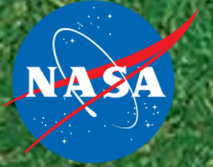


National Aeronautics and
Space Administration



EXPLORE EARTH

Commercial Smallsat Data Acquisition (CSDA) Program AMS 2022 Town Hall

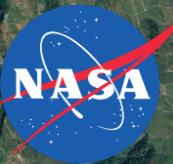
Kevin Murphy
Chief Science Data Officer
Science Mission Directorate
Earth Science Division
January 27, 2022

Commercial Smallsat Data Acquisition (CSDA) Program

- Pilot initiated in November 2017 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
- Blanket Purchase Agreements (BPAs) were awarded in September 2018 to Maxar (DigitalGlobe) Inc., Planet Labs Inc., and Spire Global.
- Pilot successfully ended early 2020 → sustained program - CSDA Program
 - *Restrictive nature of the EULAs made standard scientific collaboration difficult and must be addressed in future data purchases.*

**Commercial SmallSat Data Acquisition
Program Pilot
Evaluation Report**

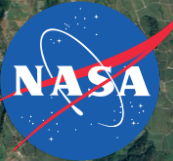
NASA Earth Science Division
April 2020



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.



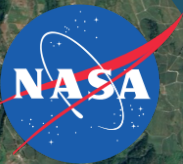
<https://earthdata.nasa.gov/csdap>

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: <ul style="list-style-type: none"> U.S. State/Local/Tribal Government; Contractors and Grantees associated with Government Agency 			X
U. S Federal Government, Foreign Civil Partners		X	X
Public Release	X	X	X

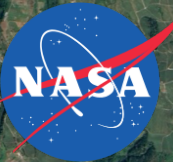
Scientific Non-Commercial Use License

Utilize the tiered EULA approach to satisfy other agency commercial data request via *SNWG Assessment Process*. Tiered EULA approach is modeled after NRO's family of EULAs.


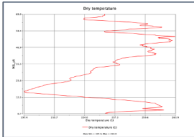

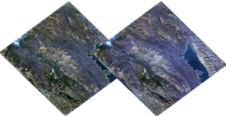
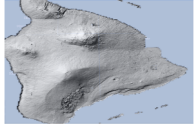


CSDA Program License Uplifts

- CSDA licensing agreements expanded to broaden the applicability for scientific applications across the US Government
 - Spire Global, Inc.: Available to Federal/State/Local/Tribal Governments & funded research
 - Full GNSS Science Data Catalog
 - Planet Labs: Available to Federal Civilian Agencies, NSF, & their funded research
 - Full RapidEye & PlanetScope archive
 - Other licensing details remain similar:
 - 30-day latency; scientific use only
- Onramp 2 and beyond vendors– utilize the broaden licenses: USG, USG Plus, and Public Release
- These licensing uplifts will make the data more readily-available across the government and improve both value and interagency collaboration.



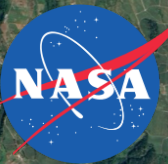
CSDA Data Holdings

Vendor	Constellations/ Products	Availability Dates	Orbit Characteristics	Spatial Resolution	Spectral Characteristics	Sample
Planet	PlanetScope, RapidEye	12/31/2005 - Present	Sun Synchronous	3 - 6.5 meters	RGB, NIR (440-860 nm), Panchromatic	 <p>PlanetScope 4 band RGB thumbnail with SkySat RGB thumbnail overlay</p>
	SkySat	3/10/2015 - 12/12/2019		< 1 meter	RGB, NIR (450-900 nm), Panchromatic	
Spire Global, Inc	GNSS Radio Occultation, GNSS Grazing Angle Reflectometry, Satellite Precise Orbit Determination (POD) and Satellite Attitude, Total Electron Content, Ionospheric Profiles, Scintillation, Magnetometer, Raw IF	9/24/2018 - 4/18/2019 (partial) 11/1/2019 - Present (all)	GNSS-R and GNSS-RO receivers satellites: 37° and Sun Synchronous			 <p>Spire GNSS-RO L2A atmospheric vertical profile of dry temperature (left)</p>
Maxar Technologies	Worldview 1-4, GeoEye-1, QuickBird, IKONOS	10/24/1999 - Present	Sun Synchronous	0.31 - 4.0 meters	Multispectral and Panchromatic (400 - 2245 nm)	 <p>Maxar WorldView3 L2A surface reflectance RGB thumbnail</p>
Teledyne Brown Engineering, Inc.	DESIS L1B, L1C, and L2A	11/21/2018 - Present	Non Sun Synchronous 52° N - 55° S (ISS)	30 meters	235 channels, 2.5nm from 402 to 1000 nm	 <p>DESIS L2A light surface reflectance and L1A (AV) top of atmosphere reflectance RGB thumbnails</p>
EarthDEM	individual strips and mosaics	2009 - Present		2 meters		 <p>EarthDEM thumbnail</p>



FY22 Activities & Beyond: Onramp and Evaluation

- Onramp #2: Onramp of qualified vendors from second Request for Information (RFI) (October 2019):
 - Airbus DS GEO (US) Inc BPA awarded July 2021; Selected PIs will conduct 1 year evaluation of the SAR data products starting January 2022.
 - BlackSky Geospatial Solutions, Inc BPA awarded Sept. 2021; Selection of PIs underway
- Onramp #3: Onramp of qualified vendors from third RFI (December 2020) is underway. Sole source synopsis posted for Capella Space, ICEYE US, Inc, GeoOptics, Inc, and GHGSat, Inc. in November 2021.
 - Selection of PIs for evaluation via ROSES 2022 (A. 43)
- Fourth RFI / Announcement of Opportunity released Q3 FY2022.
- 2nd Commercial SmallSat Data Analysis solicitation will be released (ROSES 2022 A.44) to promote scientific use of purchased data by the scientific and applied science communities.



Data Search via EOSDIS

EARTHDATA SEARCH Find a DAAC - Feedback Earthdata Login

CSDA Search Results (1 Collections)

PlanetScope Satellite Imagery 3 Band Scene CSDA

This collection is made available through the **NASA Commercial Smallsat Data Acquisition (CSDA) Program** for NASA funded researchers. Access to the data will require additional authentication. [More Details](#)

Showing 20 of 52 matching granules Sort View

Granule ID	START	END	Thumbnail
PSScene3Band-20210821_010023_1026	2021-08-21 01:00:23		
PSScene3Band-20210818_215700_1053	2021-08-18 21:57:00		
PSScene3Band-20210818_004931_55_1063	2021-08-18 00:49:31		
PSScene3Band-20210817_010959_80_2426	2021-08-17 01:09:59		
PSScene3Band-20210815_004741_1003	2021-08-15 00:47:41		
PSScene3Band-20210815_004739_1003	2021-08-15 00:47:39		

Search Time: 0.5s

[Add](#) [Download All](#) 52

PlanetScope Satellite Imagery 3 Band Scene

MONTH Jul Aug Sep Oct Nov Dec Jan Feb Mar Apr May

UAT | v1.158.3 · NASA Official: Stephen Berrick · FOIA · NASA Privacy Policy · USA.gov

Earthdata Access: A Section 508 accessible alternative

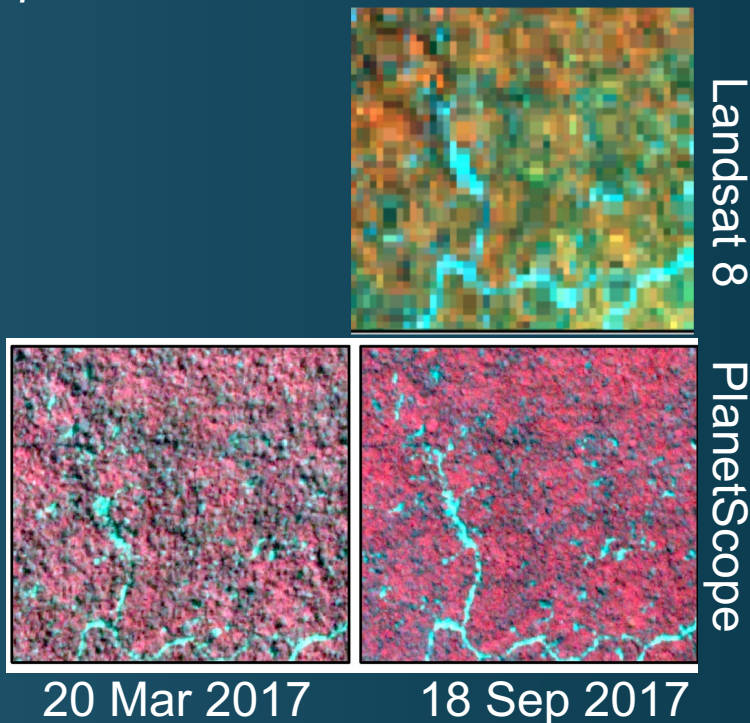
Coming soon: Data discoverable and downloadable through NASA's CMR, Earthdata Search Client



Science Research Results

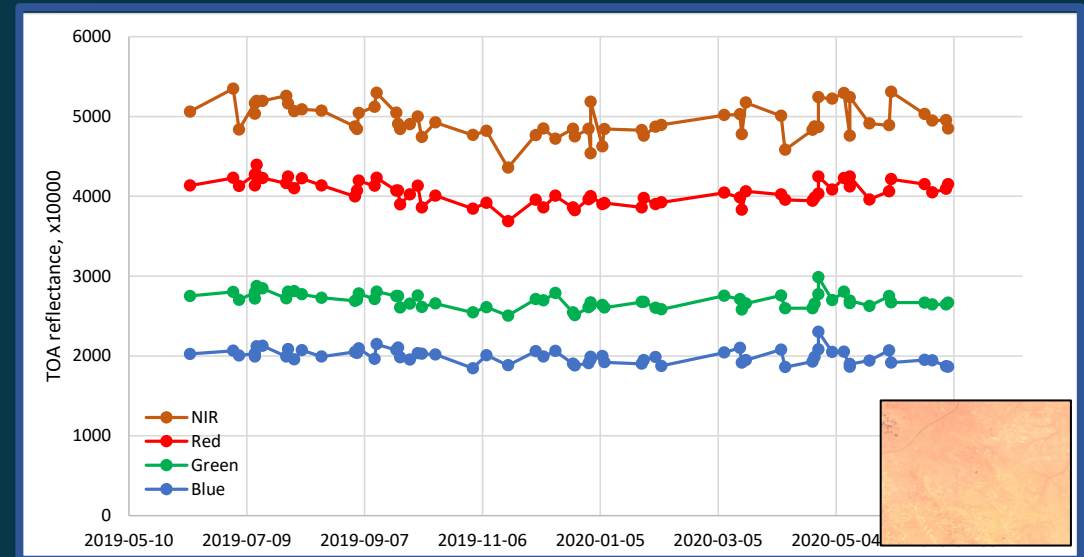
Improved Tree Loss Mapping using PlanetScope Data

- Selective tree logging (cyan) in Peru for Landsat-8 (top left) & PlanetScope (bottom) imagery, illustrating the additional spatial information within the Planet data.



Ongoing monitoring of Planet data further characterizing the stability among the multiple instruments

- Plot shows variability of four standard Planet Dove bands over well-characterized BELMANIP Site #236 (inset)



Eric Vermote (GSFC)

Pickering et al. (2021)
doi:10.3390/rs13112191



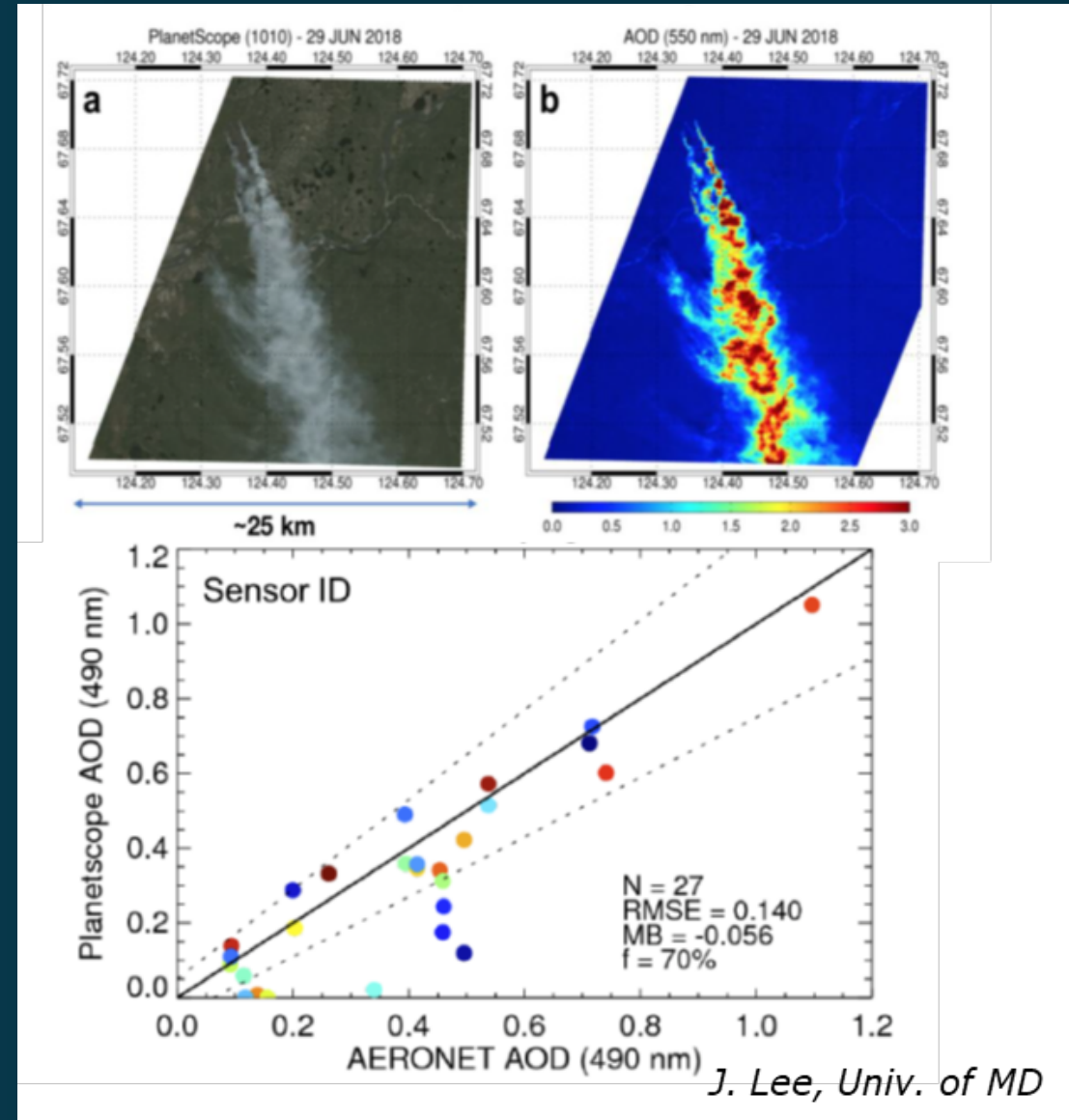
Science Research Results (cont'd)

Aerosol Retrievals using PlanetScope

- 4x larger radiometric uncertainty compared to MODIS, VIIRS
- Significant improvement in spatial resolution to complement flagship missions

Shows reasonable comparison to AERONET

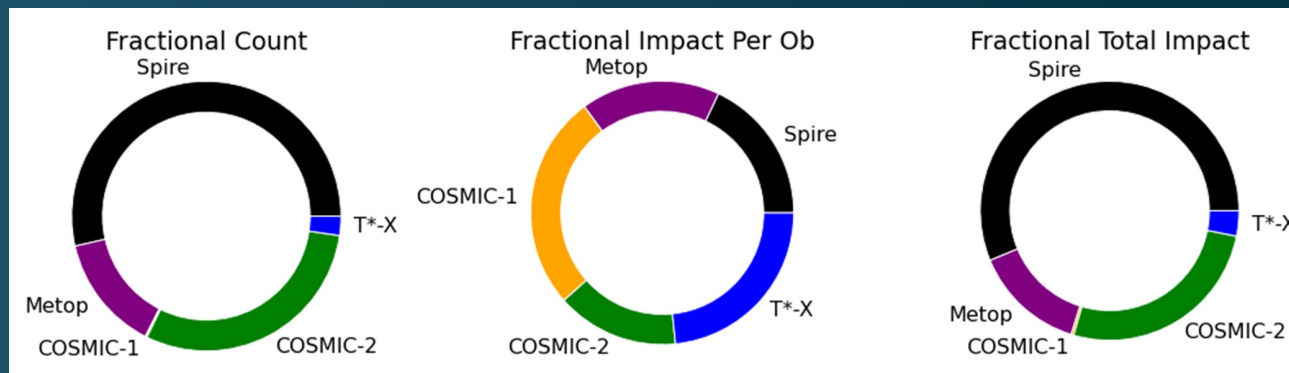
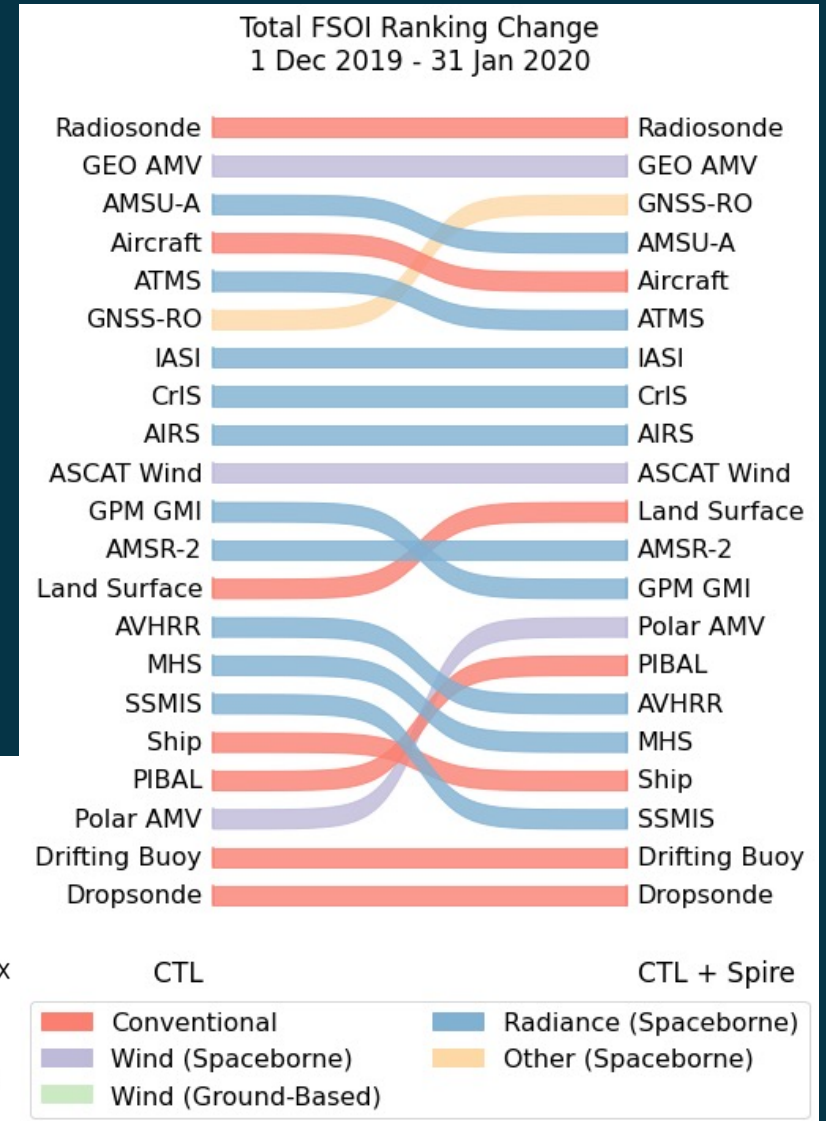
- Further analysis needed to map effects of cross-fleet calibration differences to Aerosol retrievals



Science Research Results (cont'd)

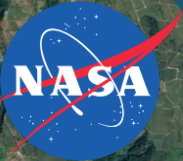
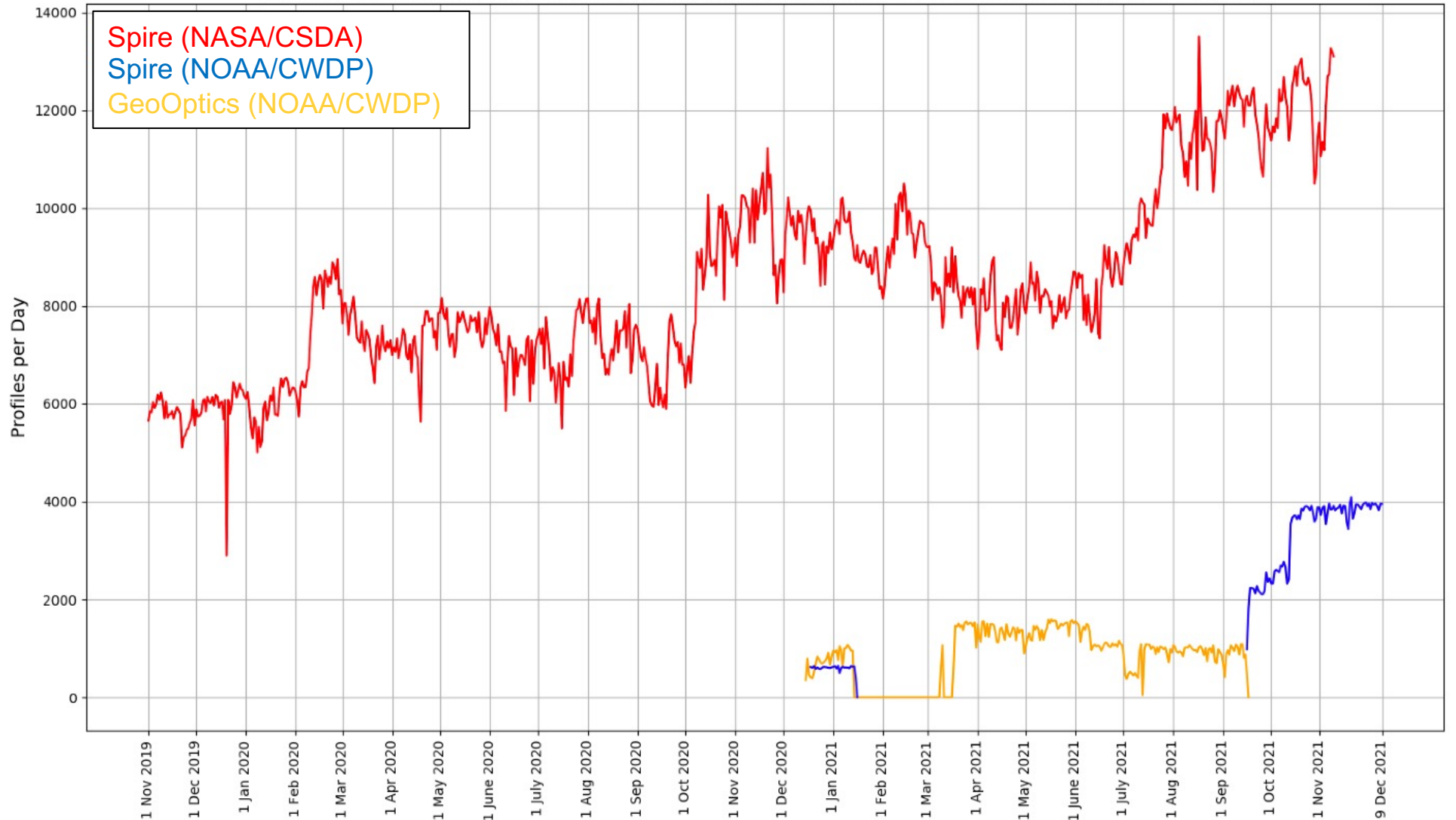
Forecast Impacts of Spire Radio Occultation Observations

- Spire data were seen to cause a substantial improvement on forecasts at NASA GMAO
- Addition of Spire data improved radio occultation observations to be the 3rd largest reducer of 24-hour forecast error (right)
- Spire observations seem to have comparable per-observation impact to other RO observing systems (below)



Science Research Results (cont'd)

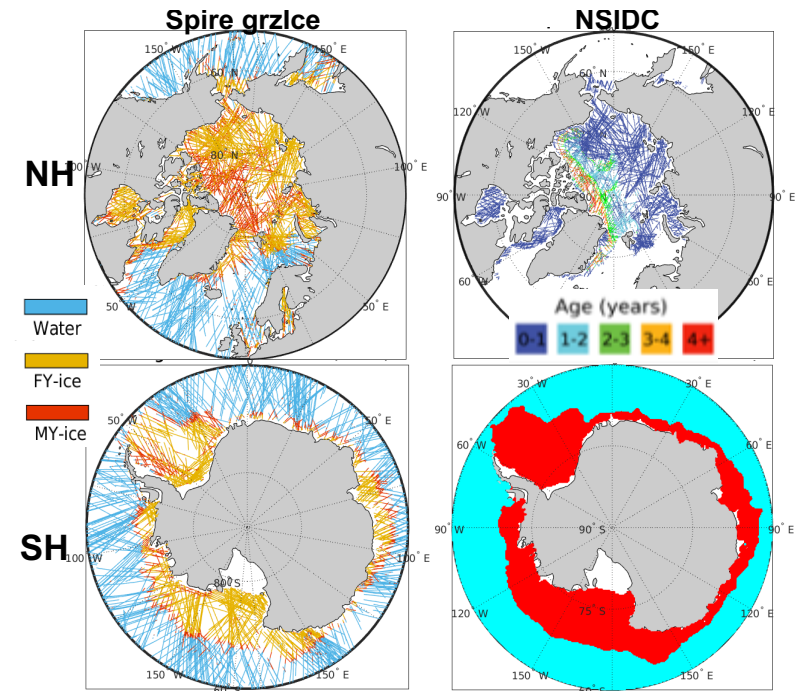
Time Series of Commercial Radio Occultation Profiles



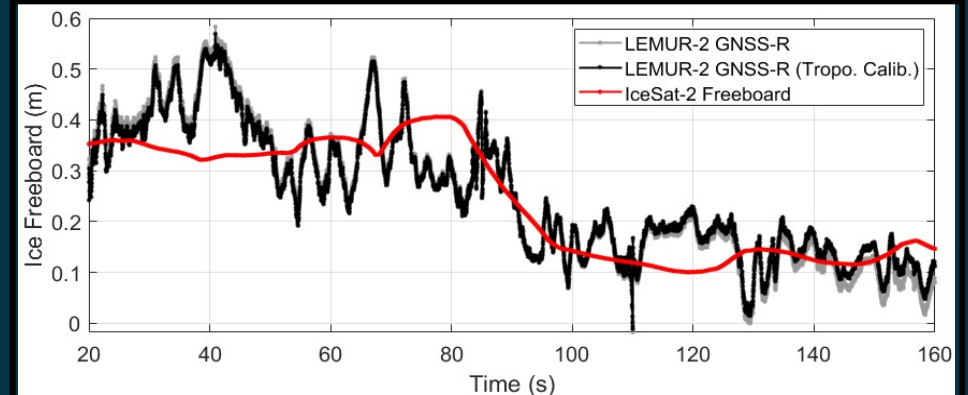
Science Research Results (cont'd)

- Two Spire-produced Level 2 products derived from GNSS Grazing Angle reflectometry have recently been evaluated and added to the routine data deliveries:
 - Sea Ice (top-right)
 - Altimetry (bottom-right)
- These products are available from CSDA
 - Sea Ice: 1 March 2020-onward
 - Altimetry: 15 June 2020-onward
 - Available by request; being integrated into Smallsat Data Explorer (SDX) web-based tool.

<https://earthdata.nasa.gov/esds/csdap/commercial-datasets>



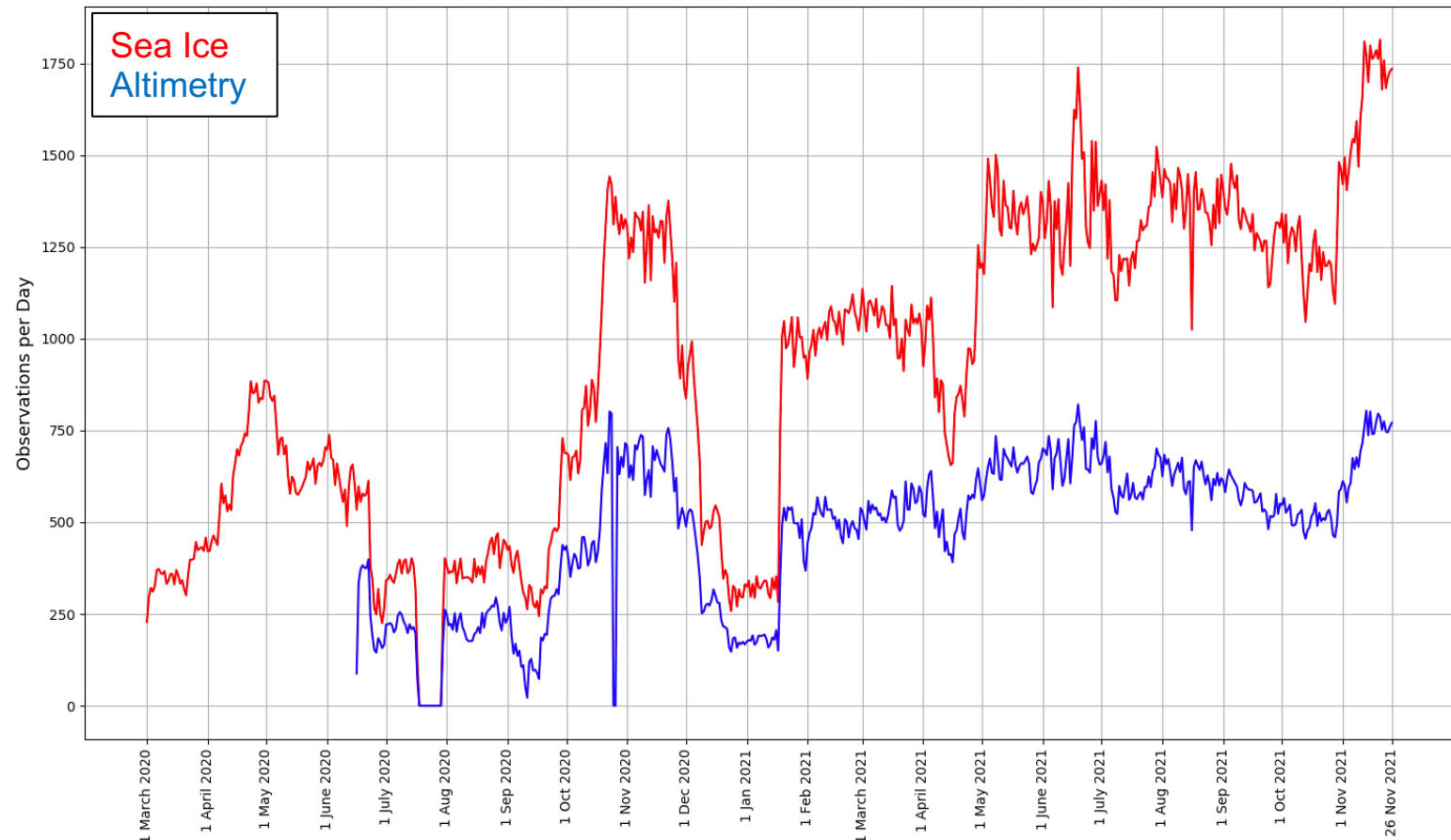
Sea ice age estimated from grazing angle specular reflection tracks (right) compared to NSIDC ice age product during the week of 22-28 April 2020



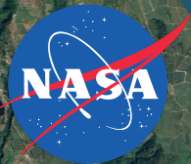
Spire sea ice surface height retrieval compared to with IceSat-2 freeboard data.

Science Research Results (cont'd)

Spire GNSS Grazing Angle Reflectometry Level 2 Product



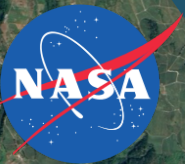
<https://earthdata.nasa.gov/esds/csdap/commercial-datasets>



Summary

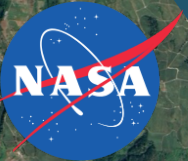
- Commercial Smallsat Data Acquisition Program is a sustained program.
- All data purchased by NASA as well as DESIS are available to funded researchers in accordance with the vendor's scientific use license.
- Onramp procurements for the new vendors are underway.
- Next RFI / Announcement of Opportunity will be released Q3 FY2022.
- Q2 FY22 CSDA data holdings will be coming available via Earthdata Cloud Search.

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





Questions?



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

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

