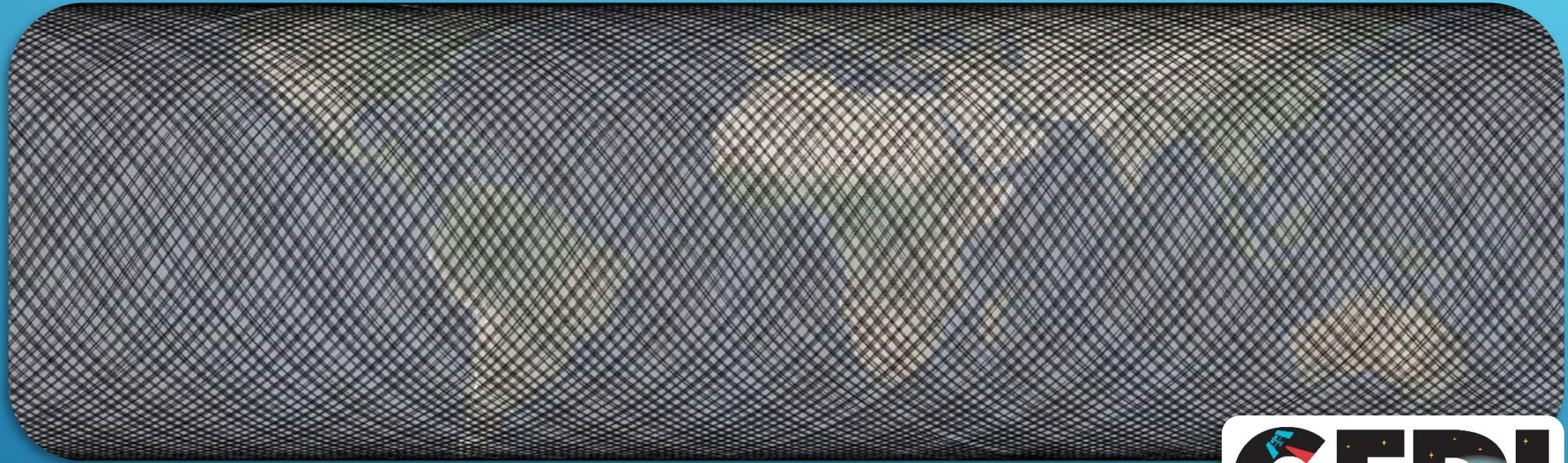




GEDI L1-L2 Data Resources, Access, and Visualization Demo



Cole Krehbiel¹

¹LP DAAC Remote Sensing Data Scientist

KBR, contractor to USGS EROS

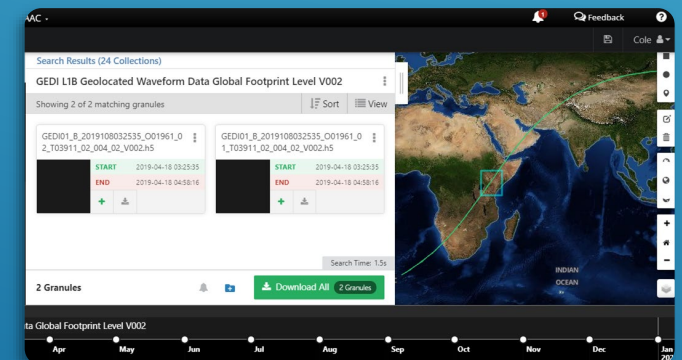
Sioux Falls, South Dakota

NASA ARSET Training: Use of SIF and LIDAR to Assess Vegetation Change and Vulnerability

*Work performed under USGS contract G0121D0001

GEDI L1-L2 DATA RESOURCES, ACCESS, & VISUALIZATION DEMO

- **INTRODUCTION:**
 - ABOUT THE LP DAAC
 - VERSION 1 GEDI DATA PRODUCTS AVAILABLE AT THE LP DAAC
 - SET UP USE CASE EXAMPLE
- **LIVE WALKTHROUGHS:**
 - NAVIGATING GEDI RESOURCES ON THE **LP DAAC WEBSITE**
 - SEARCHING FOR GEDI DATA USING THE **GEDI FINDER WEB SERVICE**
 - SUBSETTING GEDI DATA USING THE **GEDI SUBSETTER DATA PREP SCRIPT**
 - VISUALIZING GEDI DATA IN 3D IN QGIS
- **NEW WITH VERSION 2:**
 - **LIVE DEMO: SUBSETTING GEDI VERSION 2 SUB-ORBIT GRANULES IN EARTHDATA SEARCH**
 - CONCEPTUALIZING GEDI VERSION 2 DATA IN APPEARS
- **QUESTIONS**

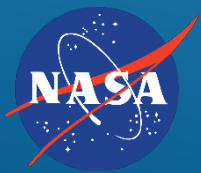


ABOUT THE LP DAAC

<https://lpdaac.usgs.gov>

The Land Processes Distributed Active Archive Center (LP DAAC) operates as a partnership between the U.S. Geological Survey (USGS) and the National Aeronautics and Space Administration (NASA).

The LP DAAC is one of the DAACs within NASA's Earth Observing System Data and Information System (EOSDIS) and has been located at the USGS Earth Resources Observation and Science (EROS) center since 1990.



EOSDIS

NASA'S EARTH OBSERVING SYSTEM
DATA & INFORMATION SYSTEM



WHAT DOES THE LP DAAC DO?

DATA PRODUCTS

1

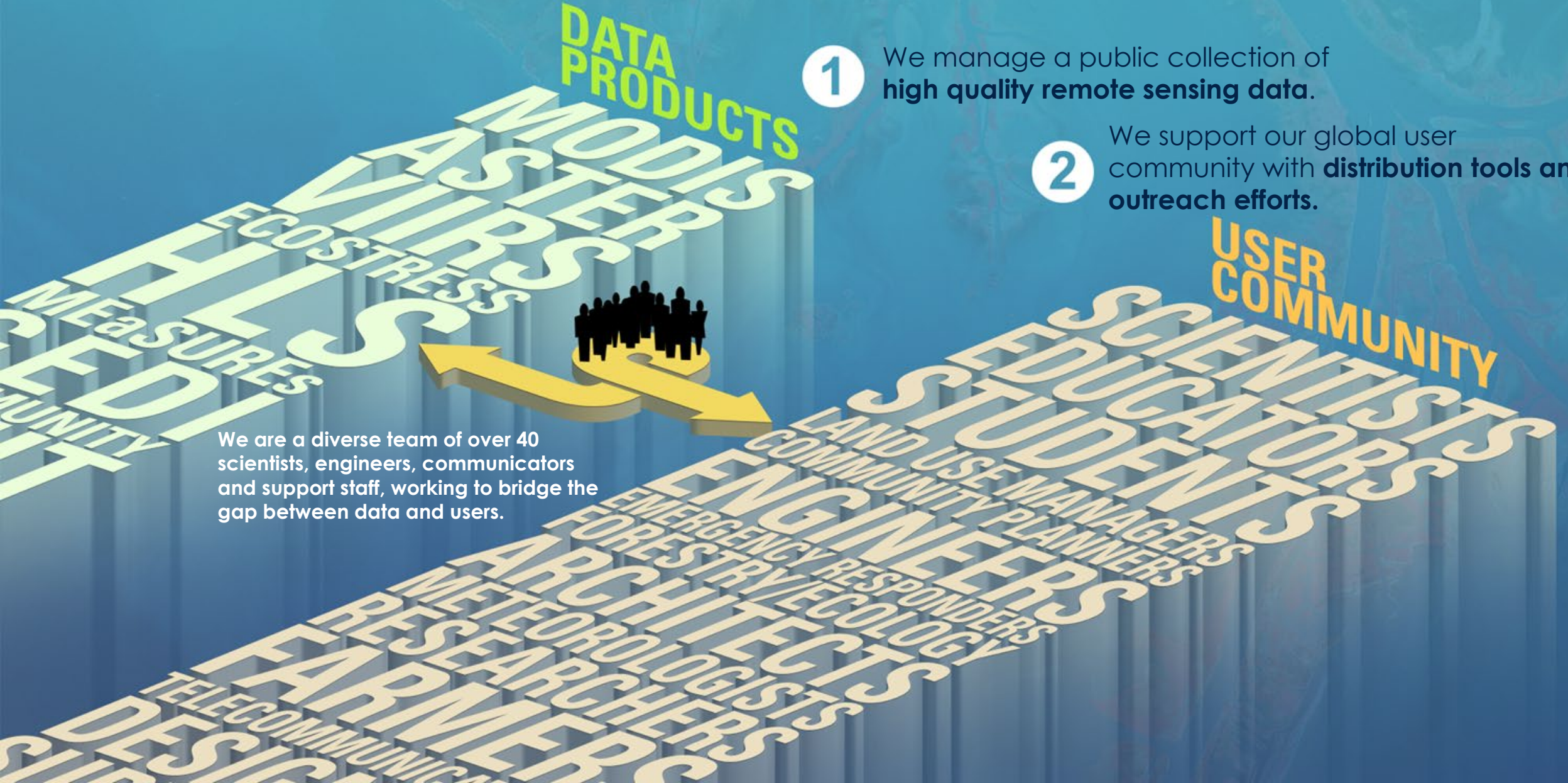
We manage a public collection of **high quality remote sensing data**.

2

We support our global user community with **distribution tools and outreach efforts**.

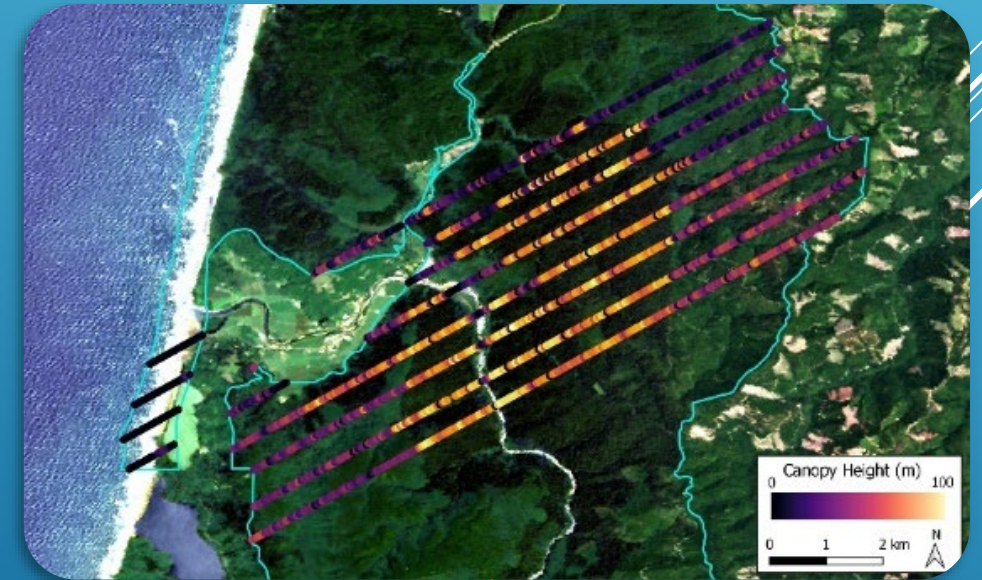
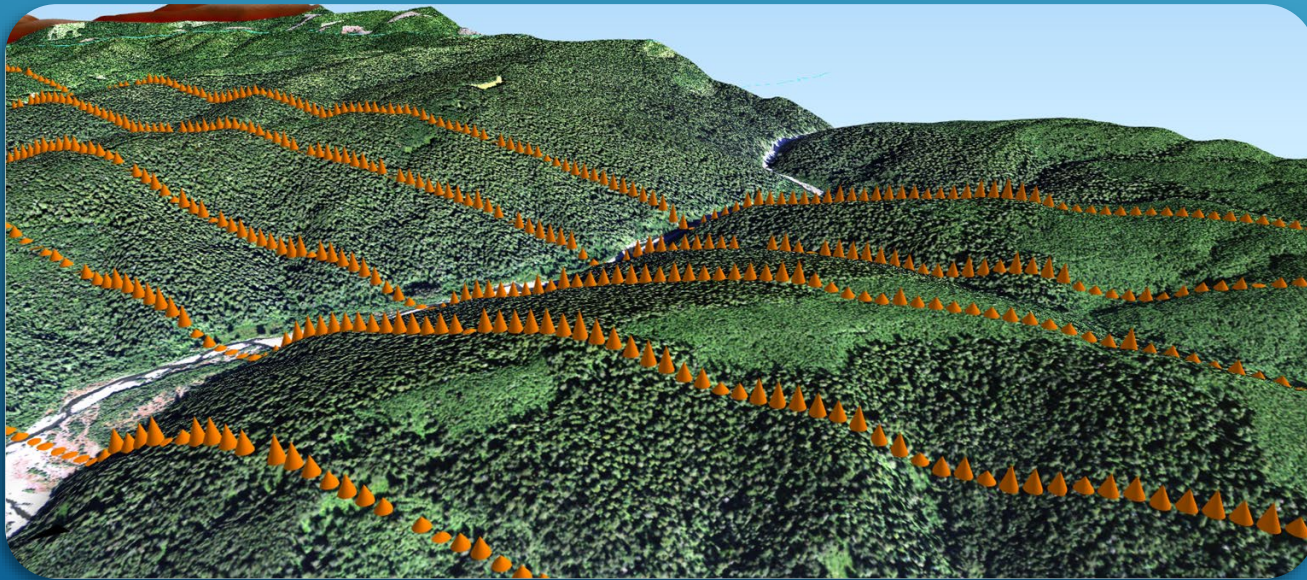
USER COMMUNITY

We are a diverse team of over 40 scientists, engineers, communicators and support staff, working to bridge the gap between data and users.



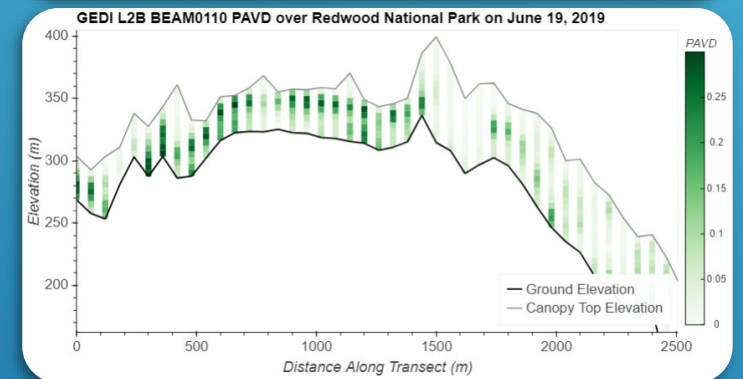
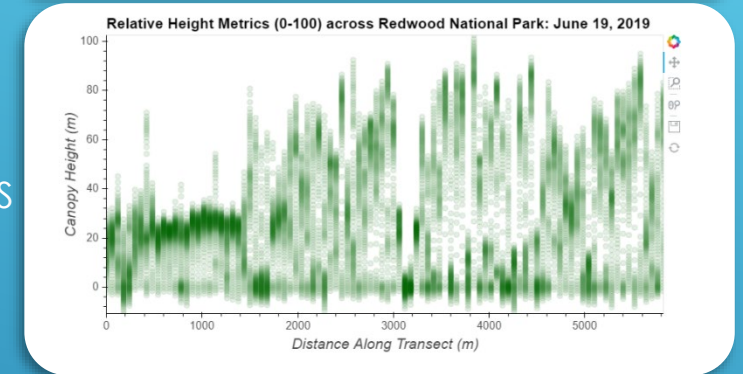
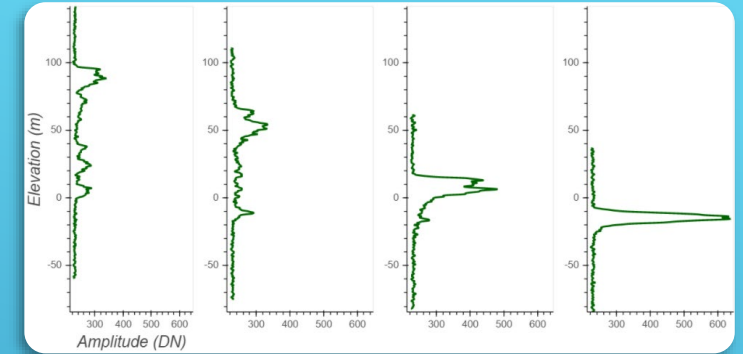
GLOBAL ECOSYSTEM DYNAMICS INVESTIGATION (GEDI)

- SENSOR: GLOBAL ECOSYSTEM DYNAMICS INVESTIGATION (GEDI)
- LAUNCH DATE: DEC 5, 2018 (LIKELY TO REMAIN ON ORBIT THROUGH FY 2022)
- PLATFORM: ISS
- SPATIAL RESOLUTION: 25 M FOOTPRINT, 4.2 KM SWATH WIDTH
- TEMPORAL RESOLUTION: ISS DEPENDENT
- SPATIAL EXTENT: A SAMPLING OF THE EARTH'S SURFACE BETWEEN $\sim 51.6^\circ$ N AND 51.6° S LATITUDES
- LASERS: 3 LASERS, 2 FULL POWER & 1 SPLIT INTO 2 BEAMS. 4 BEAMS DITHERED = 8 TRANSECTS (4 FULL POWER, 4 COVERAGE)
- SCIENCE VARIABLES: CANOPY CHARACTERISTICS, CANOPY HEIGHT, CANOPY PROFILE, ELEVATION, LIDAR, WAVEFORM
- FILE FORMAT: HDF5



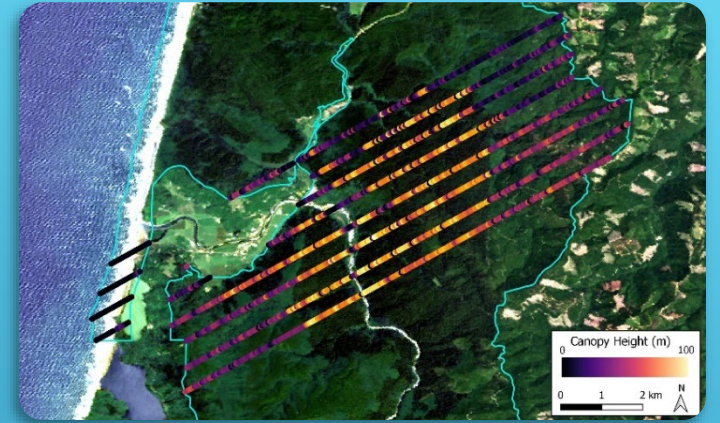
GEDI PRODUCTS AT THE LP DAAC

- **GEDI01_B: GEDI L1B GEOLOCATED WAVEFORM DATA**
 - PURPOSE: PROVIDE GEOLOCATED WAVEFORMS AND SUPPORTING DATASETS FOR EACH LASER SHOT FOR ALL 8 GEDI BEAMS
 - DATA: GEOLOCATED FULL (CORRECTED AND SMOOTHED) WAVEFORMS, GEOLOCATION PARAMETERS, GEOPHYSICAL CORRECTIONS
- **GEDI02_A: GEDI L2A ELEVATION AND HEIGHT METRICS DATA**
 - PURPOSE: PROVIDE WAVEFORM INTERPRETATION AND EXTRACTED PRODUCTS FROM EACH GEDI WAVEFORM
 - DATA: GROUND ELEVATION, CANOPY TOP HEIGHT, RELATIVE RETURN ENERGY METRICS (DESCRIBING CANOPY VERTICAL STRUCTURE), INTERPRETED PRODUCTS FROM THE RETURN WAVEFORMS
- **GEDI02_B: GEDI L2B CANOPY COVER AND VERTICAL PROFILE METRICS DATA**
 - PURPOSE: EXTRACT BIOPHYSICAL METRICS FROM EACH GEDI WAVEFORM, BASED ON THE DIRECTIONAL GAP PROBABILITY PROFILE
 - DATA: CANOPY COVER, PLANT AREA INDEX (PAI) PLANT AREA VOLUME DENSITY (PAVD), AND FOLIAGE HEIGHT DIVERSITY (FHD)
- **VERSION 2: SUB-ORBIT GRANULES (SMALLER FILE SIZES), INCREASED GEOLOCATION ACCURACY**
 - V1 GEOLOCATION ACCURACY: ~25 M, V2 GEOLOCATION ACCURACY: ~11 M



USE CASE EXAMPLE

- WHAT:
 - THE NATIONAL PARK SERVICE WANTS TO CREATE A 3D MAP OF ELEVATION AND CANOPY TOP HEIGHT OVER REDWOOD NATIONAL PARK
- WHERE:
 - REDWOOD NATIONAL PARK, CALIFORNIA, USA
- WHEN:
 - APRIL 2019 TO SEPTEMBER 2020
- WHY:
 - CREATE A BASELINE 3D MAP OF CANOPY HEIGHT AND ELEVATION IN CASE OF NATURAL DISASTER
- HOW:
 - THE NPS PLANS TO FIND INTERSECTING GEDI DATA USING THE GEDI FINDER WEB SERVICE
 - DOWNLOAD THE DATA
 - SUBSET AND PROCESS USING THE GEDI SUBSETTER DATA PREP SCRIPT
 - VISUALIZE THE DATA IN 3D USING QGIS



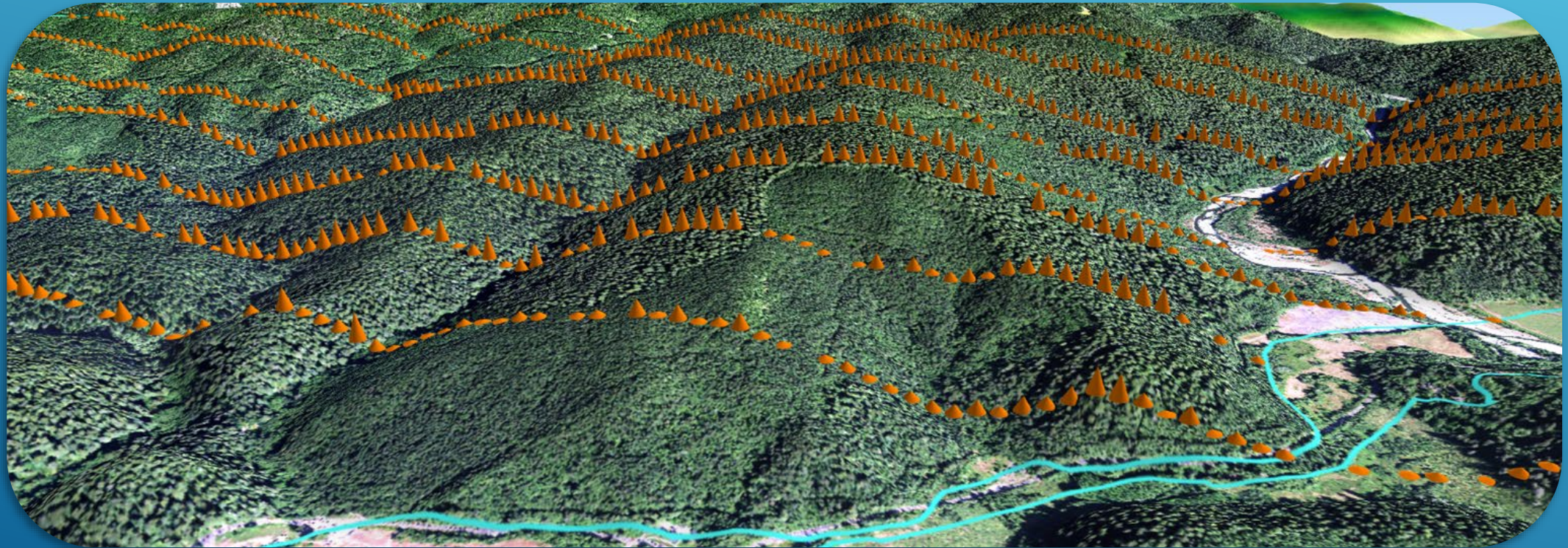
LIVE WALKTHROUGHS

LP DAAC Website: <https://lpdaac.usgs.gov/>

GEDI Finder: <https://lpdaacsvc.cr.usgs.gov/services/gedifinder>

GEDI Subsetter: <https://git.earthdata.nasa.gov/projects/LPDUR/repos/gedi-subsetter/browse>

Earthdata Search: <https://search.earthdata.nasa.gov/search>



GEDI SUBSETTER VS. EARTHDATA SEARCH SUBSETTING SERVICES

Functionality	GEDI Subsetter	EDSC Subsetting Services
Ability to subset using a shapefile/GeoJSON?	Yes	No
Export results as GeoJSON?	Yes	No
Able to import results directly into GIS/RS Software?	Yes	No
Requires Python?	Yes	No
Requires full granule download?	Yes	No
Export results as HDF5?	No	Yes
Ability to subset by bounding box?	Yes	Yes

- **Use GEDI Subsetter if:**

- Able to use Python
- Able to download full GEDI orbits
- Looking to subset by shapefile/GeoJSON
- Looking for GeoJSON outputs to directly import into GIS/RS Software

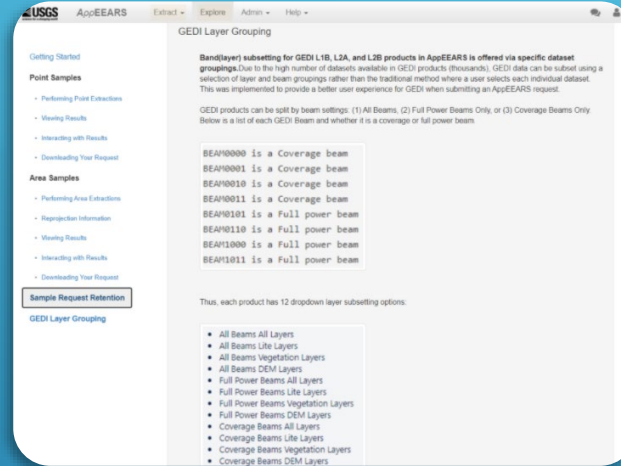
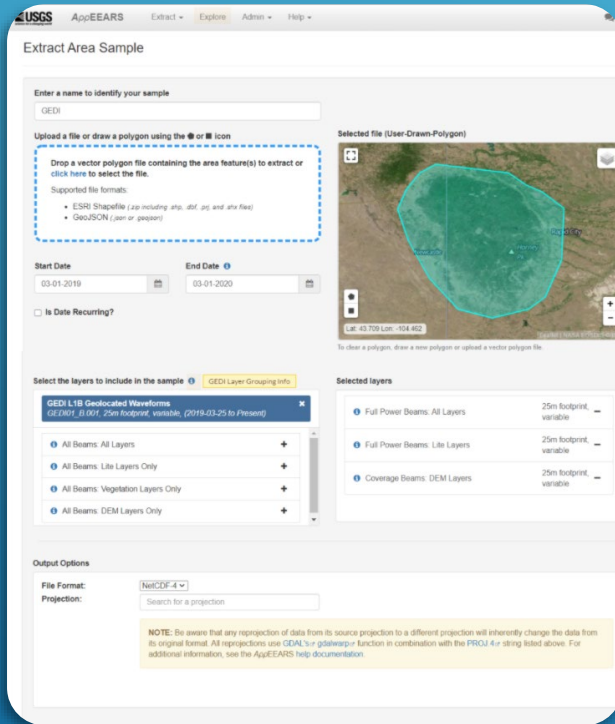
- **Use EDSC Subsetting Services if:**

- Looking for GUI-based subsetting
- Don't want to download full GEDI orbits
- Looking for HDF5 output files
- Possible to take EDSC Subsetting Services outputs and use GEDI Subsetter to convert to GeoJSON

GEDI VERSION 2 IN APPEARS

Submit an Area Request

- ROI and time period



Band/Layer Subsetting:

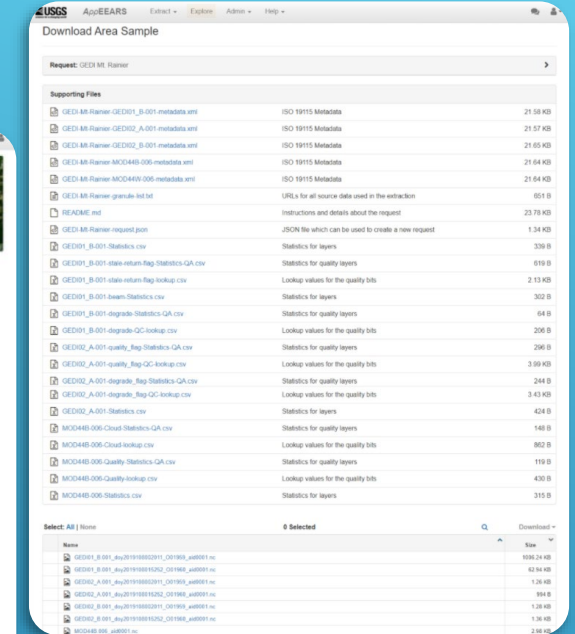
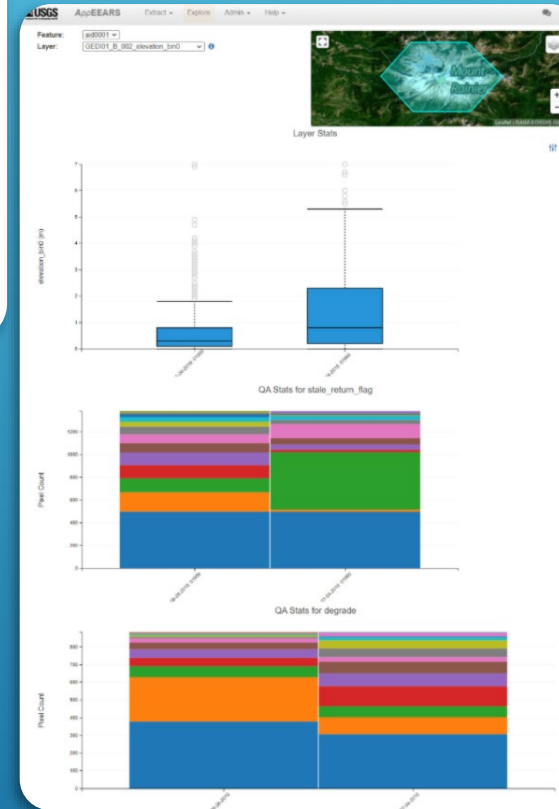
- GEDI Groupings
- All, DEM, Veg

Output Format

- NetCDF4
- Sub-orbits merged

GEDI Visualizations

- Single boxplots/barcharts



GEDI Downloads

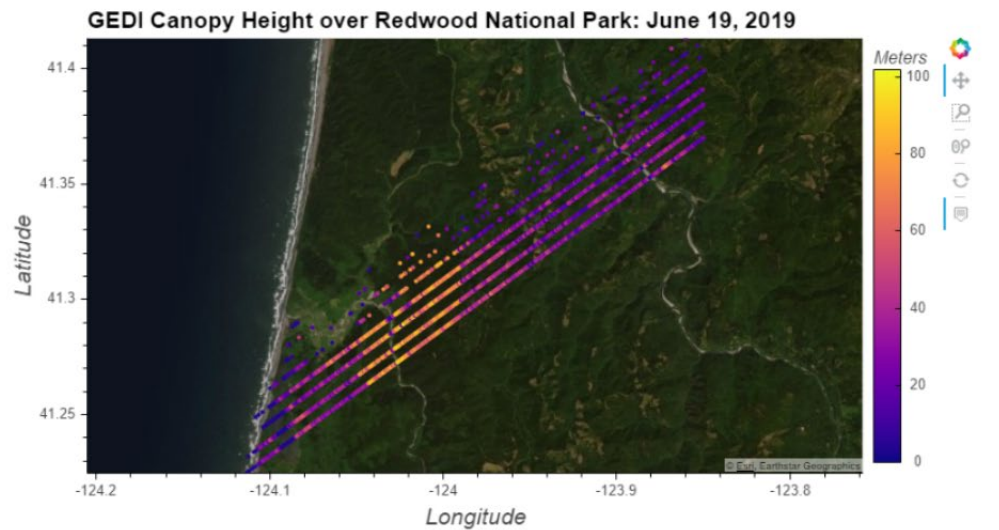
E-LEARNING RESOURCES

<https://lpdaac.usgs.gov/resources/e-learning/#gedi>

Now let's not only plot the points in the geodataframe but also add a colormap for Canopy Height (m), Elevation (m), and Plant Area Index (PAI).

```
allDF['Canopy Height (rh100)'] = allDF['Canopy Height (rh100)'] / 100 # Convert canopy height from cm to m

# Plot the basemap and geoviews Points, defining the color as the Canopy Height for each shot
(gvts.EsriImagery * gv.Points(allDF, vdims=vdims).options(color='Canopy Height (rh100)', cmap='plasma', size=3, tools=['hover'],
    clim=(0,102), colorbar=True, clabel='Meters',
    title='GEDI Canopy Height over Redwood National Park: June 19, 2019',
    fontsize={'xticks': 10, 'yticks': 10, 'xlabel': 16, 'ylabel': 12,
    'cticks': 10, 'title': 16, 'ylabel': 16})).options(height=500,
    width=900)
```



E-Learning
Frequently updated presentations, webinars, tutorials, and video tips on accessing, managing, and processing LP DAAC data using a variety of software, web applications, custom tools, and scripts.

Homepage / Resources / E-Learning

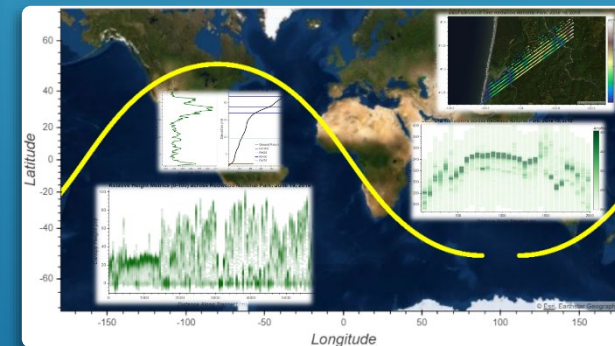
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Q GEDI

Find and Use GEDI, You Will—Getting Started with Global Ecosystems Dynamics Investigation (GEDI) Lidar Data
JUNE 30, 2020
GEDI CANOPY CHARACTERISTICS
CANOPY HEIGHT CANOPY PROFILE
ELEVATION LIDAR
Webinar

Getting Started with GEDI L2B Data in Python
MAY 13, 2020
GEDI CANOPY CHARACTERISTICS
CANOPY HEIGHT CANOPY PROFILE
ELEVATION LIDAR
Tutorial Jupyter Notebook

Getting Started with GEDI L2A Data in Python
MAY 13, 2020
GEDI CANOPY CHARACTERISTICS
CANOPY HEIGHT CANOPY PROFILE
ELEVATION LIDAR WAVEFORM
Tutorial Jupyter Notebook



CONTACT US

The LP DAAC User Services team is located at the USGS EROS Center. They are the primary point of contact for all user inquiries, including questions about data, tools, and services available from the LP DAAC.

NASA Earthdata Forum: <https://forum.earthdata.nasa.gov/>

CONTACT INFORMATION

VOICE 605-594-6116

TOLL FREE 866-573-3222
(866-LPE-DAAC)

E-MAIL lpdaac@usgs.gov

WEB <https://lpdaac.usgs.gov>

LISTSERV <https://lists.nasa.gov/mailman/listinfo/lpdaac>

Mount Saint Helens: Apr 26, 2019 - Apr 14, 2020
GEDI Elevation (m)

