



podaac

Physical Oceanography Distributed Active Archive Center



PO.DAAC Cloud Early Adopters Kickoff Telecon

April 2019

Welcome!

Introductions

PO.DAAC Cloud - Science User Services

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Agenda

- **Welcome & Introductions** (20 min)
 - PO.DAAC staff (3 min)
 - EAs (17 min)
 - institution, community, level of cloud experience
 - what you hope to get from this EAP (why did you accept the invite)?
- **Background** (10 min)
 - PO.DAAC, ESDIS, Cloud Migration
 - SWOT mission, data products, timeline
 - PO.DAAC Cloud summary of activities
 - I&A, DSA Services + User Needs Assessment, GIS Plans
- **PO.DAAC Cloud EA program overview + expectations** (from TOR) (15 min)
 - Roles and Responsibilities
 - EAs
 - PO.DAAC
 - Roadmap: potential services, datasets
 - Communication/Collaboration Process
- **Assign first tasks** (5 min)
 - Create Earthdata login (if one does not exist)
 - Provide Earthdata login credentials to PO.DAAC for restricted Forum access
 - Fill out EA profile table
 - any current/planned work that is relevant to this EAP (Cloud, SWOT)
- **Q & A** (10 min)

Introductions

Early Adopters

Ocean
Hydrology
Coastal
Informatics

Novice
Intermediate
Advanced/dev
-any/all welcomed!

homework

Name	Organization	Email	Community/ discipline (O,H,C,I)	Cloud Experience (novice, intermediate, advanced)	Current/Future work relevant to the PODAAC Cloud EAP (SWOT and/or Cloud efforts)
Ben Hamlington	Jet Propulsion Laboratory	benjamin.d.hamlington@jpl.nasa.gov			
Chelle Gentemann	Earth Space Research	cgentemann@esr.org			
Colin Gleason	University of Massachusetts Amherst	cjgleason@umass.edu			
Dan Ames	Brigham Young University	dan.ames@byu.edu			
Dave Blodgett	USGS	dblodgett@usgs.gov			
Ed Beighley	Northeastern University	r.beighley@northeastern.edu			
Faisal Hossain	University of Washington	fhossain@uw.edu			
Gregg Jacobs	NRL	gregg.jacobs@nrlssc.navy.mil			
John Wilkin	Rutgers University	jwilkin@rutgers.edu			
Mike Durand	Ohio State University	durand.8@osu.edu			
Ryan Abernathy	Columbia University, Lamont-Doherty	rpa@ldeo.columbia.edu			
Shih-Chieh Kao	DOE/ORNL	kaos@ornl.gov			
Tony Castronova	CUAHSI	acastronova@cuahsi.org			
Maikes Sonnewald	MIT	maike_s@mit.edu			

- PO.DAAC, EOSDIS, Cloud Migration
- SWOT mission, data products, timeline
- PO.DAAC Cloud summary of activities

Background

PO.DAAC, ESDIS, & Moving to the Cloud



- The mission of the **Physical Oceanography Distributed Active Archive Center (PO.DAAC)**, <https://podaac.jpl.nasa.gov>), which is an element of the Earth Observing System Data and Information System (EOSDIS), is to **preserve NASA's ocean and climate data and make these universally accessible and meaningful**.
- PO.DAAC is the primary archive for the Surface Water and Ocean Topography (SWOT) mission.
 - Expected to launch in 2021, SWOT will be generating nearly 66 PB of data during the life of its mission (~20 TB/day), and will contribute datasets of great use to a wide variety of scientific and application communities.
- The new era of big data from Earth observations offers the opportunity to rethink the design of end-to-end data system architecture and services, particularly in a Cloud computing environment.
- PO.DAAC (and EOSDIS) is evolving to enable back- and front-end **Cloud-based Archive & Data Services, including data storage, search and discovery, access, and analysis**, in addition to the current, more established “download and analyze” paradigm. Performance, functionality, usability, stability, scalability, and interoperability are the foundational design elements for the PO.DAAC data tools and services.
 - This effort is leveraging the Earth Science Data Information System (ESDIS) cloud-based data management system.
 - **This effort aims to enhance what the science and applications communities can do with the NASA Earth-observing data**

PO.DAAC Cloud Early Adopters - Program* Goal

Ensure PO.DAAC-provided Cloud-based data and services meet the greater user community's expectations and needs as it adopts the Cloud as a platform for Earth data use.

**This program is not limited to SWOT but will use the SWOT mission as a test case.*

Background: SWOT Mission

- **The Surface Water and Ocean Topography (SWOT) mission aims to provide valuable data and information about the world's oceans and its terrestrial surface water such as lakes, rivers, and wetlands.**
- SWOT is being developed jointly by NASA and Centre National D'Etudes Spatiales (CNES), with contributions from the Canadian Space Agency (CSA) and United Kingdom Space Agency (UKSA).
- The mission is targeted to launch September 2021.
- **SWOT will measure ocean surface topography and land surface water elevation with great accuracy**, using interferometry to achieve two-dimensional mapping.
- Observations from SWOT can be used to better understand **ocean** currents and processes happening at spatial scales on the order of 15-150 km, something that has not been done before.
- SWOT will enable high resolution (within 1 km from land) monitoring of **coastal** regions, including coastal currents, storm surges, and regional sea level change.
- On land, SWOT will provide **hydrology** measurements of water storage changes (surface water area and water depth) of major lakes, reservoirs, rivers, and wetlands, and support derived estimates of river discharge, which aid in assessing water resources.



<https://swot.jpl.nasa.gov/>

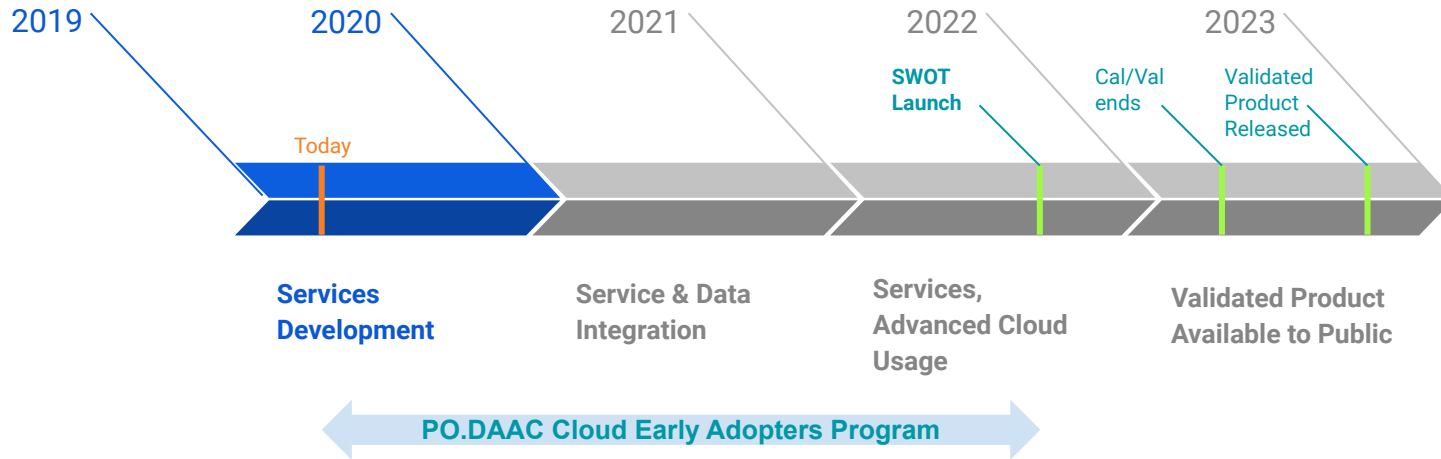
<https://podaac.jpl.nasa.gov/SWOT>

Background: SWOT Mission

SWOT Data Products

levelA	Data product	file type	pass/ cycle-based	description
L1	KaRIn SLC	netCDF4	pass	Interferomic single look complexes over land
L1	KaRIn interferogram	netCDF4	pass	Interferograms over the ocean
L2	Pixel Cloud	netCDF4	pass	water mask; inland + coastal; highest spatial res but much noisier than other hydro products
L2	Pixel Cloud River/Lake Vector	shapefile	pass	Pixel cloud vector attribute, geolocated river data
L2	Hydro River Vector	shapefile	pass	River data
L2	Hydro Lakes Vector	shapefile	pass	Lakes data
L2	Hydro Raster	netCDF4	pass	Raster product of lakes and rivers
L2	Cycle avg river vector prod	shapefile	cycle	21 day average of a specific river reach
L2	Cycle avg lake vector prod	netCDF4	cycle	21 day average of a specific lake/reservoir
L2	KaRIn oceans SSH	netCDF4	pass	Sea surface heights and significant wave heights from the KaRIn altimeter
L2	Nadir alt SSH	netCDF4	pass	Sea surface heights and significant wave heights from the nadir altimeter, similar to the Jason series datasets

Background: PO.DAAC, SWOT, Cloud - Timeline



Background: PO.DAAC, SWOT, Cloud - Activities

Summary of Activities:

1. Ingest & Archive status
2. Discovery, Search, & Access (DSA) Services + Science User Services activities
3. GIS Plans

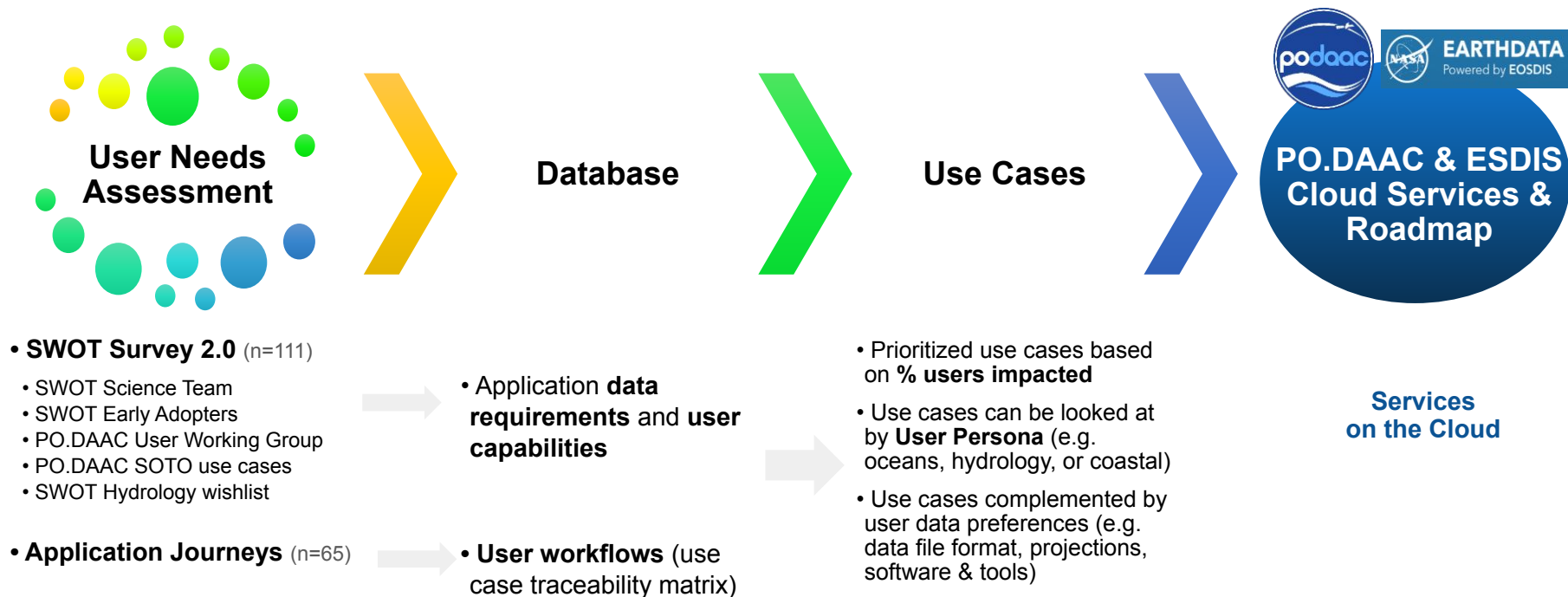
1. Ingest & Archive status

- a. Ingest and Archive is proceeding well and is progressing as according to plan
- b. Ingest and Archive Risks have been identified and mitigated
- c. Performance stress testing - currently support peak SWOT performance requirements
- d. Working on Disaster Recovery plan

Background: PO.DAAC, SWOT, Cloud Activities

2. DSA + User Services: a user-driven approach

Application Journeys & Survey → Services Roadmap → Implementation Plan



Background: PO.DAAC, SWOT, Cloud Activities

2. DSA + User Services: a user-driven approach

Use Cases → Functionality

Application Journeys (user stories)

1. Identify common use cases across user personas

Hydrology

UC1	data search online
UC3	data available as netCDF (pixel cloud)
UC5	data availability doesn't change with time
UC6	SWOT geospatial info + L/W mask - static (as shp)
UC8	query by attribute/feature
UC10	query for specific time
UC15	dataset description
UC16	SWOT L/W mask spatial info - changes w time
UC19	subset by temporal range
UC21	subset by spatial extent (shp)
UC25	download (general)
UC28	download only selected data (general)
UC29	download selected data (by attribute/feature)
UC30	download selected data (in time)
UC31	download selected data (in space)
UC34	download in specific format (file type)
UC37	data request on the Cloud
UC42	I/O (locally)
UC43	mask by QA/QC
UC44	interpolate spatially
UC46	reproject
UC50	spatial average
UC54	calculate uncertainty
UC56	convert to inundation depth
UC64	time series
UC66	100-year streamflow, for flooding
UC66	data use: compare to other datasets (general)
UC67	data use: compare to other datasets (in-situ)
UC69	data use: data assimilation
UC71	data use: alongside/with modeling

Oceans

UC1	data search online
UC7	data exploration (general UC)
UC14	explore visually (preview selection)
UC15	dataset description
UC17	select/subset data (general)
UC21	subset by spatial extent (shp)
UC25	download (general)
UC28	download only selected data (general)
UC31	download selected data (in space)
UC42	I/O (locally)
UC43	mask by QA/QC
UC44	interpolate spatially
UC47	reformat
UC48	data analysis (general)
UC69	data use: data assimilation
UC71	data use: alongside/with modeling

Coastal

UC1	data search online
UC6	SWOT geospatial info + L/W mask - static (as shp)
UC15	dataset description
UC16	SWOT L/W mask spatial info - changes w time
UC19	subset by temporal range
UC22	subset by spatial extent (bbox)
UC23	subset by spatial extent (general)
UC25	download (general)
UC31	download selected data (in space)
UC38	upload other datasets to Cloud (for comparison)
UC44	interpolate spatially
UC45	interpolate temporally
UC47	reformat
UC49	temporal average
UC50	spatial average
UC61	EOF
UC62	seasonal component
UC63	time series
UC64	100-year streamflow, for flooding
UC65	hovmuller diagram
UC66	data use: compare to other datasets (general)
UC67	data use: compare to other datasets (in-situ)
UC68	data use: compare to other datasets (satellite)
UC69	data use: data assimilation
UC71	data use: alongside/with modeling

2. Compare and prioritize use cases, across user persona

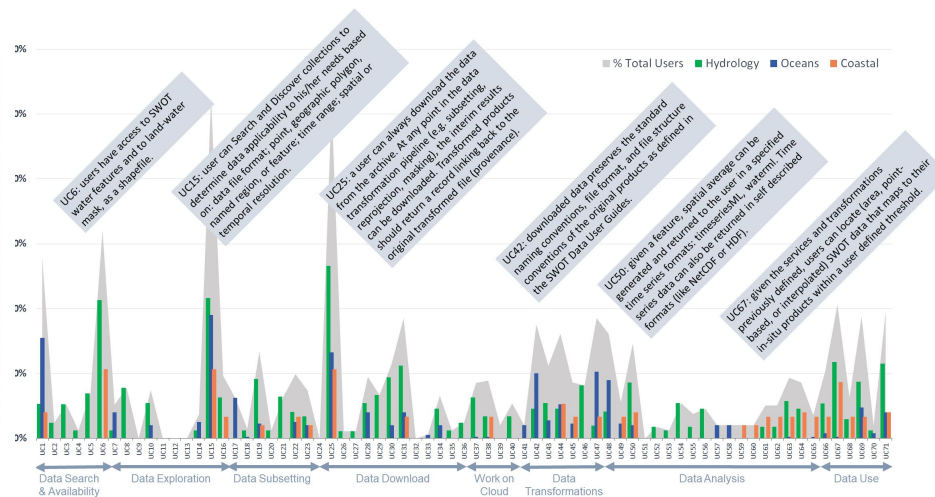


Fig 5. Percent of users (surveyed) impacted by given Use Case, by user persona (Hydrology, Oceans, Coastal). Highlights how different applications of data may have varying needs for Discovery, Search, and Access of data. Box inserts give examples of what requirements derived from the use cases would look like.

Background: PO.DAAC, SWOT, Cloud Activities

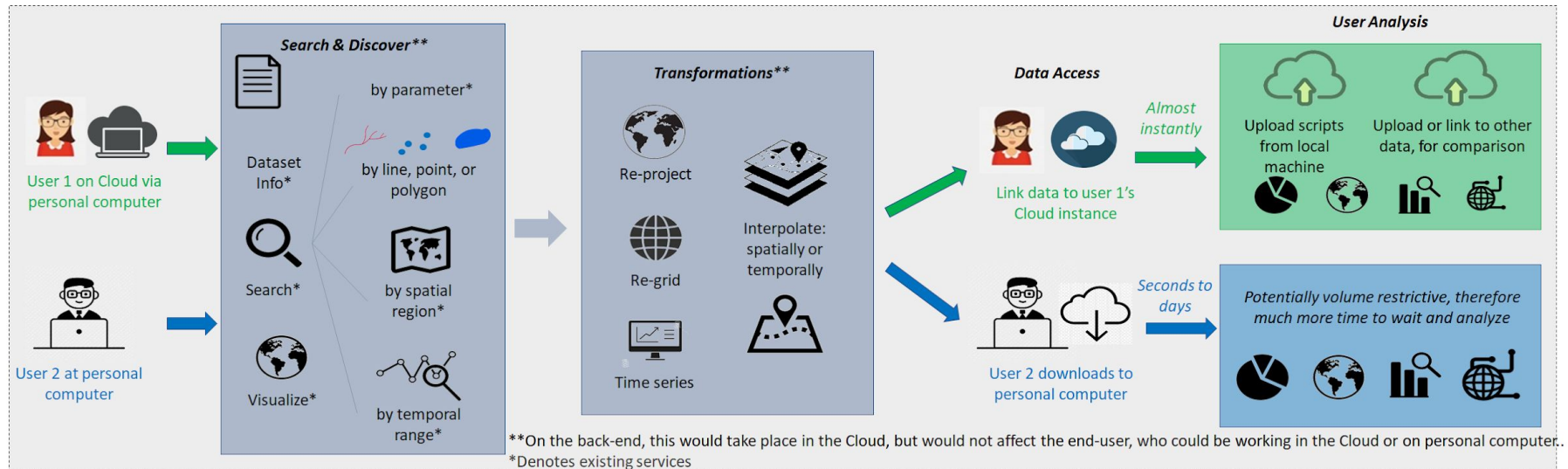
2. DSA + User Services: a user-driven approach

Finalized Services Roadmap - May 2019

- List of functionalities
- Timeline: when beta version available for testing

Preliminary Services Identified, through User Needs Assessment

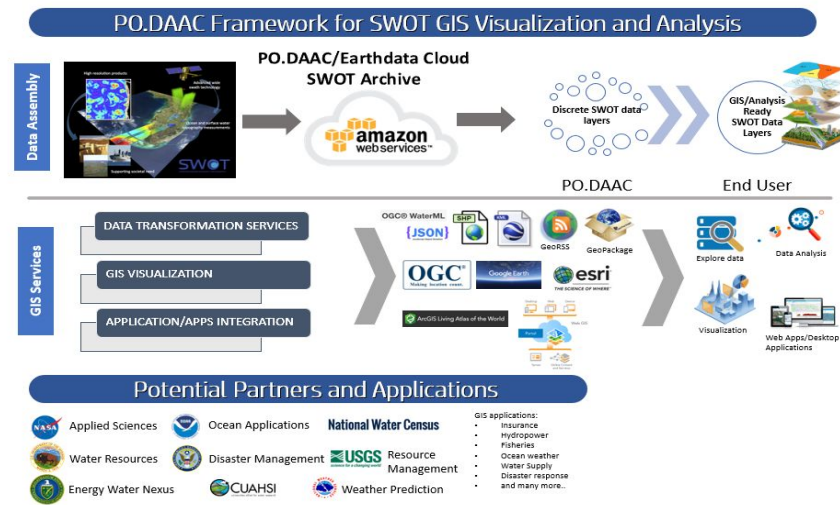
- *Discovery, Search, Transformations* experience for the user would be the same whether user is on the Cloud or not.
- It is at the data *Access* point (wait time, bandwidth) where the difference arises.



Background: PO.DAAC, SWOT, Cloud Activities

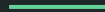
3. GIS Plans

- PO.DAAC will be supporting SWOT surface water datasets in GIS ready formats
- PODAAC to provide services to support Exploratory data Visualization and Analytics (EVA) of SWOT GIS datasets
- Integrate with common GIS software (ArcGIS, qGIS, etc), and partner with various communities (e.g. CUAHSI, OGC) to build services
- One archive format (.shp), many output/distribution formats (geopackage, netCDF, geoTIFF)
- On-demand hydrology focused raster generation



PO.DAAC's conceptual framework for storing, organizing, and accessing SWOT GIS datasets to enable EVA within the cloud environment based on anticipated community needs and big data approaches

EA Program Overview



Program Overview

Why the PO.DAAC Cloud Early Adopters Program?

→ Ensure PO.DAAC-provided Cloud-based data and services meet the greater user community's expectations and needs as it adopts the Cloud as a platform for Earth data use.

Goals for the PO.DAAC Cloud Early Adopters Program

1. Support the development of appropriate PO.DAAC Cloud-based Services for use and adoption by the oceans, hydrology, and coastal communities.
2. Support the user community in the adoption and use of PO.DAAC Cloud-based Data holdings and Services.
3. Expand the PO.DAAC user community through:
 - a. Fostering a (SWOT-focused) community that is ready to adopt Cloud Computing when using Earth data;
 - b. Relationship development with the hydrology community, a new user community for PO.DAAC.

Program Overview

Roles and Responsibilities

Early Adopters will:

- Test and provide feedback on Cloud-based Services;
- Beta test the data pipeline into their own workflows;
- Test and provide feedback on training materials, e.g., tutorials/jupyter notebooks/recipes for discovering, searching, accessing, utilizing (SWOT) data on the Cloud;
- Co-develop application-specific training materials (e.g., jupyter notebook/recipes);
- Provide feedback on pain points regarding transitioning to the Cloud, e.g., barrier types: technical, institutional, knowledge, money, resources (e.g. IT);
- Suggest relevant datasets from their respective community of practice
 - For validation of, or comparison to, SWOT
 - Data that may complement SWOT data;
- Be ambassadors for PO.DAAC Cloud development activities.

Program Overview

Roles and Responsibilities

The **PO.DAAC** will provide:

- Defined boundaries for Early Adopters to operate within;
- Access to PO.DAAC Cloud-based **Services** being developed, e.g., search, access, download, subset;
- Access to simulated and/or complementary SWOT **datasets**** (as made available).
- **Training materials**, including recipes/tutorials;
- Specifications, guidance or best practices on how to develop recipes that can be used with PO.DAAC data on the Cloud.

***Note that the purpose of the datasets made available as part of the Early Adopters Program is solely to test PO.DAAC Services, and thereby may not be applicable for scientific endeavors at this time;*

Program Overview

Services

Preliminary Services Identified

Finalized Services Roadmap - May 2019

- List of functionalities
- Timeline: when beta version available for testing

e.g.

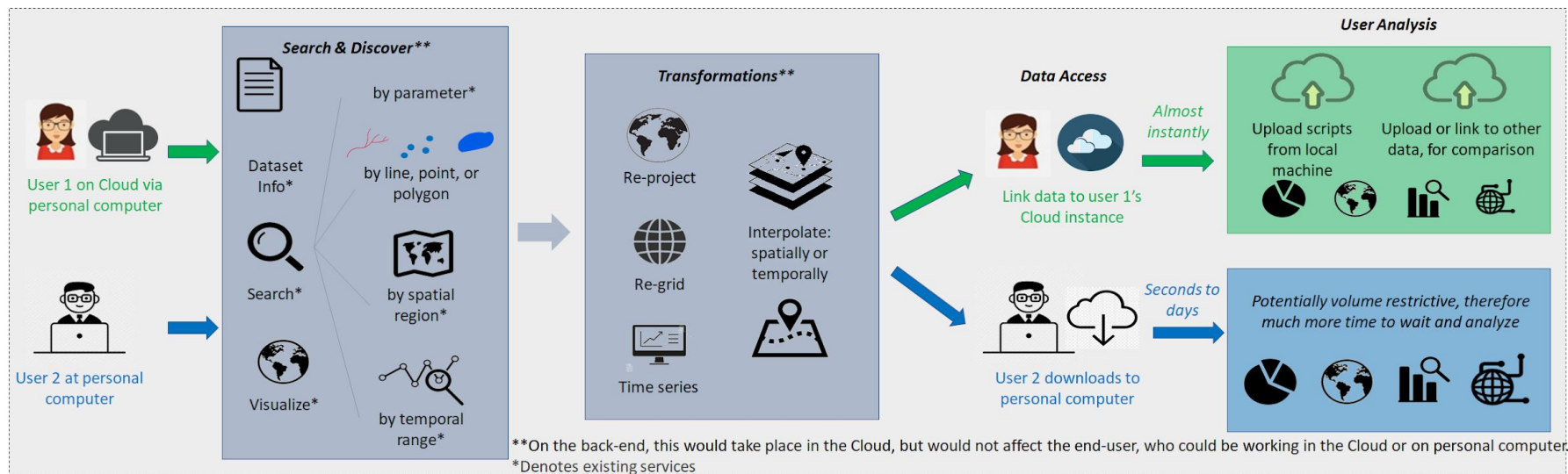
[ancillary prod] As a hydrologist, I want to have access to shapefiles for standard SWOT water features such as rivers or lakes.

[search] As a hydrologist, I want to search for SWOT inland water collections which intersect a specified SWOT water feature.

[subset] As a SWOT user, I want to subset my selected granules by user-defined shapefile.

[subset] As a SWOT user, I want to subset my selected granules by temporal range.

[on-demand analysis] As a hydrologist, I want to download spatially aggregated L2 hydrology time series data in WaterML format, so that I can easily work with existing user scripts.



Program Overview

Datasets

Are there additional datasets you would like to have available (from other DAACs, modeled, etc) as part of this Program?

- **MEaSURES products** - available now
 - Hydrology [netCDF] (Dennis Lettenmaier)
 - Pre SWOT Hydrology Global Lake/Reservoir Water Height GREALM
 - Pre SWOT Hydrology Global Lake/Reservoir Surface Water Area Extent
 - Pre SWOT Hydrology GRRATS Jason-2 Virtual Station Heights Version 1
 - Oceans [netCDF] (Josh Willis / Brian Beckley)
 - Integrated Multi-Mission Ocean Altimeter Data for Climate Research Version 4.2
 - Integrated Multi-Mission Ocean Altimeter Data for Climate Research complete time series Version 4.2
 - Global Mean Sea Level Trend from Integrated Multi-Mission Ocean Altimeters Version 4.2
- **Datasets in AWS** - available now
 - Landsat 8
 - MODIS
 - Sentinel-2
- **Official SWOT Simulated data** (as available)
 - Proxy Hydrology L2B pixel data [netCDF] - anticipated Summer 2019 (TBC)
 - Proxy Hydrology L2B vector data [shp] - anticipated Summer 2019 (TBC)
 - Proxy Hydrology L2B raster data [netCDF] - anticipated Fall 2019 (TBC)
 - Proxy Oceans L2 data [netCDF] - anticipated Summer 2019 (TBC)

Program Overview

Process

Program Length: April 2019 - July 2021

Communication / Collaboration

- **Quarterly Telecons** as a group
 - roughly April, July, October, January

- PO.DAAC Cloud Early Adopters **Forum** (restricted)
<https://podaac.jpl.nasa.gov/forum/>

- **FAQ:** quarterly telecon presentations, meeting notes, Terms of Reference, reports, etc.

Recipes & Tutorials: recipes, tutorials to be tested, comments specific to those recipes/tutorials

Discussion: communication & collaboration among EAs, and with PODAAC staff

TBD - being revisited by PODAAC; Slack and/or github as alternates

The screenshot shows the PO.DAAC Cloud Early Adopters Forum page. The header includes the NASA logo, Jet Propulsion Laboratory logo, and the PODAAC logo. The page title is "PO.DAAC Cloud Early Adopters (private)". Below the title is a table with forum topics. The table has columns for "FORUM", "TOPICS", "POSTS", and "LAST POST". The topics listed are "PO.DAAC Cloud Early Adopters FAQ", "PO.DAAC Cloud Early Adopters Recipes and Tutorials", and "PO.DAAC Cloud Early Adopters Discussion". The "Discussion" topic has 1 topic and 2 posts, with the last post by "scosic" on "Tue Apr 02, 2019 5:05 pm". To the right of the table is a sidebar with a search bar, a "Subscribe forum" checkbox, a "User Control Panel" link, and a "View your posts" link. At the bottom of the page, there are "Forum permissions" listed, including "You can post new topics in this forum", "You can reply to topics in this forum", "You can edit your posts in this forum", "You can delete your posts in this forum", and "You can post attachments in this forum".

FORUM	TOPICS	POSTS	LAST POST
PO.DAAC Cloud Early Adopters FAQ	0	0	No posts
PO.DAAC Cloud Early Adopters Recipes and Tutorials	0	0	No posts
PO.DAAC Cloud Early Adopters Discussion	1	2	by scosic Tue Apr 02, 2019 5:05 pm

First 'homework' Due by next telecon ~Early Aug 2019

1. Create an Earthdata account (optional, but might be useful regardless, down the road: ftp retirement!)
2. Send PO.DAAC your Earthdata user name so you can be added to restricted Forum for collaboration/communication (hold off, collaboration process/platform being re-evaluated by PODAAC - TBD)
3. Fill out the Participant Table: relevant work - yes, please still fill out. Catalina will send table/doc in next couple of day after telecon
4. Next telecon - ~Early Aug 2019
 - Meanwhile, please email us should you have any questions, comments, concerns
 - Catalina Oaida catalina.oaida@jpl.nasa.gov



podaac

Physical Oceanography Distributed Active Archive Center



PO.DAAC Cloud Early Adopters

Questions? Comments?

Thank you!

Extras

Summary of Preliminary Services

1.
 - **External search** points to relevant data needed by user.
 - SWOT **portal resources** provide clear metadata, variable names, dimensions, temporal and spatial coverage info, file naming convention, file format and structure.
 - **Ancillary data: SWOT water features** with geospatial info (shp) available for download, and/or quick visualization (see prev point, spatial coverage)

2. **Query**, and return data to user based on those query parameters:

- a. attribute (e.g. coordinated of river centerline)
- b. SWOT Water Feature ID
- c. HUC ID
- d. commID
- e. Data structure (file type)
- f. File structure (e.g. CF)
- g. QA/QC flag values
- h. Spatial availability
 - i. Geometric shape: point, line, geographic polygon
 - ii. Named region or feature
- i. Spatial resolution
- j. Temporal availability
 - i. At time
 - ii. Time range
- k. Temporal resolution
- l. User provided
 - i. File with point-based site coordinates (e.g. stream gauges, tidal gauges, buoys)
 - ii. Shapefile (e.g. of watershed of interest)

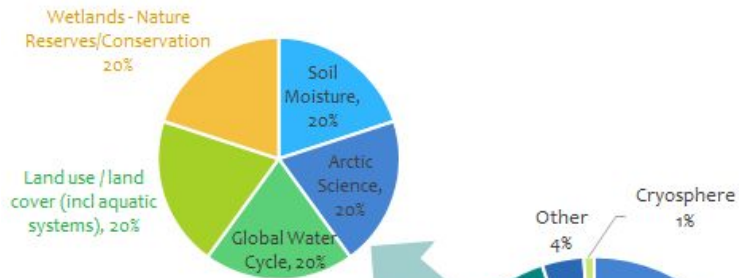
3. **Transformations** here refer to any of the following:

- subsetting (in space, time)
- re-gridding/interpolation (in space)
- interpolation/aggregation (in time)
- reprojection
- reformat
- averaging, resulting in time series
 - over river reach(es)
 - over area of interest

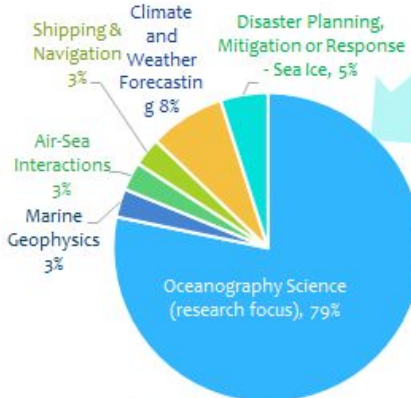
4. **Download**

- Whole granules
- Results of transformations: user can download at any point along the query/transformation pipeline
 - Downloaded data preserve the standard naming conventions, file format, and file structure conventions of the original product. Variables and metadata correspond to those in the original data products as defined in the SWOT Data User Guides.
- Offline, to local machine
- Push to user's AWS instance (down the road, to any Cloud computing platform)

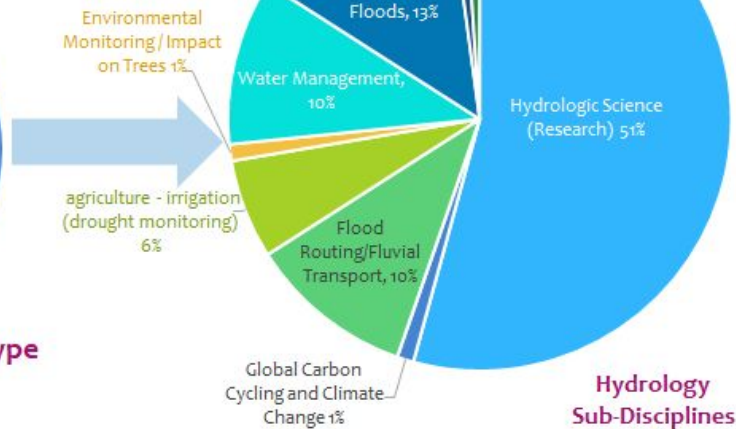
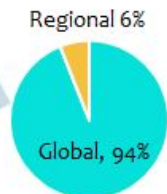
Coastal Sub-Disciplines



General Application Type



Oceans Sub-disciplines



Hydrology Sub-Disciplines

User Persona by Application Type

[source: SWOT Survey 2.0]

ShortName	Product (1 or more files)	Shapefile metadata	Archive & Distrib'n metadata	PCM catalog metadata	Quick look image	Run Config File	Check-sum
L0A_LR_Packet	binary	-	Archive.xml	Yes	-	-	Yes
L0B_LR_Frame	netCDF	-	Archive.xml	Yes	-	Yes	Yes
L1B_LR_INTF	netCDF	-	ISO.xml	Yes	-	Yes	Yes
INT_LR_XOverCal	netCDF	-	Archive.xml	Yes	-	Yes	Yes
L2A_LR_NativeSSH	netCDF	-	ISO.xml	Yes	-	Yes	Yes
L2B_LR_FixedSSH	netCDF	-	ISO.xml	Yes	-	Yes	Yes
L0A_HR_Packet	binary	-	Archive.xml	Yes	-	-	Yes
L0B_HR_Frame	netCDF	-	Archive.xml	Yes	-	Yes	Yes
L1B_HR_SLC	netCDF	-	ISO.xml	Yes	Yes	Yes	Yes
L2_HR_PIXC	netCDF	-	ISO.xml	Yes	TBD	Yes	Yes
L2_HR_RiverSP	shapefile	Yes	ISO.xml	Yes	TBD	Yes	Yes
L2_HR_RiverAvg	shapefile	Yes	ISO.xml	Yes	TBD	Yes	Yes
L2_HR_LakeSP	shapefile	Yes	ISO.xml	Yes	TBD	Yes	Yes
L2_HR_PIXCVec	netCDF	-	-	Yes	TBD	-	Yes
L2_HR_LakeAvg	netCDF	Yes	ISO.xml	Yes	TBD	Yes	Yes
L2_HR_Raster	netCDF	-	ISO.xml	Yes	TBD	Yes	Yes
L2_HR_FPDEM	netCDF	-	ISO.xml	Yes	TBD	Yes	Yes

Product Short Name	Product Long Name
L1B_LR_INTF	Level 1B KaRIn low rate nine beam interferogram product
L2A_LR_NativeSSH	Level 2A KaRIn low rate native sampling sea surface height product
L2B_LR_FixedSSH	Level 2B KaRIn low rate fixed sampling sea surface height product
L1B_HR_SLC	Level 1B KaRIn high rate single look complex data product
L2_HR_PIXC	Level 2 KaRIn high rate water mask pixel cloud product
L2_HR_RiverSP	Level 2 KaRIn high rate river single pass vector product
L2_HR_RiverAvg	Level 2 KaRIn high rate river average vector product
L2_HR_LakeSP	Level 2 KaRIn high rate lake single pass vector product
L2_HR_PIXCVec	Level 2 KaRIn high rate pixel cloud vector attribute product
L2_HR_LakeAvg	Level 2 KaRIn high rate lake average vector product
L2_HR_Raster	Level 2 KaRIn high rate raster product
L2_HR_FPDEM	Level 2 KaRIn high rate floodplain DEM product
L2_RAD_GDR	Level 2 Radiometer Geophysical Data Record
L2_NALT_OGDR	Level 2 Nadir Altimeter Operational Geophysical Data Record
L2_NALT_IGDR	Level 2 Nadir Altimeter Interim Geophysical Data Record
L2_NALT_GDR	Level 2 Nadir Altimeter Geophysical Data Record

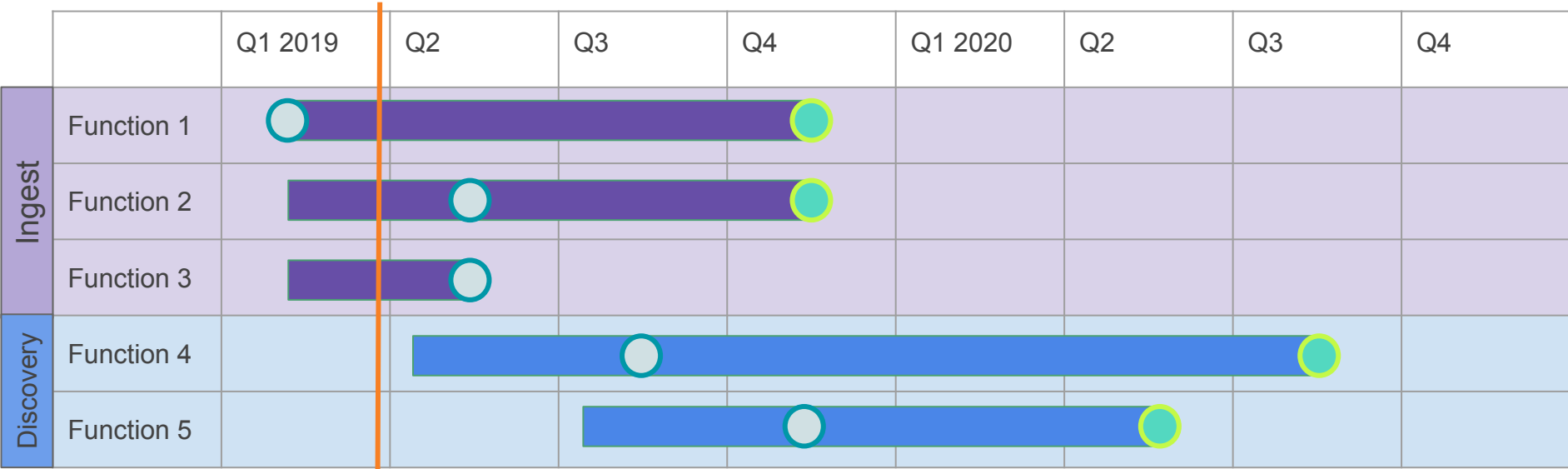
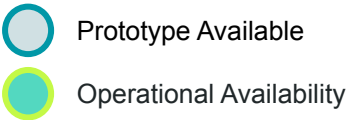
Program Overview

Services

Preliminary Services Identified

Finalized Services Roadmap - May 2019

- List of functionalities
- Timeline: when beta version available for testing



Demo - Earthdata Search

<https://earthdata.nasa.gov/>

The screenshot displays the Earthdata Search web application. On the left is a dark sidebar with navigation links: "Browse Collections", "Features" (with sub-links for Map Imagery, Near Real Time, and Customizable), "Keywords", "Platforms", "Instruments", "Organizations", "Projects", and "Processing levels". The main content area has a header with the "EARTHDATA Search" logo and a search bar containing "SST 2018". Below the search bar, it shows the search parameters: "Start: 2018-01-01 00:00:00 Stop: 2018-12-31 23:59:59" and a "Rectangle" with SW coordinates (19.265625, -131.765625) and NE coordinates (49.640625, -104.203125). A map of the North Pacific Ocean is shown with a red rectangle highlighting the search area. Below the map, it states "136 Matching Collections". There are filters for "Sort by: Relevance" and checkboxes for "Only include collections with granules" and "Include non-EOSDIS collections". A tip suggests adding collections to a project. Two collection results are visible: "PODAAC-ERSST-L4N40" and "PODAAC-ERSST-L4N50". The footer includes version information (v 1.84.4), search time (1.0s), and links to NASA Official, FOIA, Privacy Policy, and USA.gov. A link for "Earthdata Access: A Section 508 accessible alternative" is also present.

EARTHDATA Search

Find a DAAC

SST 2018

Start: 2018-01-01 00:00:00 Stop: 2018-12-31 23:59:59

Rectangle: SW: 19.265625, -131.765625 NE: 49.640625, -104.203125

136 Matching Collections

Sort by: Relevance Only include collections with granules Include non-EOSDIS collections

Tip: Add + collections to your project to compare and download their data. Learn More

PODAAC-ERSST-L4N40

0 Granules • 1854-01-01 ongoing • The Smith & Reynolds Extended Reconstructed Sea Surface Temperature (ERSST) Level 4 dataset provides a historical reconstruction of monthly global ocean surface temperatures and temperature anomalies over a 2 degree spatial grid since 1854 from in-situ observations based on a con...

REYNOLDS_NEDS_L4_MONTHLY_V4_v1 - PODAAC

PODAAC-ERSST-L4N50

v 1.84.4 Search Time: 1.0s NASA Official: Stephen Berwick FOIA NASA Privacy Policy USA.gov

Earthdata Access: A Section 508 accessible alternative