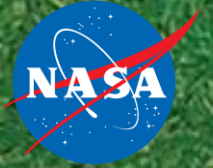


National Aeronautics and
Space Administration



EXPLORE EARTH

Commercial Smallsat Data Acquisition Program (CSDAP) Overview

Alfreda Hall – May 2020

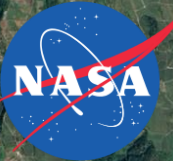


Today's Discussion

- Overview of the Pilot Results
- Transition from Pilot to Sustained Program
- Data Management Overview
- Data Access
- Open Discussion

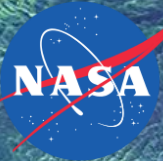
Private-Sector Small Constellation Satellite Data Product Pilot Project

- Initiated in November 2017
- Pilot activity to evaluate data from operating commercial small-satellite constellations for research and applied science activities
 - Augment and/or complement NASA observations
 - Cost effective means to advance/extend research and applications
- Issued Request For Information (RFI) in December 2017, 11 vendors responded, and four vendors were selected and were asked to respond to a Request For Proposal (RFP).
- Blanket Purchase Agreements were awarded in September 2018 to DigitalGlobe Inc., Planet Labs Inc., and Spire Global.
- Pilot activity ending early 2020



Terms & Conditions for the Pilot Purchased Data for Scientific Use

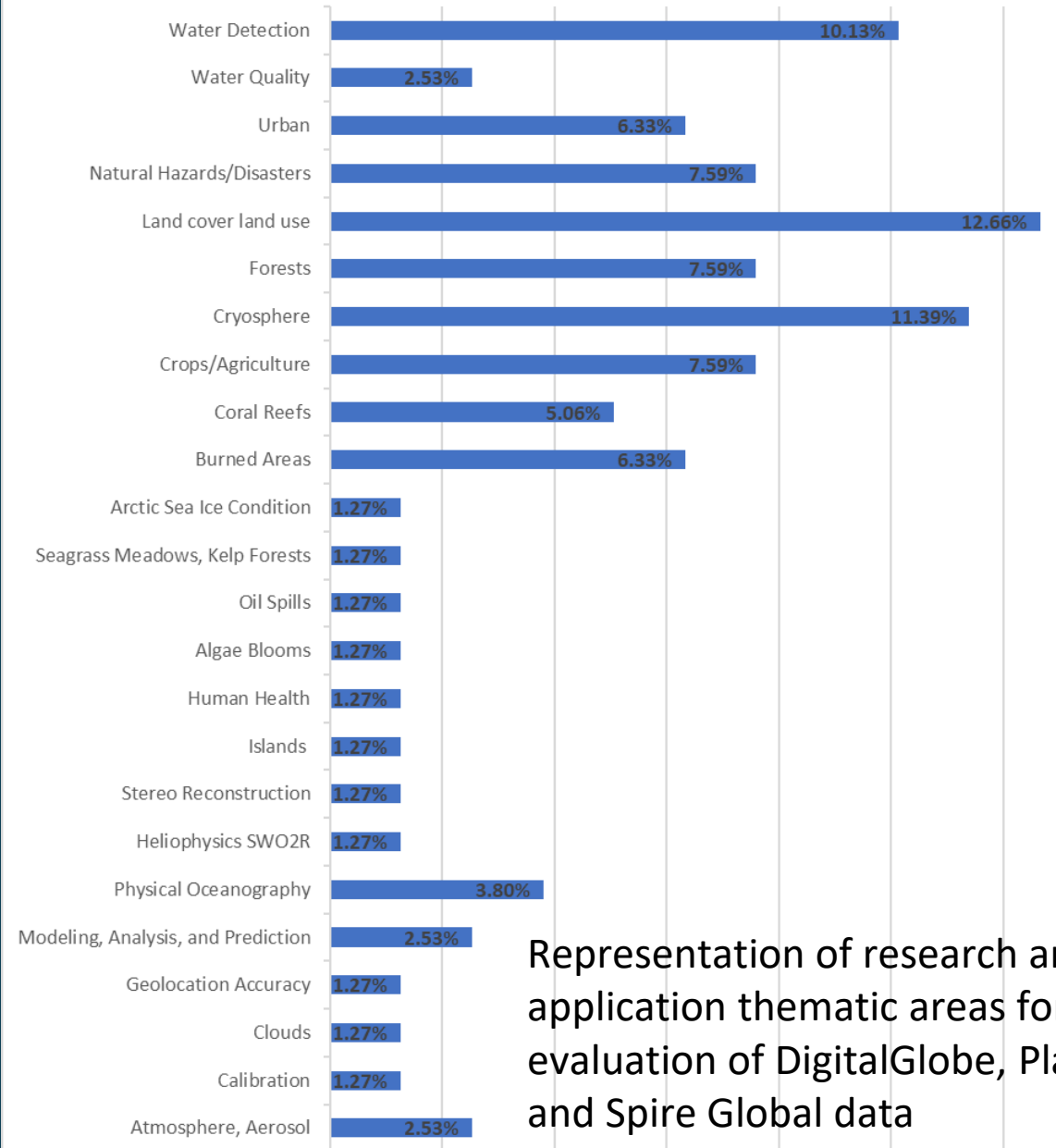
- Use by NASA or its Related Entities of the Data Products pursuant to a NASA-initiated, US Government-funded and/or US Government-peer reviewed investigation established through a NASA Research Announcement or similar public notice of opportunity, and performed for the purpose of conducting experiments, evaluation, research, and/or development, including basic and applied research under the NASA Applied Sciences Program.
- Scientific Use is not intended for the development of commercial products or services and does not include activities funded or sponsored by non-governmental organizations or activities outside of NASA.
- No Publication or third-party access of Data or derivatives without permission from the vendor.
- Maintain Copyright notices and any restrictive markings.



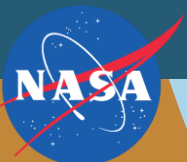
Pilot Evaluation Approach

NASA ESD identified 41 existing projects to evaluate data from DigitalGlobe Inc. (now known as Maxar), Planet Labs Inc., and Spire Global.

- All six ESD Research and Analysis (R&A) science focus areas, the Applied Science program elements, and Heliophysics Space Weather were represented.
- An independent assessment of calibration and geolocation was conducted.
- Each project developed reports independently using common evaluation criteria.
- NASA HQ developed a [summary report](#) from the individual project reports for each vendor.



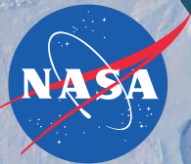
Representation of research and application thematic areas for evaluation of DigitalGlobe, Planet, and Spire Global data



Pilot Evaluation Criteria

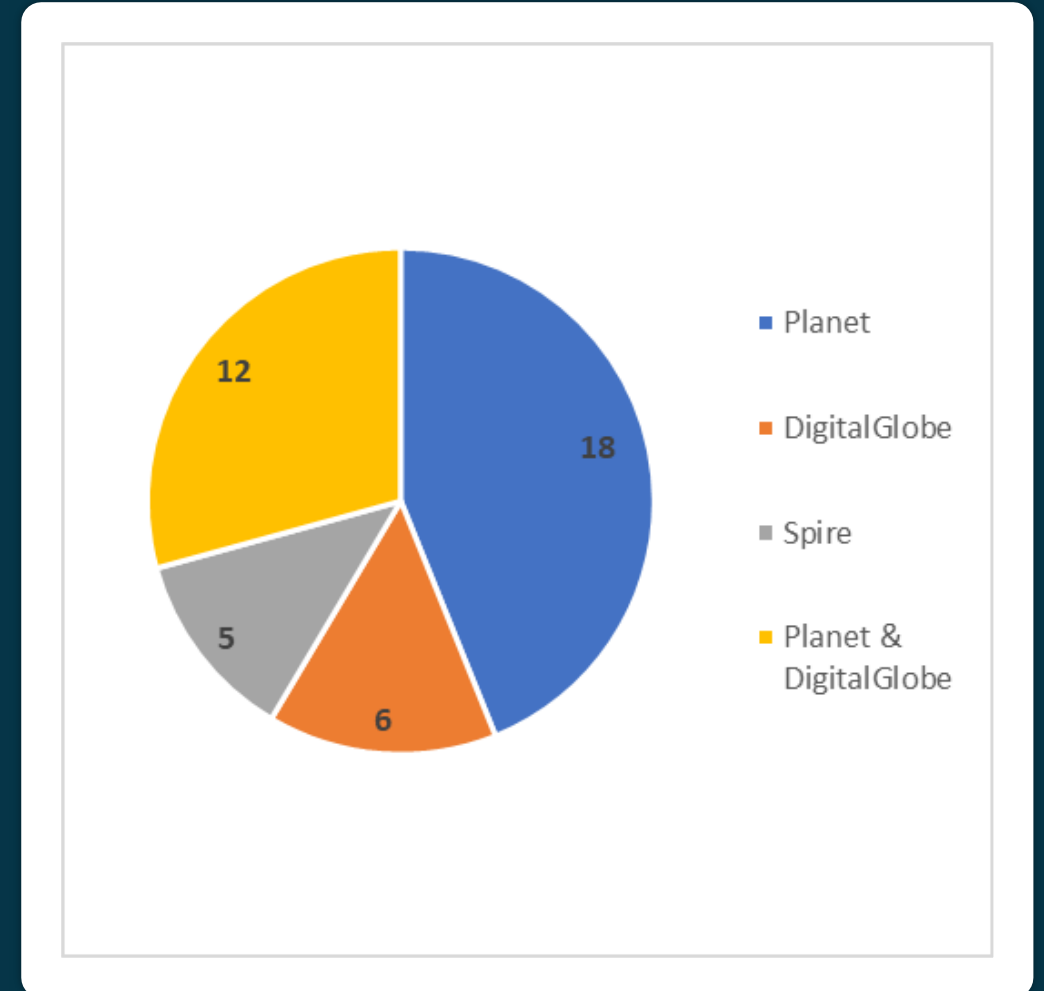
All projects were asked to evaluate and comment on the following:

1. **Accessibility of vendor supplied imagery and data:** The ease and efficiency with which data can be searched, discovered, and downloaded from the vendor systems.
2. **Accuracy and completeness of metadata:** The accuracy and completeness of metadata that accompanies the imagery provided by the vendor.
3. **Quality of User Support Services:** The availability, responsiveness, and technical expertise required to answer Investigator inquiries.
4. **Appropriateness of End User License Agreement (EULA):** The suitability of EULA to allow Investigators to practice and perform open science.
5. **Utility of data and imagery for advancing Earth system science research and applications:** The ability of vendor provided imagery and data to support Earth system science research and application activities.
6. **Quality of vendor supplied imagery and/or data:** Data attributes such as geolocation accuracy, quality of radiometric calibration, platform intercalibration, etc.



Pilot Evaluation Reporting

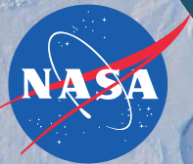
- The 41 projects were separated into two groups based on type of data being evaluated
 - Radio Occultation
 - Imagery
- Less than half of the Pilot investigators evaluated multiple commercial vendors for their projects.
- Investigators in each group submitted interim, midterm and final reports and attended one in-person meeting.



Evaluation Results – DigitalGlobe Inc.

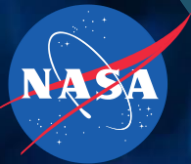
- Data augmented and complement existing NASA research and applied activities
 - Data are primarily suited to point-in-time analyses because of not frequent data acquisitions outside of Arctic and Antarctic areas.
 - Monitoring long term trends is possible where data exist with excellent calibration and radiometric performance.
- No issues with data access/download*
- Documentation and metadata are sufficient
- User services are very good
- Standard scientific collaboration is inhibited by license terms

**The DigitalGlobe datasets evaluated in the Pilot were made available through the NextView license from the National Geospatial Intelligence Agency and distributed through NASA's CAD4NASA project at Goddard Space Flight Center.*



Evaluation Results - Planet Labs Inc.

- Data augmented and complement existing NASA research and applied activities
 - PlanetScope data are primarily suited to point in time analysis and verification; monitoring long term trends is difficult because of inconsistent calibration, uneven radiometric performance and inconsistent geolocation – revisit frequency is excellent
 - RapidEye and SkySat suited to point-in-time analyses because of not frequent data acquisitions
- Direct PI data access/download needs improvement
- Documentation and metadata need improvement
- User services are very good
- Standard scientific collaboration is inhibited by license terms



Evaluation Results – Spire Global, Inc.

- The radio occultation (RO) measurements were of quality consistent with the other GNSS-RO observing systems
 - Data are comparable to other RO observing system in terms of their weather forecast impact, and the spatial distribution was complementary in filling data void regions
 - Vertical information content was suitable for studying the fine structures and seasonal variabilities of the tropopause, and their penetration depth was very good and may be useful in the study of the planetary boundary layer
- The GNSS reflected measurements show promise to measure sea surface height with a precision of 2.5 cm over 1 sec averages and an accuracy of < 10 cm
- The Precise Orbital Determination (POD) products were found to be useful in retrieving thermosphere density via satellite drag – particularly in quantifying day-to-day variability
- The mechanism for accessing and ordering from Spire’s data catalog needs improvement to enable ease of data discovery
- No issues with data access/download*
- Documentation and metadata are reasonable
- User services are very good
- Standard scientific collaboration is inhibited by license terms

**The Spire Global datasets evaluated in the Pilot were made available and distributed through NASA’s GMAO system at Goddard Space Flight Center.*



The background of the slide is a cosmic scene. The top half features a dark blue and black space filled with numerous small white stars and a prominent, bright blue nebula on the right side. The bottom half is dominated by a large, glowing orange and yellow nebula on the left, which transitions into a greenish-blue nebula on the right. The overall effect is a vibrant, multi-colored starfield.

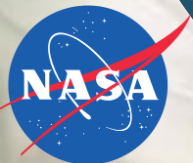
Transitioning from Pilot to Sustained Program

Commercial Smallsat Data Acquisition Program

Program Objectives:

- Establish a continuous and repeatable process to onramp new commercial data vendors and evaluate data for its potential to advance NASA's Earth science research and applications activities.
- Enable sustained use of purchased data for broader use and dissemination by NASA scientific community.
- Ensure long-term data preservation through establishment of data management processes and systems to support rapid evaluation; access and distribution of purchased data; and long-term access to purchased data for scientific reproducibility.
- Coordinate evaluation and scientific use with the European Space Agency (ESA)) as part of the Joint Program Planning Group activities for data from third party missions.

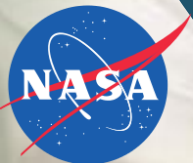
<https://earthdata.nasa.gov/csdap>



FY20 Activities & Beyond: Onramp and Evaluation

NASA ESD will continuously monitor the development of companies and acquire relevant data to complement NASA's observation data.

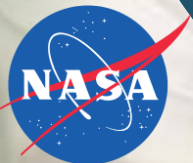
- Each 12-18 months an RFI will be issued with the goal of identifying data that is potentially valuable for NASA's Earth science research and application activities.
- All RFIs, RFPs and BPAs will contain a standardized scientific use license to minimize the effort by NASA and confusion by users on how data can be used.
- Data from selected vendors will be evaluated by teams of Principal Investigators (PIs) selected via directed funding or through the annual Research Opportunities in Space and Earth Science (ROSES) solicitation.
- The web-based tool, Smallsat Data Explorer (SDX) Tool, will provide a consistent interface for the PIs to request and manage their data allocation.
- All data purchased by NASA will be made available to NASA funded researchers with a standard scientific use license. Language will be added to ROSES solicitations to ensure access and usage of the purchased data by the broader community.



Scientific Non-Commercial Use License

- NASA has determined a necessity for the U.S. Government to acquire minimum rights to Data for any and all Data procured under any agreement to support intended Scientific Non-Commercial Use.
- At a minimum, the U.S. Government and its related entities shall have the ability to copy, store, share and use Data and any Derivatives for Scientific Use including but not limited to inclusion in scientific and technical articles and publishing academic, technical or professional journals, symposia proceedings, or similar works.
- The minimum data rights apply to all phases of the Commercial Smallsat Data Acquisition Program.

Currently for NASA funded researchers ... for U.S. Government is the ultimate goal ... not there yet!



Data Management Overview - Phases

Evaluation

- PIs directly interact with vendors to request and access data
- Vendors provide a list of requested data
- NASA mirrors data

Interim/Transition

- Manage and archive **mirrored** data in NASA cloud
- Extract metadata
- Provide search and access to the data (SDX)
- Make data available to NASA funded researchers
 - Verify users
 - Validate quotas

Long-term Sustained

- Users will first search whether the data to be requested is already available in NASA catalog (already mirrored from vendor)
- Users will directly interact with vendors for new orders, issues etc.
- Earthdata cloud will host the data long-term and provide an egress solution (~24 months from the end of evaluation)
- All purchased data will be made available to NASA funded researchers only**

***DESIS data is available for all US Gov. funded researchers



Data Access

Vendor	Data Available	Who can use the data?	Scientific Use Only	3rd Party Publication Requires Permission	Maintain Original Copyright	Where To Get the Data	Can PIs submit new orders
Planet	PlanetScope, RapidEye, SkySat	NASA (funded) researchers	Y	N*	Y	SDX + Planet	Yes**
Spire	GNSS-RO, GNSS-R, POD	NASA (funded) researchers	Y	Y	Y	SDX	Yes
Maxar (formerly DigitalGlobe)	WorldView 1, WorldView 2, WorldView 3, Worldview 4, QuickBird, IKONOS, and GeoEye	NASA (funded) researchers	Y	Y	Y	CAD4NASA	Yes
Teledyne Brown Engineering, Inc.	DESI	U.S. Government	Y	N*	Y	TCloudHost	Yes

* = Courtesy
 ** = Not for SkySat



Smallsat Data Explorer (SDX)

- Search and discovery of all commercial data archived by NASA
- Metadata extracted during mirroring
- User authentication
- User data request approval process
- Enforce EULA acceptance

The screenshot shows the Smallsat Data Explorer (SDX) interface. The main map displays a world map with a blue rectangular selection box over the Indian Ocean region. The interface includes a sidebar with navigation icons (home, list, search, user profile) and a right-hand panel with filters and scene lists.

Filters:

- 113 M km² Area of interest
- Nov 8th, 2019 — Jan 1st, 2020 Date
- 0 — 52% Cloud coverage
- PSScene4Band Types

Scenes:

- PSScene4Ban... Nov 7th, 2019
- PSScene4Ban... Nov 7th, 2019
- PSScene4Ban... Nov 7th, 2019
- PSScene4Ban... Nov 7th, 2019
- PSScene4Ban... Nov 7th, 2019

0 of 50 selected for a total of 0 km²

Order scenes →



<https://earthdata.nasa.gov/esds/small-satellite-data-buy-program/sdx>



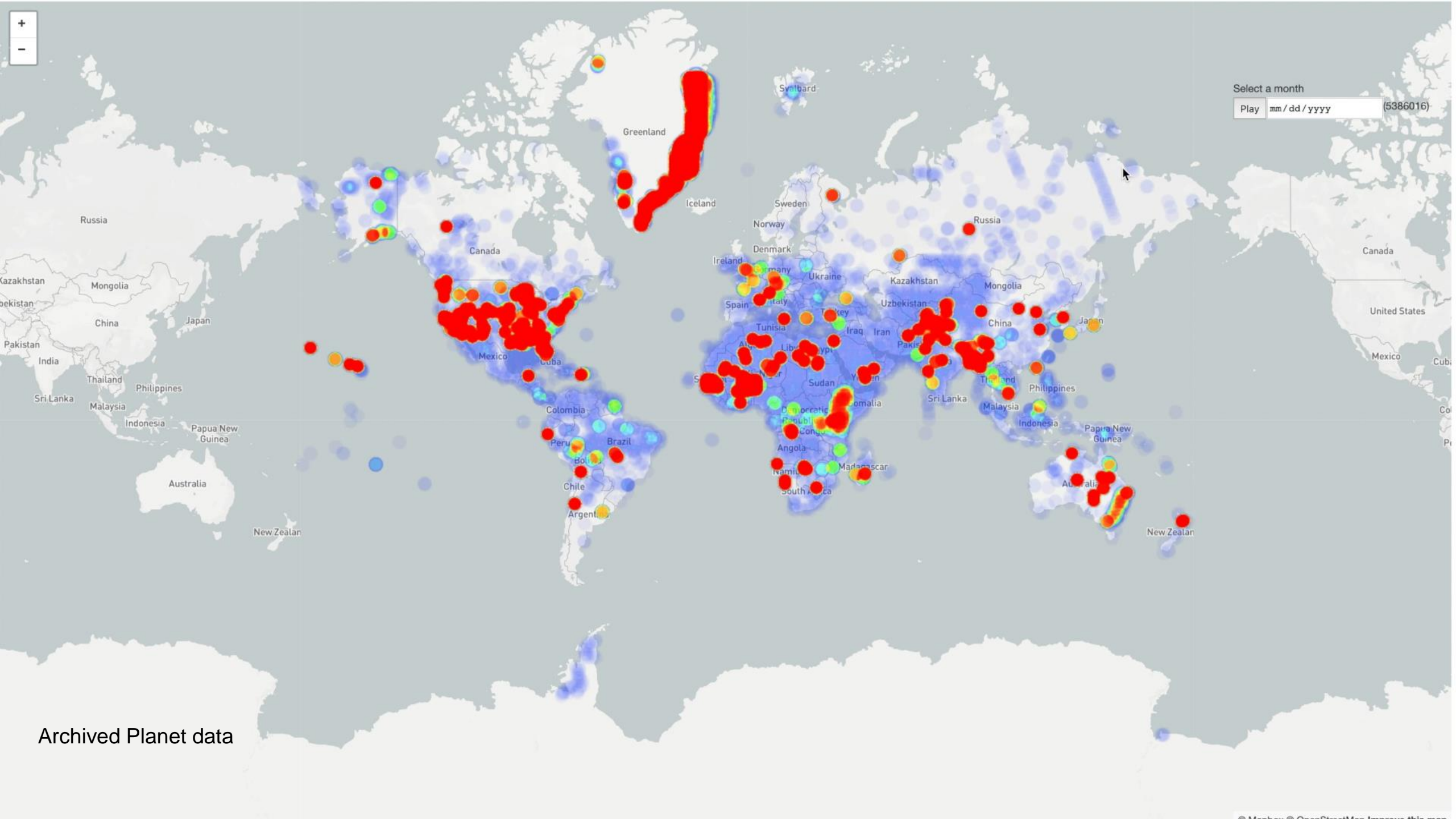
- DESIS (183)
- Planet (370)

Select a month

Stop January 2015



Through November 2019



Select a month
Play mm / dd / yyyy (5386016)

Archived Planet data

Summary

- Results from pilot program indicate data is of sufficient quality for continued access
 - [Pilot Evaluation Final Report](#)
- Pilot program is transitioning to the Commercial Smallsat Data Acquisition Program
- Next RFI will be released September of 2020

Accessing and Requesting Commercial Smallsat Data FAQ:
<https://earthdata.nasa.gov/esds/small-satellite-data-buy-program/faq-commercial-data>

Contact Us

Program related questions:

- Alfreda Hall @ alfreda.a.hall@nasa.gov

Data Management:

- Manil Maskey @ manil.maskey@nasa.gov

Science related questions:

- Will McCarty @ will.mccarty@nasa.gov

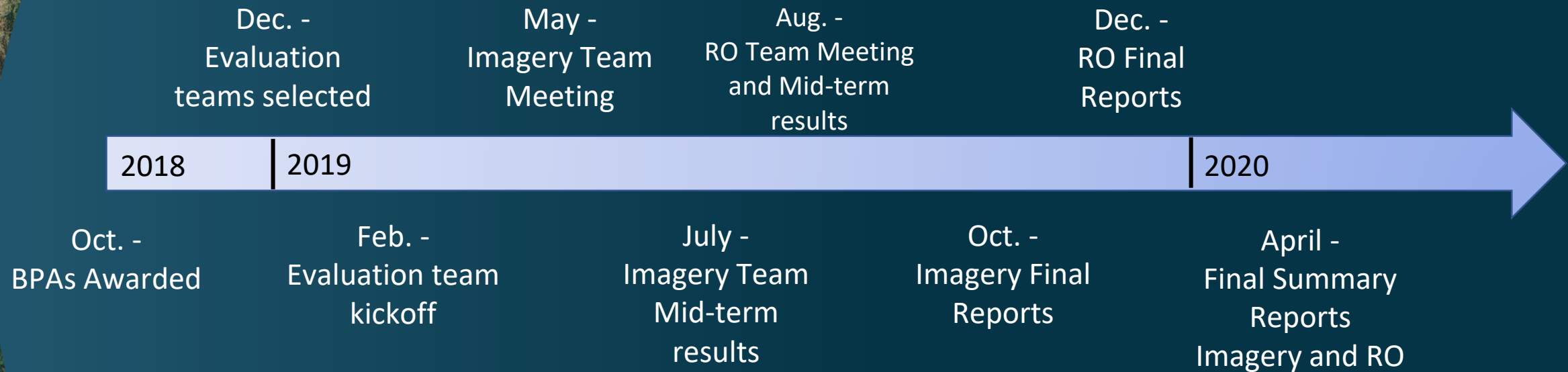


Questions?



Back-up

Pilot Evaluation Timeline



Commercial Data Mirroring Status

Planet

- Total archive size is about 3 PB of data
- All Planet data is in NASA cloud
 - PlanetScope and RapidEye (530M sq. km)
 - Skysat (4,400,000M sq. km)

Digital Globe

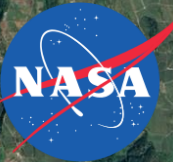
- All DigitalGlobe data is mirrored at GSFC and distributed via CAD4NASA (~4 PB)

Spire

- All Spire data is mirrored in NASA cloud (~3.2 TB)

DESI

- Mirroring to NASA cloud in near future





Process for Data Access: PlanetScope and RapidEye

Process for requesting and obtaining PlanetScope and RapidEye data is as follows:

- User contacts CSDAP and provides name, email address, and pertinent information (grant number, contract number, etc.) for data access approval
- CSDAP will verify and notify Planet
- User will create an account at <https://www.planet.com/explorer>
- User will search and browse data using <https://www.planet.com/explorer>
- User will place a data request order
- A data download URL will be sent to the user via email

Quota: 5M sq km/account; data avail – 30 days after acquisition, exceptions handled by NASA and Planet



Process for Data Access: Planet SkySat, Spire, Maxar

Process for requesting and obtaining Planet SkySat and any Spire data products data is as follows:

- User will search the data using the SDX
- User will select the data from the search result
- User will request the data (user will be asked to login using the Earthdata Login)
- Reviewer will review the request including verifying the user for data access
- If the request is denied, a notification will be sent requesting additional information
- If the request is approved, the user will be notified with a data download URL via email

Process for requesting and obtaining any Maxar data products is specified at <https://cad4nasa.gsfc.nasa.gov/>

Process for Data Access: DESIS

Process for requesting and obtaining DESIS data is as follows:

- User will contact CSDAP to request an account
- CSDAP will send EULA information to the requesting user
- After acceptance of EULA, user will receive email from Teledyne Brown Engineering with instructions to create an account at the TCloudHost
 - User will search data using the TCloudHost
 - User will request data using the TCloudHost
 - A data download URL will be sent to the user via email