Red Edge (CIRE)
- Carotenoid Content Index (Car)
- Modified Anthocyanin Reflectance Index (mARI)

HERITAGE Terrestrial Indices:

- Normalized Difference Vegetation Index (NDVI)
- Normalized Difference Water Index (NDWI)
- Normalized Difference Infrared Index (NDII)
- Normalized Difference Snow Index (NDSI)
- Enhanced vegetation index (EVI)
- Chlorophyll-Carotenoid Index (CCI)

Full descriptions of products: https://pace.oceansciences.org/data_table.htm#category4

Please review our first meeting for details: https://pace.oceansciences.org/event_archive/landDataUserGroup.htm

PACE Terrestrial Data Product Updates

Please review our first meeting if you are not familiar with our data levels/versions/products:

https://pace.oceansciences.org/event_archive/landDataUserGroup.htm

Current data version:

- Version 3 (same since last meeting)
- Version 3.1 in coming months. Will update group upon release.

You asked, we listened!

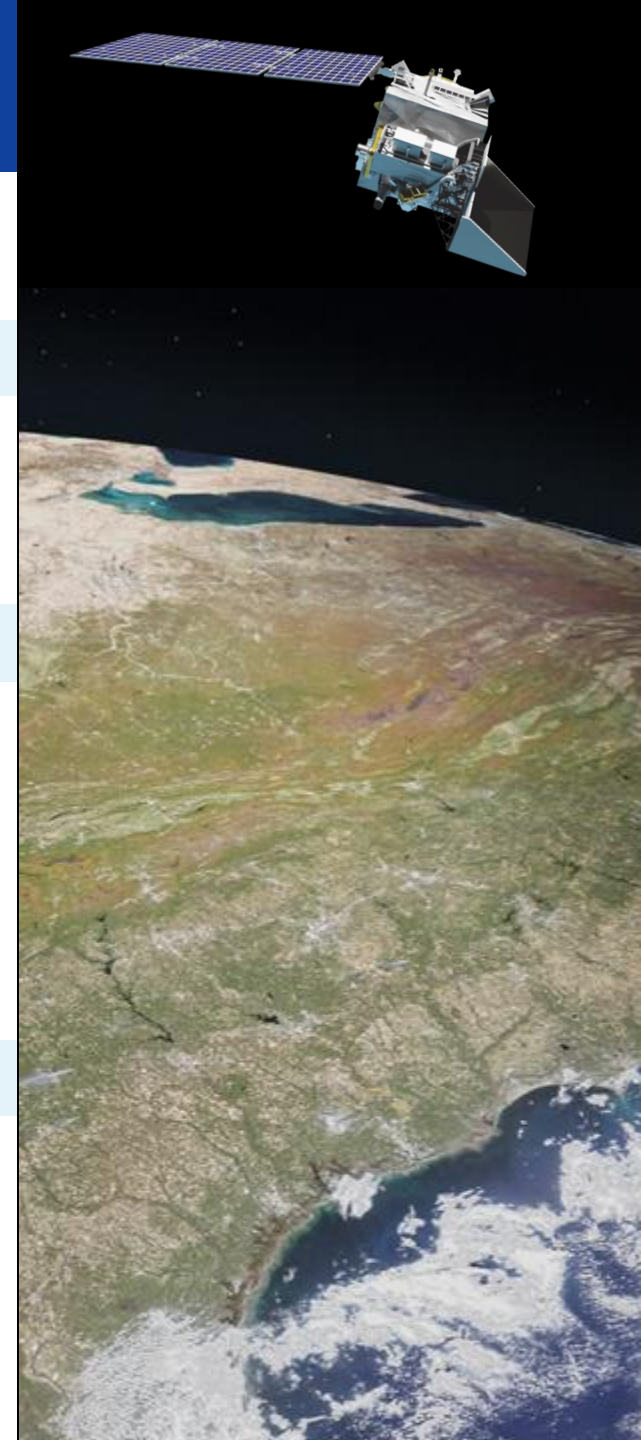
Level 3 mapped land data products now available at 2km; previously highest Level 3 spatial resolution was 4km

- **Forward stream only, for now**, covers only past month or two
- **Full-mission coverage** (March 2024-Present) in next few months

Novel Nitrogen Dioxide (NO₂, Vertical Column Density) Data Product
with *uniquely high spatial resolution (~2km)* in next few months

Presentation from PI + how to access preliminary data:

https://pace.oceansciences.org/event_archive/CoP_Quarterly_Telecon_2025.htm



PACE Land data Users' Group (PLUG)

Building knowledge & capacity for PACE's advanced terrestrial data products

How do I join?

Subscribe to the PLUG mailing list (light on email traffic)

- Email pace-land-community-request@lists.nasa.gov, with “subscribe” in the subject
- Confirm your email address when prompted. Welcome email = success!

How do I participate?

YOU help determine PLUG meeting content.

- Attend our quarterly meetings. Bring your questions!
- Email us if you would like to present! 5-15 minutes, open to content ideas.
- *Respond to short, post-meeting surveys. Your input determines next meeting's content.*

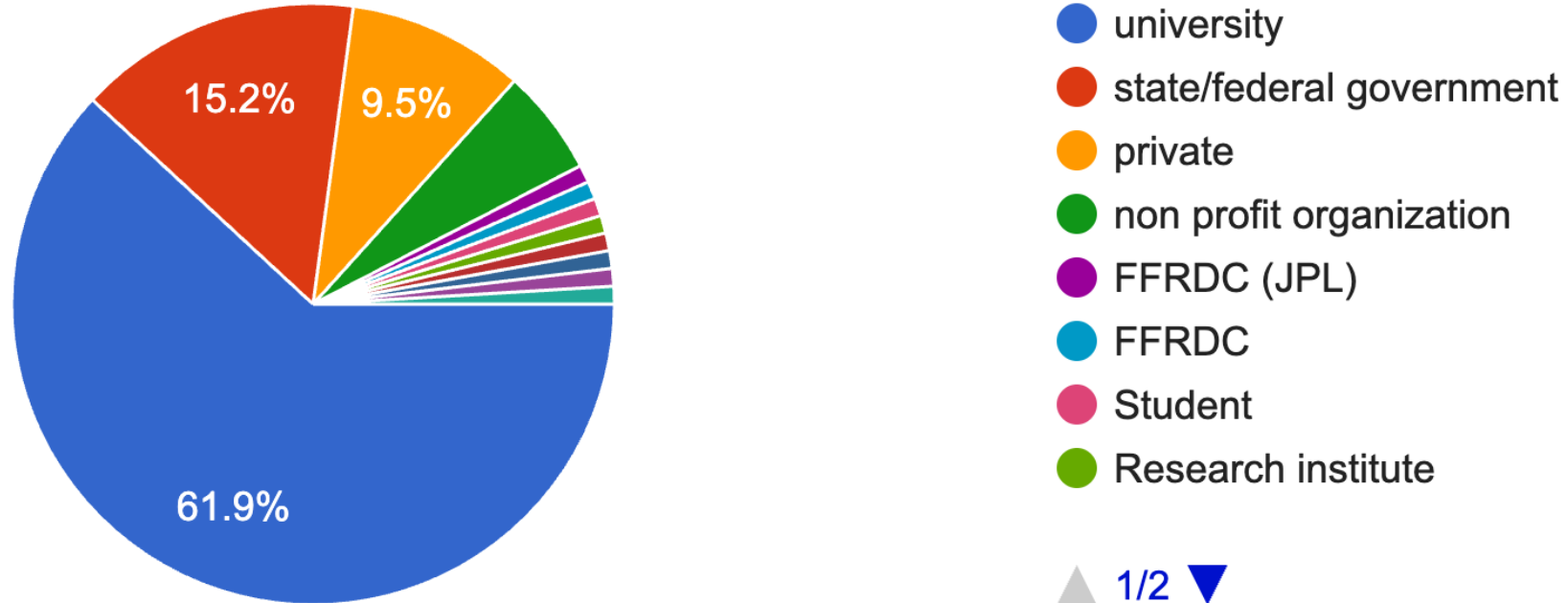
Questions? Feedback? Email: pace-applications@oceancolor.gsfc.nasa.gov



Post Meeting Survey Results

What sector do you work in?

105 responses

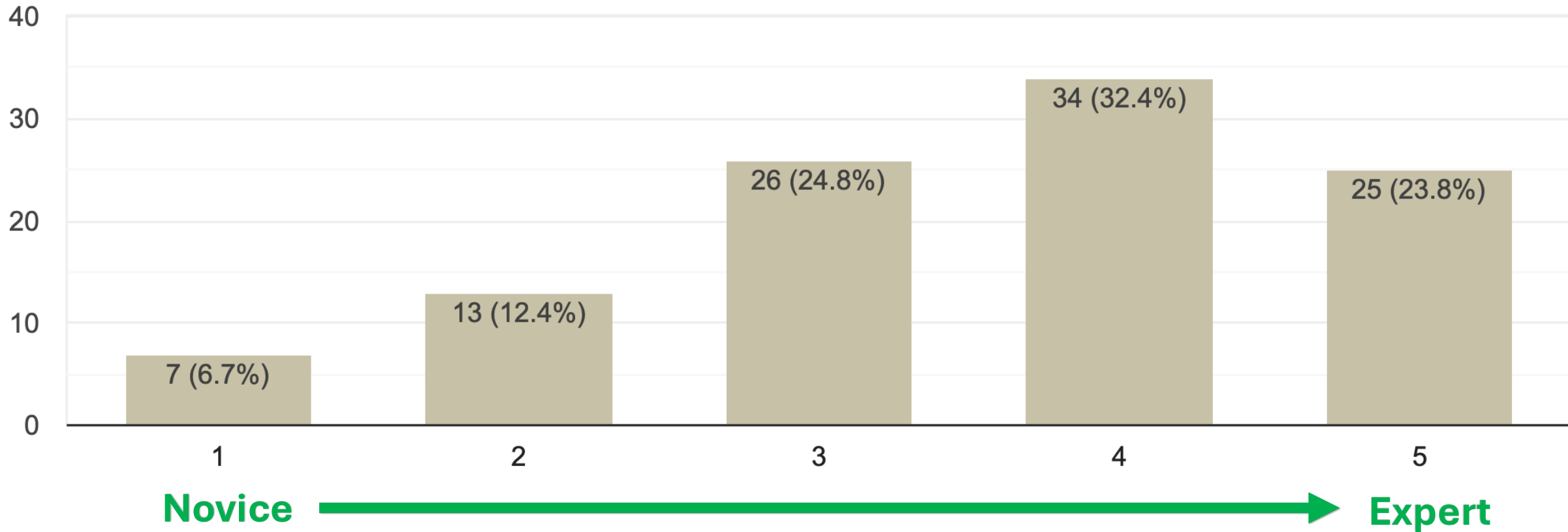


Survey Results: 1st PACE Land data Users' Group Meeting



What is your level of expertise in satellite remote sensing?

105 responses



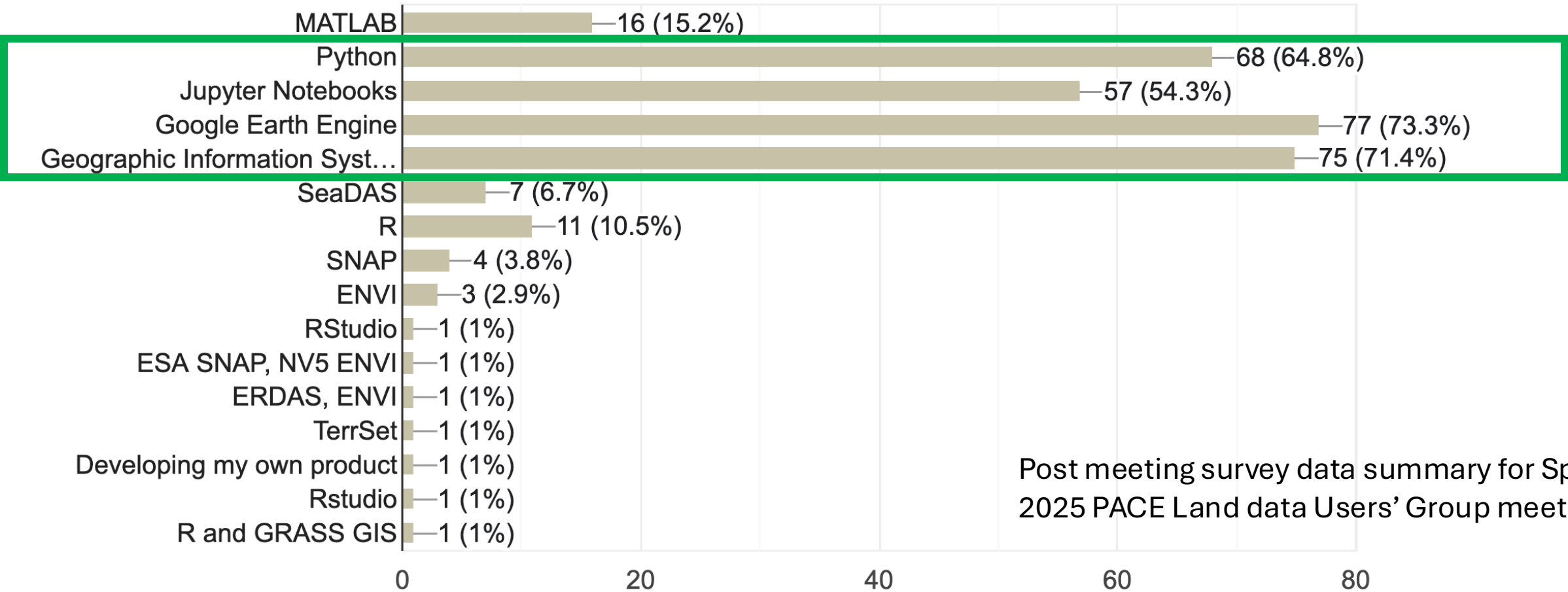
Post meeting survey data summary for Spring 2025 PACE Land data Users' Group meeting

Survey Results: 1st PACE Land data Users' Group Meeting



Which platform(s) do you use to work with satellite remote sensing data? Check the ones you use the most frequently.

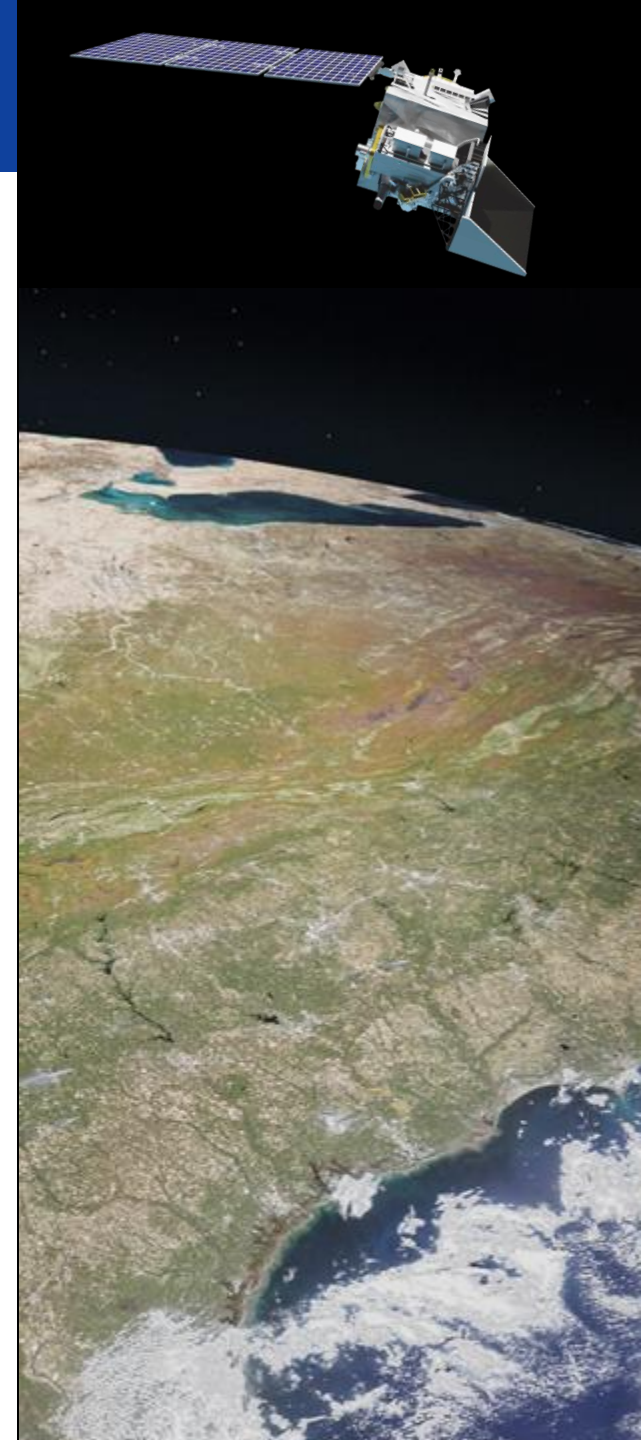
105 responses



Post meeting survey data summary for Spring 2025 PACE Land data Users' Group meeting

Post-meeting survey: Requested topics

- Reproject Level 2 PACE data to Level 3 mapped, export to GeoTIFF → *tutorial today*
- Current capabilities w/PACE in GIS & GEE environments → *today's presentations*
- **More applications and pilot study examples:**
 - **Your turn! You are invited to present at our next meeting. 5-15 minutes, open to content ideas. Email with questions.*
- **Ocean & air quality topics/questions:**
 - *This group focuses on terrestrial data products, but there is overlap in data products, research & applications questions*
- **Less frequent/assortment of related topics** → *stay tuned events, notebooks ahead to address many of these*
 - Beginners' tutorials, utilizing/interpreting new PACE vegetation indexes, considerations to know when using the data, cal/val information
 - Data subscriptions, cross-sensor synergy, data fusion with high spatial/low temporal coverage observations from other satellite



Geographic Information Systems Software



Software examples: Esri's ArcGIS (fee for license), QGIS (free)

Download from NASA Earthdata & Convert to GeoTIFF:

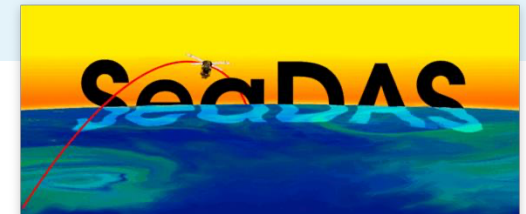
- 1) download from NASA Earthdata
- 2) convert the NetCDF file to GeoTIFF format
- 3) import into your GIS software



<https://earthdata.nasa.gov>

Software options to do this conversion include:

- **Python:** *Today's tutorial provides a Jupyter Notebook that does this*
- **SeaDAS:** Free software from NASA (<https://seadas.gsfc.nasa.gov>)
- **SNAP:** Free software from ESA (<https://step.esa.int/main/download/snap-download/>)
- ***Not an exhaustive list:*** *Feel free to share your favorites in the chat!*



Geographic Information Systems Software



Software examples: Esri's ArcGIS (fee for license), QGIS (free)

Future PACE data access options for GIS users:

Esri Living Atlas/NASA GIS: 10 Level 3 products (for land, ocean, and atmosphere) will be available by the end of 2025 from:

- Esri's Living Atlas Image Services:
<https://livingatlas.arcgis.com/en/home/>
- NASA Earthdata GIS Portal:
<https://gis.earthdata.nasa.gov/portal/home/index.html>



NASA Worldview (click here to view): currently 3 PACE products → terrestrial products added by end of the year

- Worldview is a powerful, easy-to-use visualizer that exports images, animations, and GeoTIFF format
- Worldview interfaces with ArcGIS and QGIS via Global Imagery Browsing Services: <https://nasa-gibs.github.io/gibs-api-docs/gis-usage/>



<https://worldview.nasa.gov>

Will PACE data be ingested into Google Earth Engine's Catalog?

No, there are not plans at this time to ingest PACE data into the GEE Catalog. Alternatives below:

Download from NASA Earthdata & Convert to GeoTIFF:

- 1) download from NASA Earthdata
- 2) convert the NetCDF file to GeoTIFF format
- 3) import into your GEE user account



<https://earthdata.nasa.gov>

Shortcut: Today's presentation is a great example of this! Code repository and data from the presentation will be made available to you.

Request PACE data ingestion (no guarantee of ingestion):

- 1) go to <https://developers.google.com/earth-engine/datasets/catalog>, select "suggest a dataset"
- 2) look for PACE requests, add your +1 if you see one you'd like to upvote (also can add a comment)
- 3) or create your own Feature Request to indicate you are interested in using this data in GEE – be detailed!

Join us: PACE Applications Partners/Early Adopters



Seeking *terrestrial* Applications Partners!

- **PACE Applications works with individuals and groups across public, private, non-profit, university, etc. sectors** who are looking integrate PACE data into decision-making, business, resource management and more.
- **Does your applied project have direct economic, health, or other benefits to society?**
- **Partnerships specifically amplify applied research and development efforts** and accelerate the translation of PACE observations into action



← Learn more, see examples of Apps Partners, and consider **APPLYING!!**

https://pace.oceansciences.org/app_adopters.htm



Clarissa Anderson



Jordan Borak

Questions?



PLEASE FILL OUT THIS SURVEY TODAY!!

<https://forms.gle/oznfmtnD62t3TQjf9>

Don't forget to subscribe to the PLUG mailing list to join us:

- Email pace-land-community-request@lists.nasa.gov, with “**subscribe**” in the subject
- **Confirm** your email address when prompted.
Welcome email = success!

Email us: Volunteer to present at the next meeting!

pace-applications@oceancolor.gsfc.nasa.gov

