
# Commercial Smallsat Data Acquisition (CSDA) Program Overview

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Earth Science Data Systems
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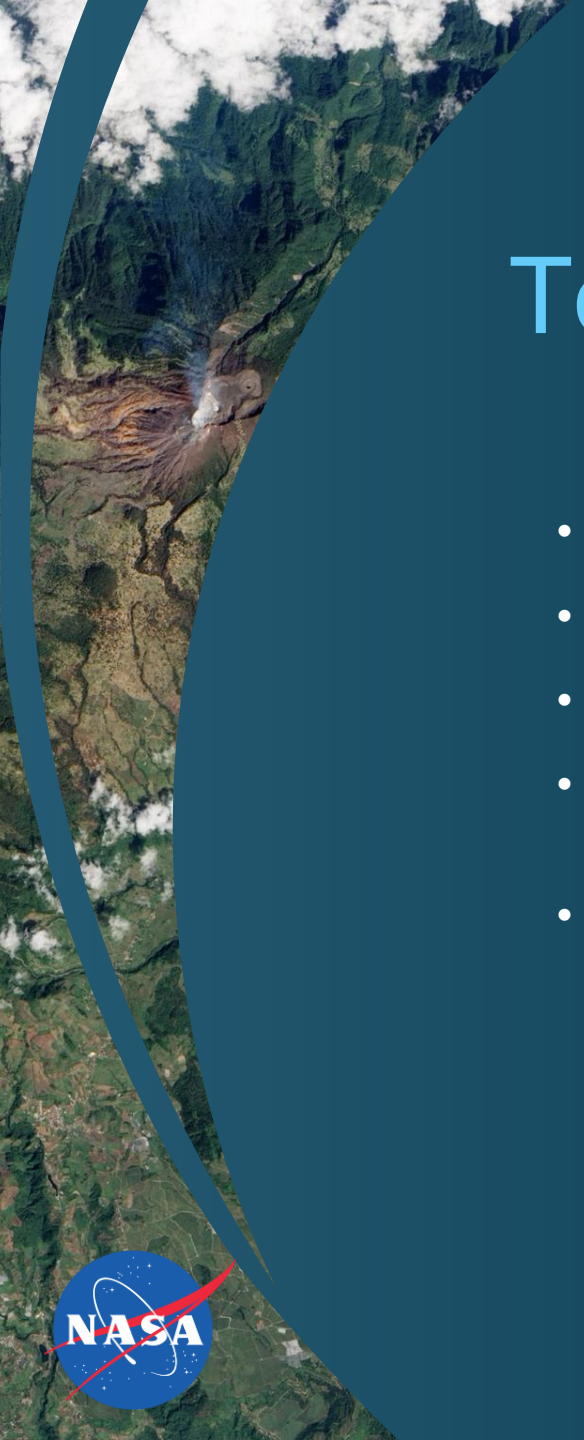


# Today's Discussion

- Overview of the Pilot Results
- Science Results
- Data Access
- Transition to a Sustained Program
  - New licensing approach
- Summary

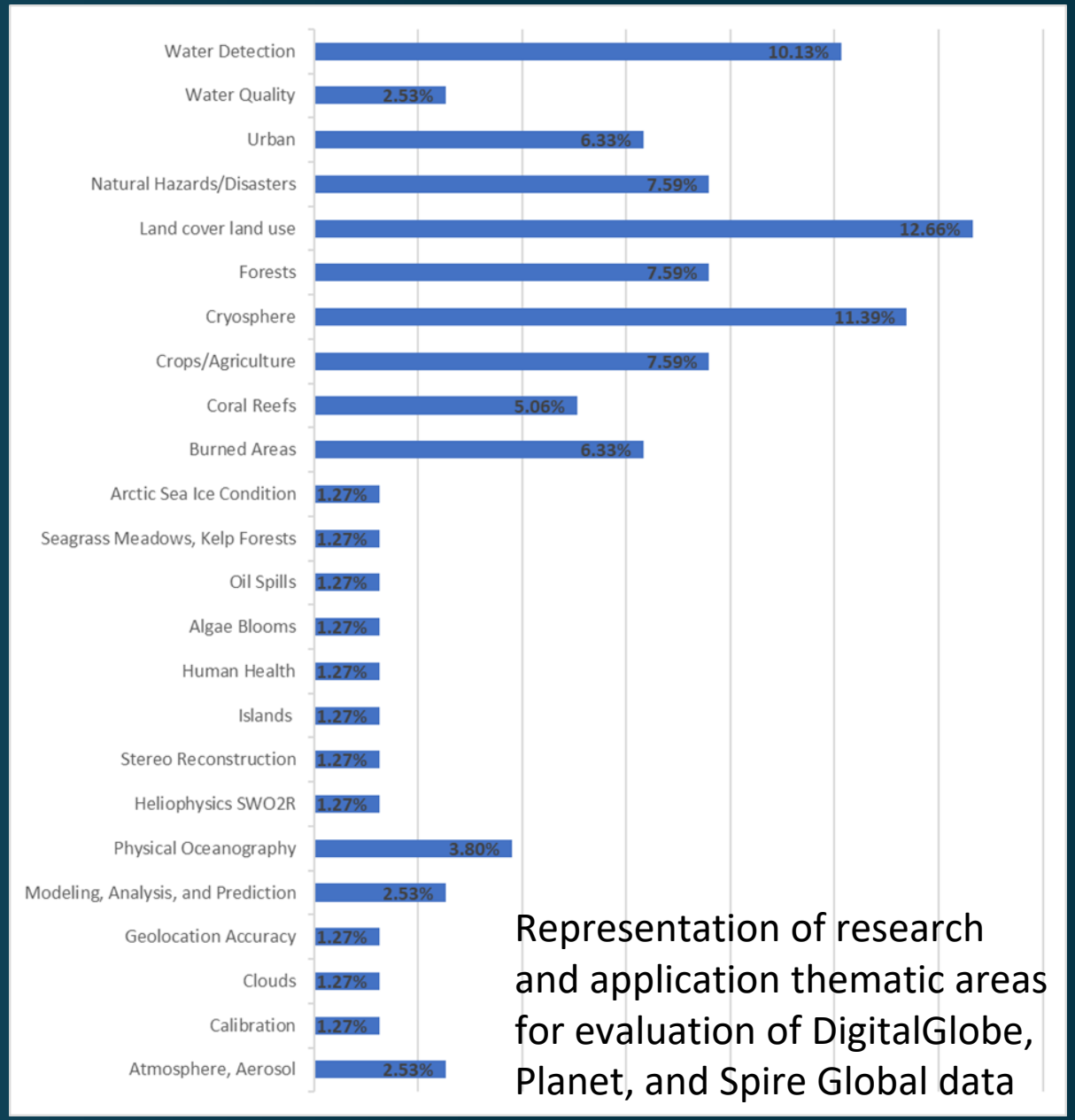
# Private-Sector Small Constellation Satellite Data Product Pilot Project

- 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
  - 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 (BPAs) were awarded in September 2018 to DigitalGlobe Inc., Planet Labs Inc., and Spire Global.
- Pilot activity ended early 2020

# 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.

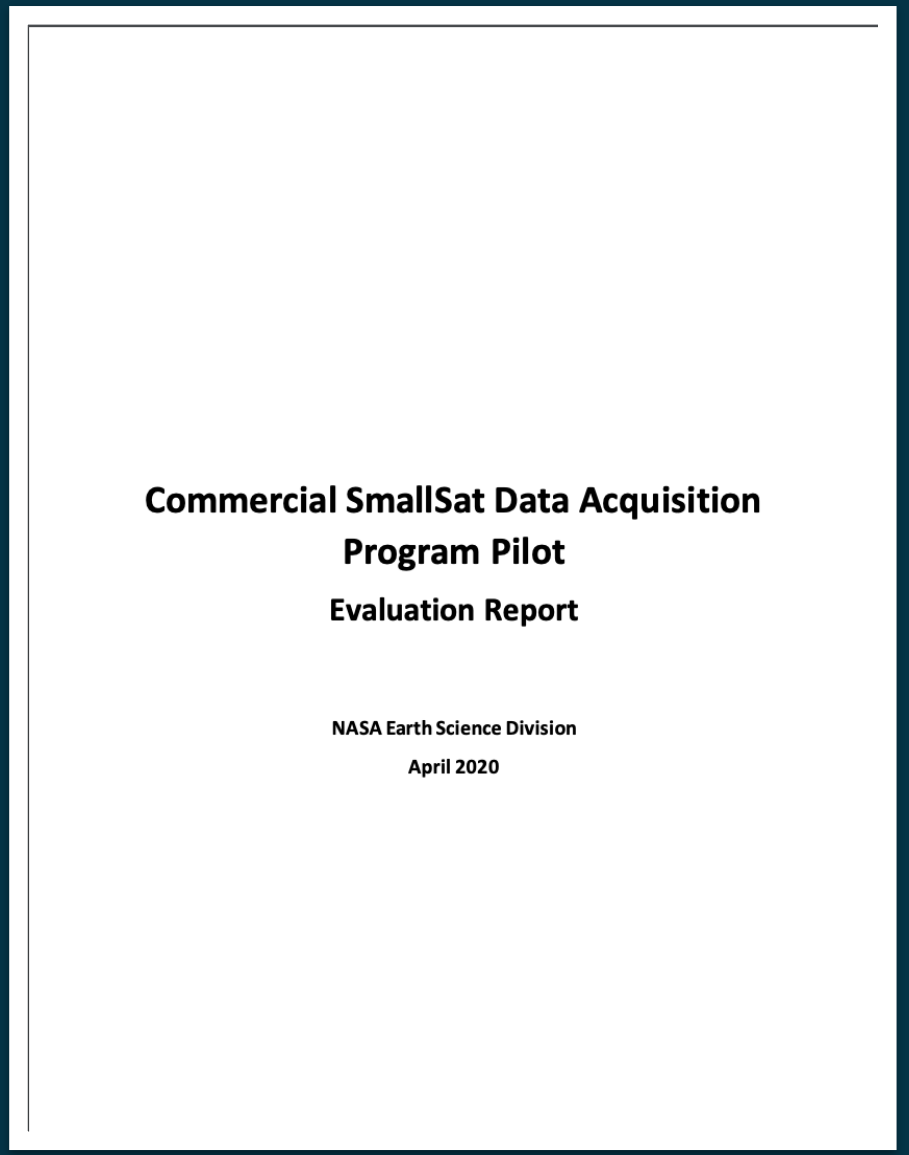
- All Research and Analysis (R&A) science focus areas, Applied Science program elements, and Heliophysics Space Weather were represented.
- An independent assessment of calibration and geolocation was conducted.




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

# Evaluation Results Summary

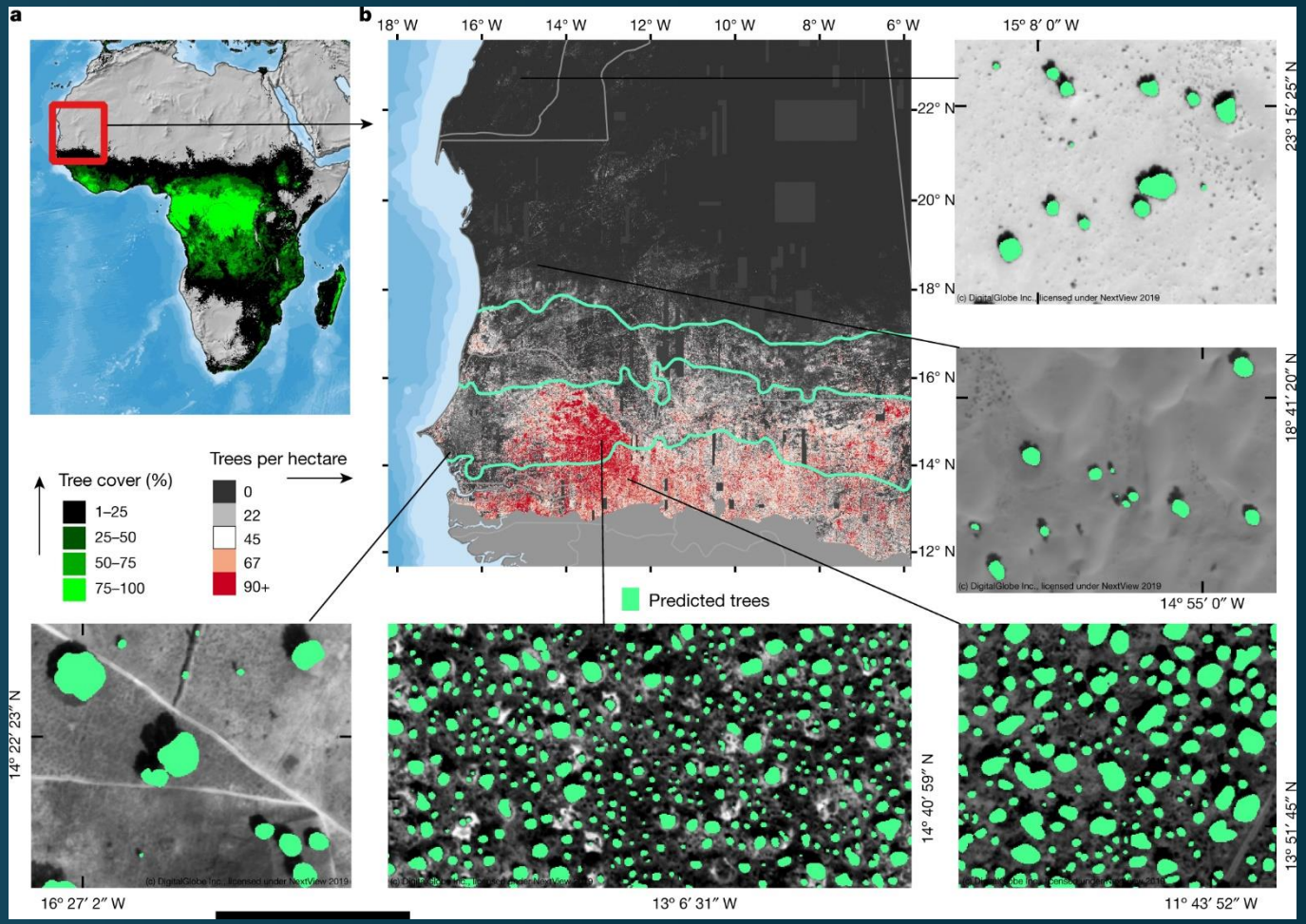
- Majority of **evaluations demonstrated the usefulness of commercial data and imagery** for advancing scientific research and applications.
- Investigators encountered **limitations**:
  - Calibration and geolocation
  - Increased the amount of work needed to access, preprocess, and analyze data (e.g., download services, documentation, and metadata).
  - ***Restrictive nature of the EULAs made standard scientific collaboration difficult and must be addressed in future data purchases***.
- Overall, the utility of the evaluated data outweighed the difficulties encountered.




DESIS (183)
Planet (370)
Select a month
Stop
January 2015
Through November 2019
© Mapbox © OpenStreetMap Improve this map

# An Unexpectedly Large Count of Trees in West African Sahara and Sahel

- Semi-arid trees have a crucial role in carbon storage & biodiversity and are not well-documented.
- Researchers mapped trees >3 $m^2$ crown area in West Africa, from the Sahara, Sahel, and sub-humid zone using 50 cm satellite imagery, deep learning, and HPC.
- 1,837,565,501 tress were mapped over 1,300,000 $km^2$
- Deep learning and <1 m satellite imagery deliver here-to-for unavailable semi-arid carbon storage and biodiversity insights
- GEDI and ICESat-2 data  can be combined with these data to provide tree heights for larger trees or clusters of trees




a) All trees >3-$m^2$ crown area were mapped in the red rectangle using deep learning and <1 m satellite imagery. b) The density of trees per hectare derived from 1,837,565,501 trees at various scales, from local to regional scales.


Brandt, M., Tucker, C.J., Kariryaa, A. et al. An unexpectedly large count of trees in the West African Sahara and Sahel. *Nature* (2020). https://doi.org/10.1038/s41586-020-2824-5

# Neuse River Flooding near Goldsboro, NC (Nov. 14-21, 2020)

- Per request from North Carolina Department of Public Safety, NASA Earth Science Disasters Program put together flood impacts on correctional facility that frequently requires evacuation during high water events on the nearby Neuse River.

- Planet data acquired from the CSDA Program and the European Space Agency's Sentinel-2 were used to provide an expedited analysis for this request.

- Planet data is uniquely helpful here because it has greater repeat of observations, which would allow scientists (post-event) to see how algorithms for mapping water can capture finer-scale details of the event evolution, and also provide greater opportunities to match up with and cal-val other coarser and open data sets.

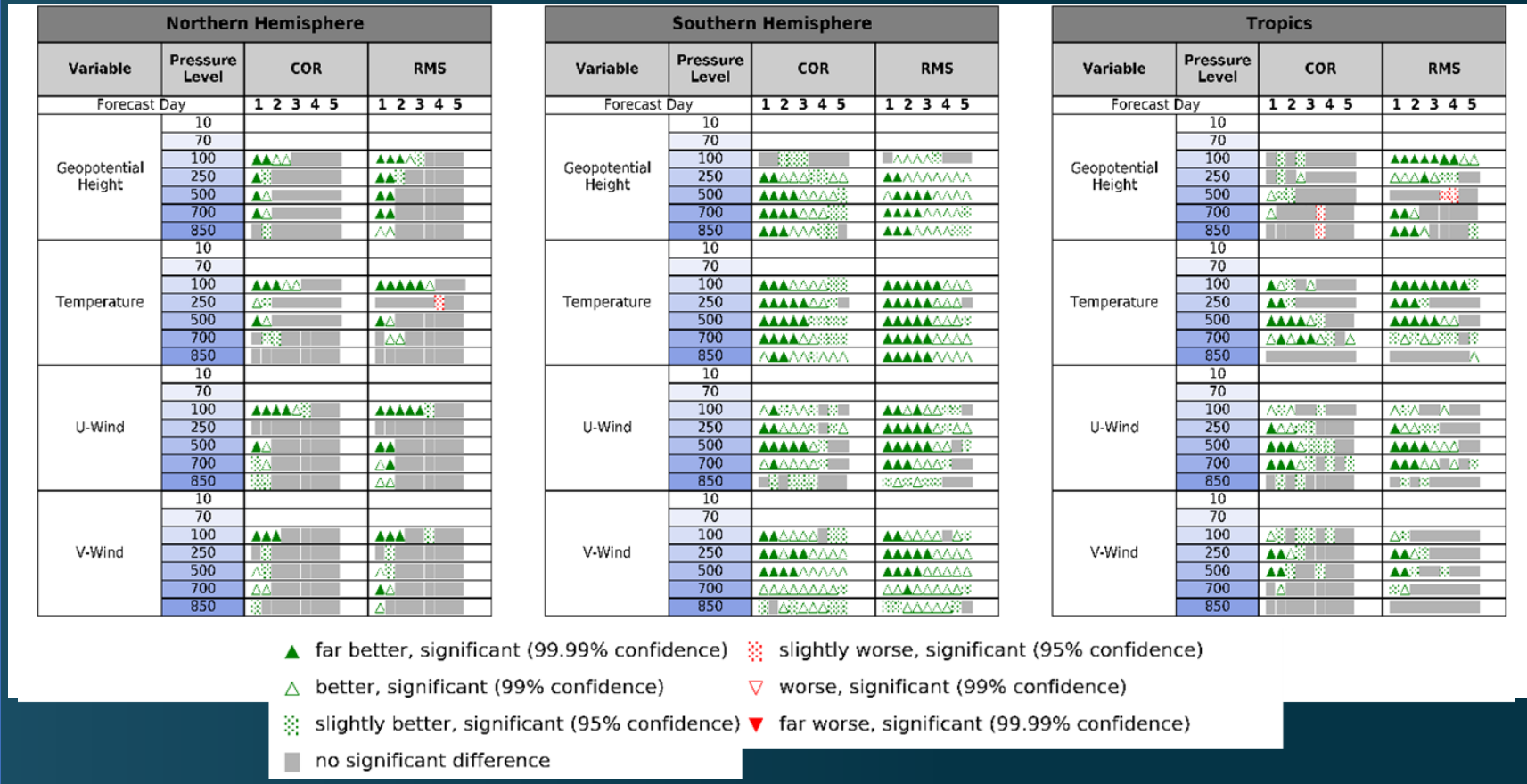
*Planet images (right) are colored by adopting ESA's false color composite to the Planet imagery. It's a combination of the near-infrared, red, and green reflectance bands—it helps the water to appear relatively dark and consistent in contrast to red vegetation.*


# Commercial Radio Occultation Assimilation Improvements at the GMAO

Data assimilation experiments illustrate the forecast benefits of NASA-purchased Spire data

- Spire-processed bending angle profiles were assimilated on top of current radio occultation (RO) observing system
- Largest improvements seen in the southern hemisphere (middle)
- Spire improves tropical forecasts, even in the presence of COSMIC-2 (left)

## Forecast Skill Scorecard: Assessed against ECMWF Operations (12/1/2019-1/31/2020)

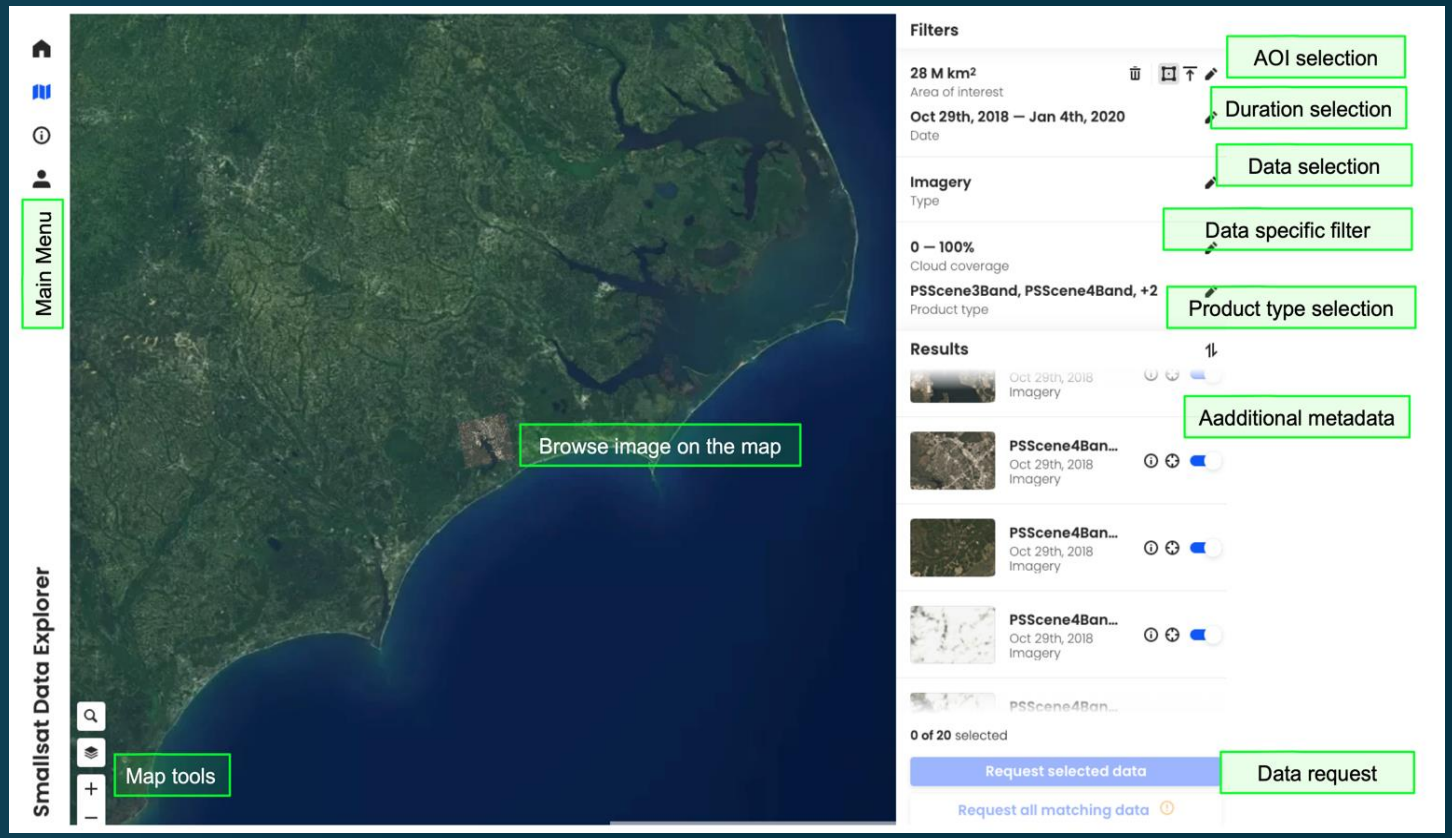



The forecast skill scorecard shows large improvements (green) from using the new forward operator and the new Spire RO data in GEOS


GMAO
Global Modeling and Assimilation Office
gmao.gsfc.nasa.gov

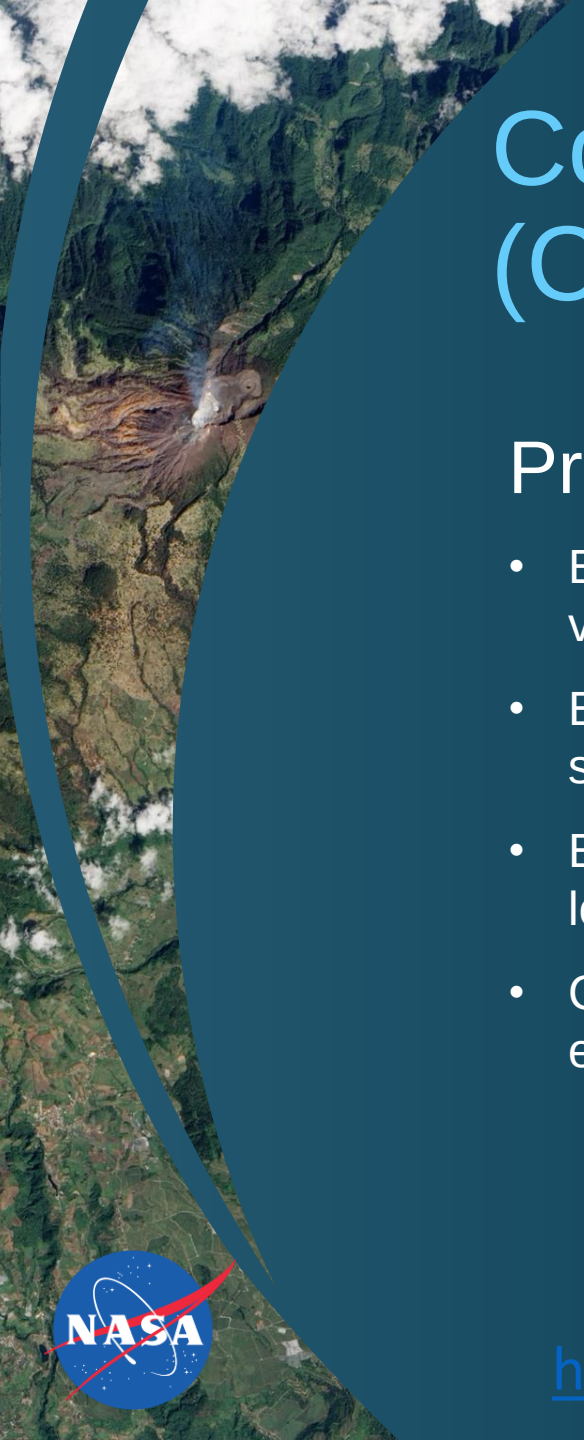
# Smallsat Data Explorer (SDX)

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




https://csdap.earthdata.nasa.gov

# Pilot to Sustained Program



# Commercial Smallsat Data Acquisition (CSDA) Program

## Program Objectives:

- Establish a continuous and repeatable process to onramp new commercial data vendors.
- Enable sustained use of purchased data for broader use and dissemination by NASA scientific community.
- Ensure long-term data preservation, access and distribution of purchased data and long-term access for scientific reproducibility.
- Coordinate with other US Government agencies and international partners on the evaluation and scientific use of commercial data.

https://earthdata.nasa.gov/csdap

# Evaluation Criteria

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.

# FY21 Activities & Beyond: Onramp and Evaluation

- Commercial SmallSat Data Analysis solicitation released (ROSES A.42) to promote scientific use of purchased data by the scientific and applied science communities.
- Onramp of qualified vendors from second RFI (October 2019) anticipated Q2 CY2021
- Third RFI released December 2020 → Closed January 2, 2021.
- Coordination with US Government Agencies to develop standardized scientific licenses.

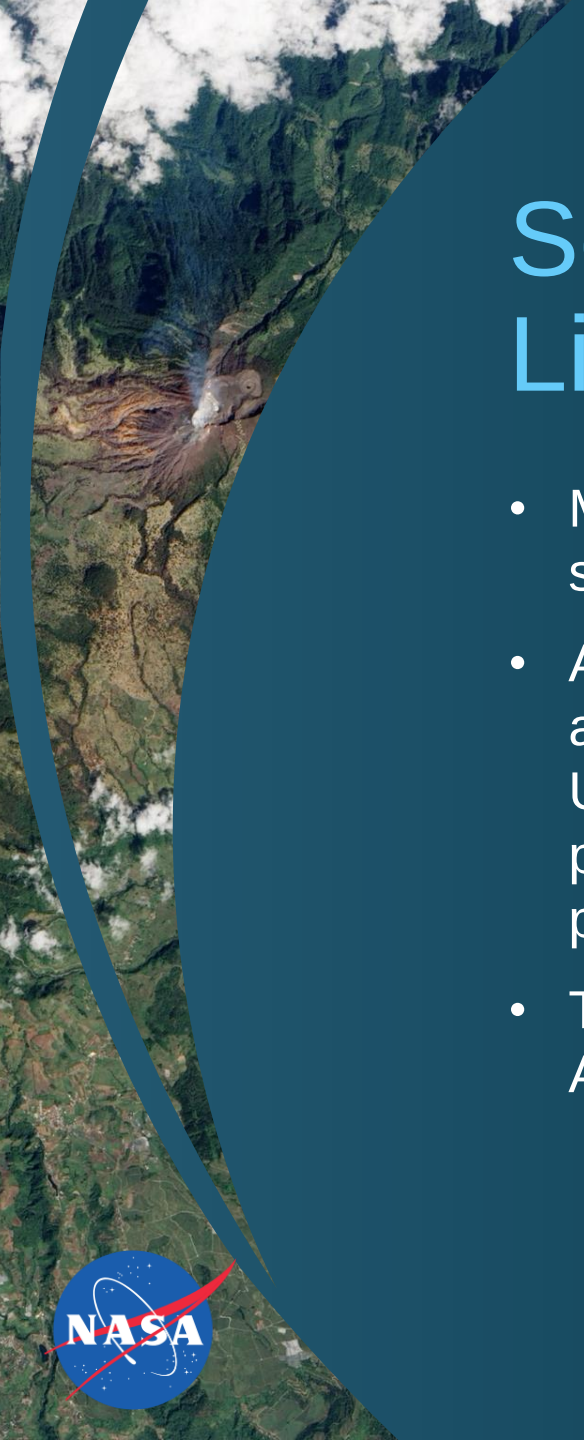
# Data Licensing Approach

- NASA's End Users License Agreements (EULAs) for data acquired during the pilot phase restrict usage to NASA researchers only.
  - Satellite Needs Working Group (SNWG) Assessment will be use to uplift licenses.

- A tiered EULA approach will be used beginning with the second onramp to allow academic and government-wide use of purchased data.
  - EULA approach is modeled after National Reconnaissance Office (NRO) Geospatial Intelligence Systems Acquisition Directorate Commercial Systems Program Office (CSPO) common, standardized family of EULAs.

# End User License Agreements (EULAs) Tiered Approach

| Authorized User Community | Type of EULA | | |
|---|---|---|---|
| | Public Release | U.S.G. Plus | U.S.G. |
| U.S. Federal Government including:<br>• U.S. State/Local/Tribal Government; Contractors and Grantees associated with Government Agency and Academia | | | X |
| U. S Federal Government, Foreign Civil Partners | | X | X |
| Public Release | X | X | X |



# Scientific Non-Commercial Use License

- 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.

# Summary

- Pilot program has transitioned to the Commercial Smallsat Data Acquisition Program
- All data purchased by NASA as well as DESIS are available to NASA funded researchers in accordance to the vendor's scientific use license.
- Onramp procurements for two new vendors are underway - new EULA tiers will be applied.
- Third RFI with the EULA tiers closed January 2, 2021.

FAQ: https://earthdata.nasa.gov/esds/small-satellite-data-buy-program/faq-commercial-data

# Contact Us

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https://earthdata.nasa.gov/esds/csdap

# Questions?