



National Aeronautics and
Space Administration

Hydrosphere's Terrestrial Hydrology Element

Craig Ferguson, PS Hydrosphere

Also: PS SMAP

DPS for: NISAR, SWOT, GPM, GRACE-
FO, PBL-DSI, Snow4Flow, LACCE

Hydrosphere Rep. for MIO, IMVI Board

PS ASF

A large circular graphic representing Earth's layers. The center is a blue globe. Surrounding it are concentric rings: a purple ring, a blue ring, a green ring, an orange ring, and a grey ring. Various images are overlaid on these rings: a satellite in the top left, a white aircraft in the bottom right, a green plant in the bottom left, and a network diagram in the bottom right. The text "NASA Earth" is written in large white letters across the center.

NASA Earth



Terrestrial Hydrology

Craig Ferguson, ESD/Research

Hydrosphere

Monitoring and predictive understanding of the Earth's water supply across the land, ocean, and atmosphere

Terrestrial Hydrology (TH) is dedicated to advancing the nation's capability to observe, understand, and predict essential terrestrial water resources, including soil moisture, snow, groundwater, streamflow, and evapotranspiration, using NASA satellites and models.

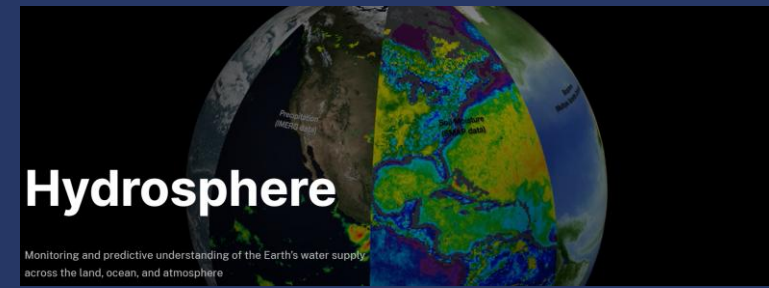
Addressing these core science questions:

- (1) How can we better observe, understand, and predict the distribution and movement of water on Earth from space?
- (2) How does human water resources management modify water and energy cycles locally, regionally, and globally, and what are the short- and long-term consequences of these changes to water security?
- (3) How important are land-atmosphere interactions relative to large scale atmosphere-ocean dynamics in hydrologic extremes prediction?
- (4) How can we accurately and consistently estimate water availability across different scales of space and time, and what are the limitations of these methods?

<https://science.nasa.gov/earth-science/research/hydrosphere/>

Terrestrial Hydrology

Craig Ferguson, ESD/Research

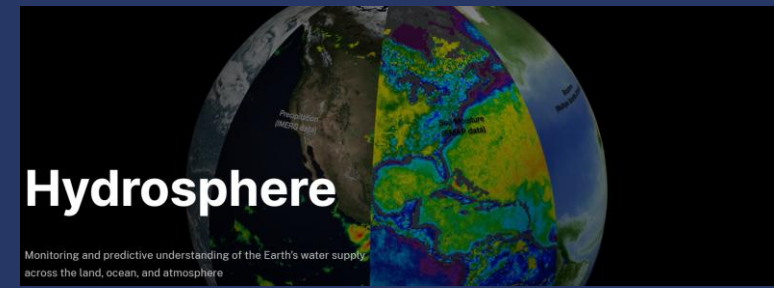


Current Terrestrial Hydrology Portfolio Snapshot

- SMAP Science (~20 teams)
- Snow remote sensing and modeling (~15 teams)
- S2S Hydrometeorological Prediction (~14 teams)
- NASA Energy and Water Cycle Integrated Analysis Product (NEWS-IA, GEWEX GDAP) (core+5 teams)
- Ecohydrology (4 teams)
- GEWEX IGPO
- Directed work to NASA Center PIs, joint programmatic funding, AND invited projects including Campaigns and the 2025-2026 series of community engagements titled “Opportunities for Space-Based Observations to Advance Priorities for Water Cycle Science and Applications in the Next Decade”

Terrestrial Hydrology

Craig Ferguson, ESD/Research



Stay Tuned: Tomorrow's State of the Science:

Opportunities
Prioritized for NASA in
water demand, floods,
water supply, water
quality, and droughts: 6
White Papers to
NASEM DS!

Opportunities for Space-Based Observations to Advance Priorities for Water Cycle Science and Applications in the Next Decade



Emily Jack-Scott



Sujay Kumar



JT T. Reager



Timothy Schneider

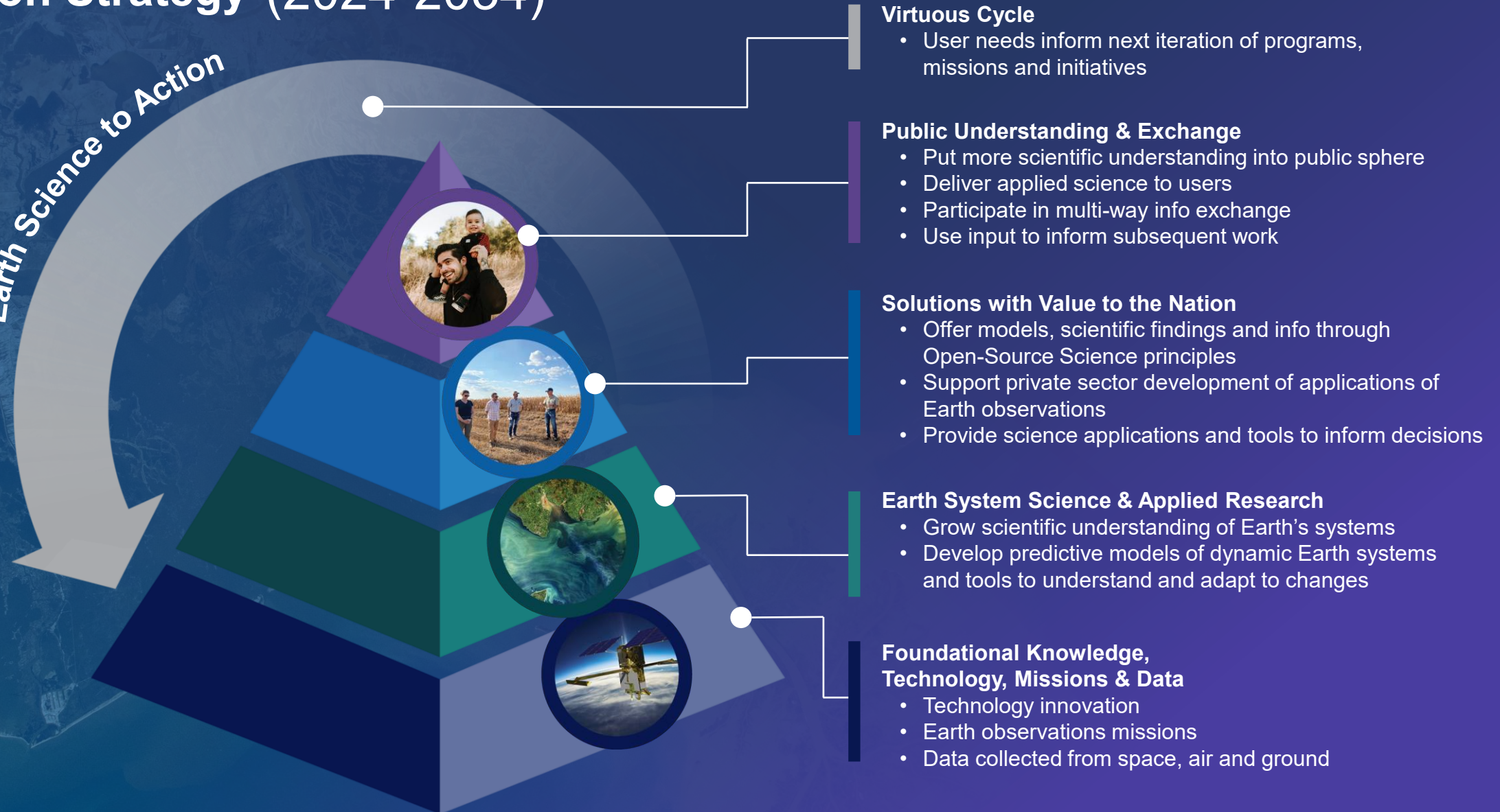


Julie Vano

Water and Energy Cycle program scope due for revisit,
esp. with ES2A (2024-2034)

Earth Science to Action Strategy (2024-2034)

Earth Science to Action





EARTH SCIENCE
DIVISION

EARTH SCIENCE APPLICATIONS GUIDEBOOK

ENTER THE WORLD
OF EARTH SCIENCE



DARTs / MIO, IMVI are critical to Increasing the Speed of Earth Science

NASA's Earth Science Division is accelerating functions and simplifying processes with the goal of increasing speed of science and scale of impact.

This includes:

- Speed to orbit
- Speed to science and scientific discovery
- Speed and scale of impact of science
- Driving interdisciplinary science to go after the most complex questions

For NISAR DART, we are seeing shorter cal/val, faster first standard product releases with expectation of immediate applications (e.g., A.3 Applications Selections), >15 NISAR Applications Workshops

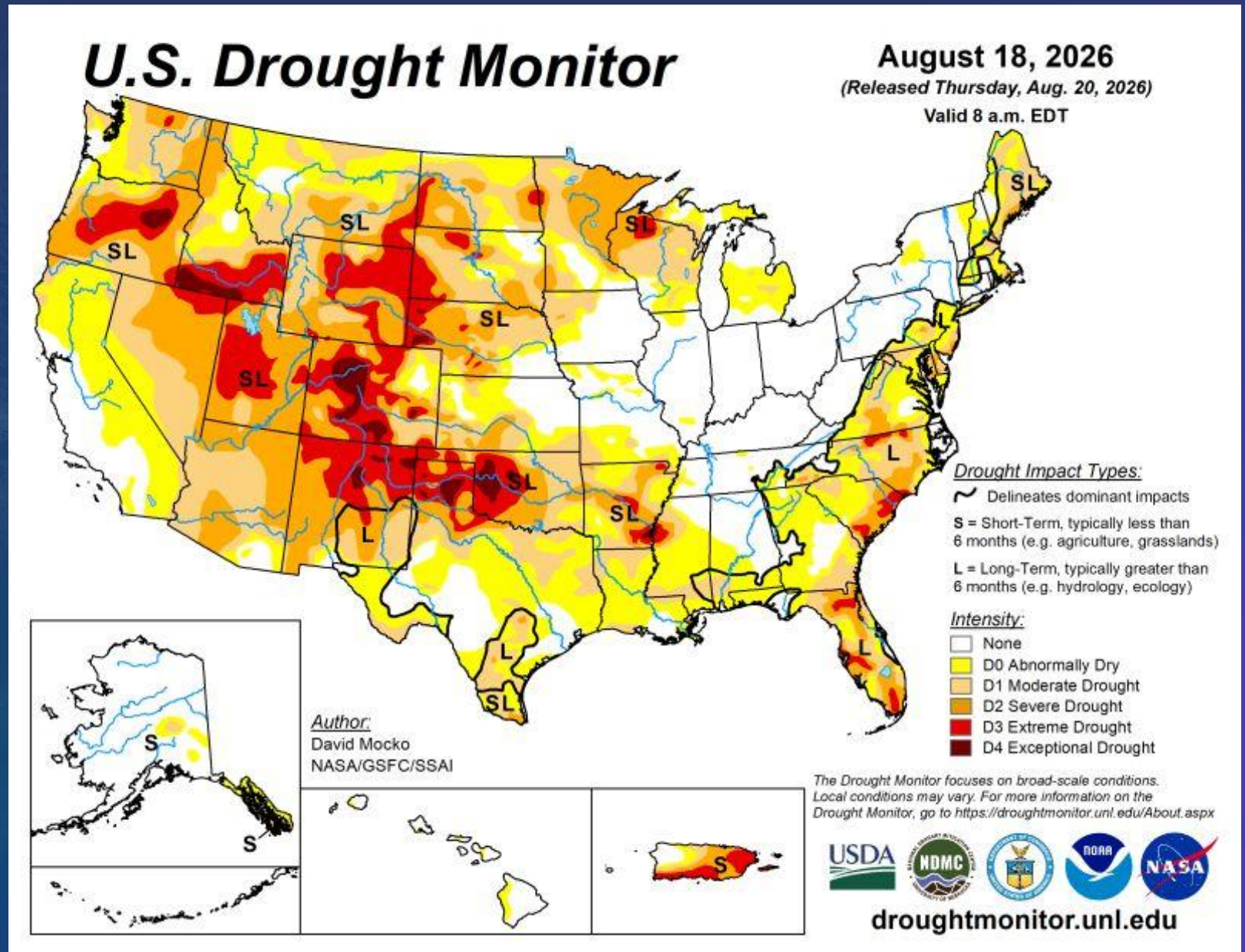


ES2A: Improved Interpretation and Action

US Multi-Agency Drought Monitor operational since 1999; triggers agricultural relief funds

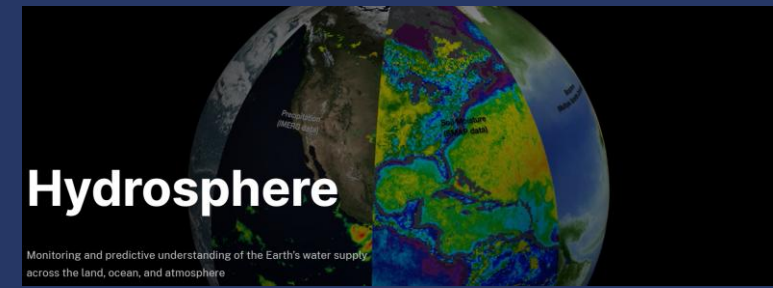
NASA products constitute ~10/60 inputs

New since January 2026:
NASA has two authors: Mocko(GSFC) and Case (MSFC)



Terrestrial Hydrology

Craig Ferguson, ESD/Research



Beyond ES2A, Important Reorg Details to Track

- Terrestrial Hydrology, Ecohydrology, NASA Water and Energy Cycle merged into one Terrestrial Hydrology element
- SMAP Science Team in its last cycle; PIs should prepare to transition to MIO Water Thematic DART
- S2S Hydrometeorological Prediction element moved to IMVI
- High Mountain Asia element moved (?) to Earth Action Water Resources
- Remote Sensing of Water Quality element moved to Earth Action Water Resources
- GEWEX IGPO gaining stronger ESA partner

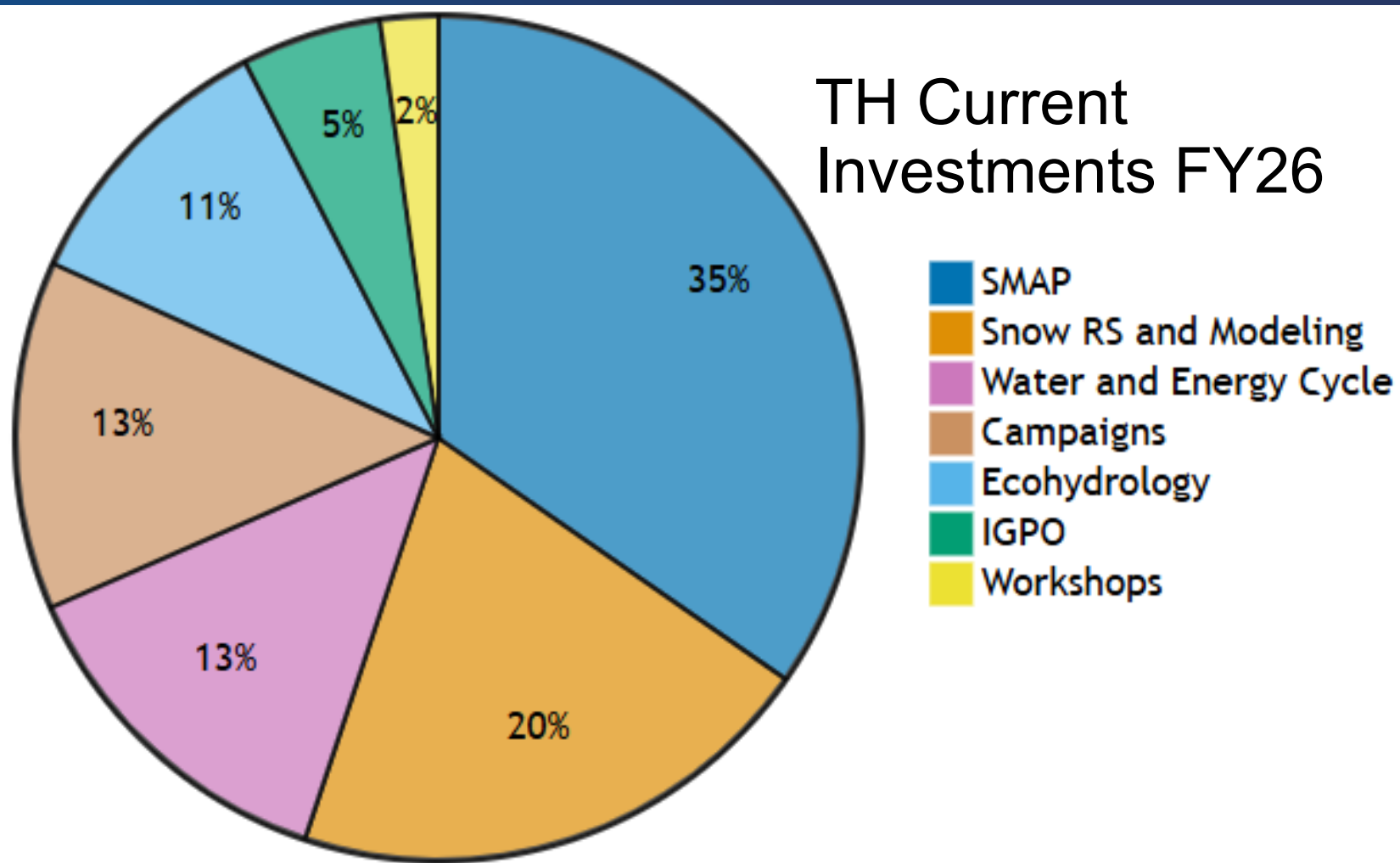
Terrestrial Hydrology

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Hydrosphere

Monitoring and predictive understanding of the Earth's water supply across the land, ocean, and atmosphere

TH Current Investments FY26



Terrestrial Hydrology: What's Exciting!

NISAR Launch

July 30, 2025

The NASA-ISRO partnership launched humanity's first-of-its kind dual-band satellite

Actional information in:

- Disaster response
- Infrastructure monitoring
- Land-use planning
- Farming
- Water management



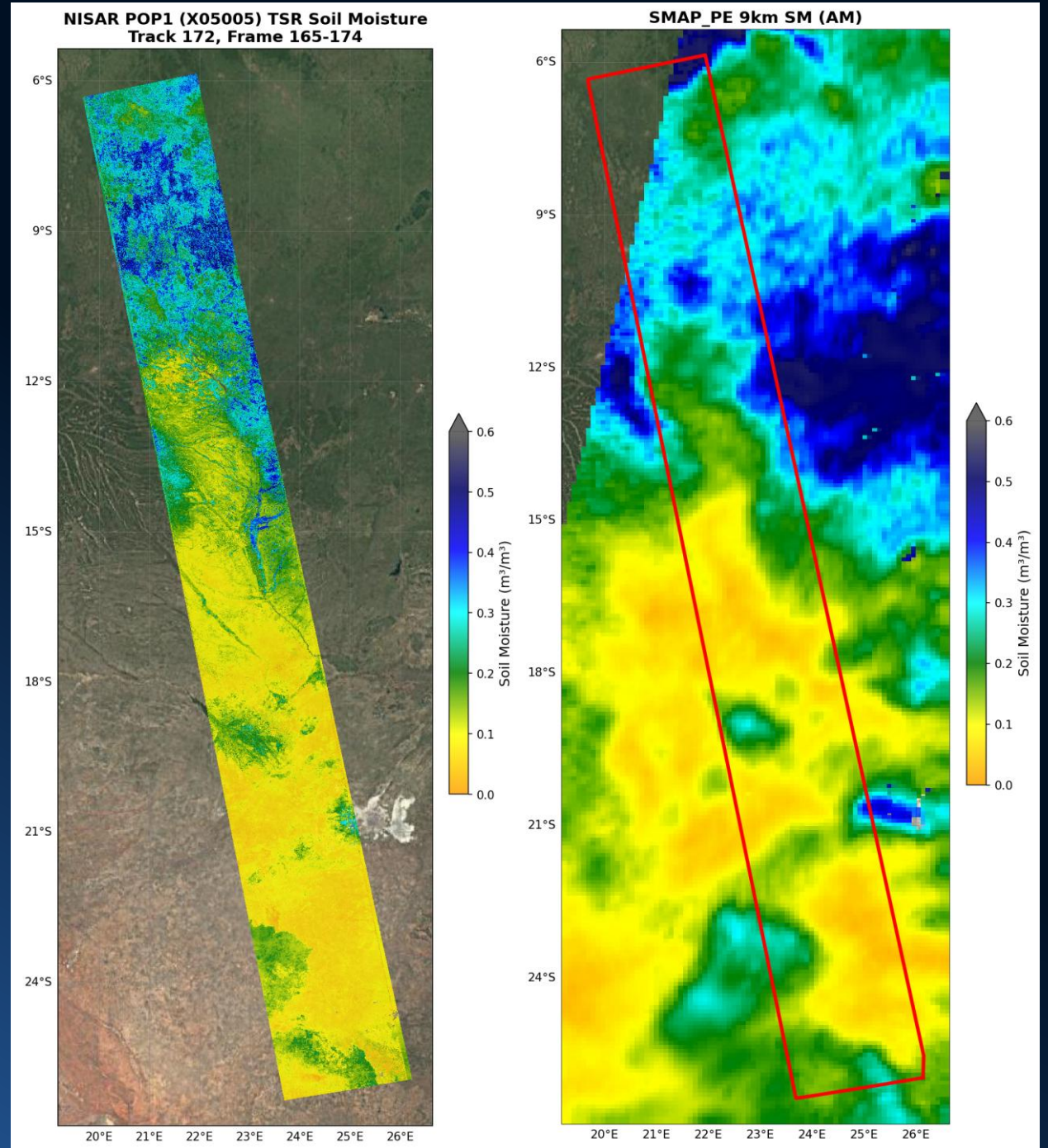
The Indian Space Research Organisation's Geosynchronous Satellite Launch Vehicle lifts off from Satish Dhawan Space Centre on India's southeastern coast at 8:10 a.m. EDT (5:40 a.m. IST), July 30, 2025. Credit: ISRO

NISAR Soil Moisture 'First Light'

Rajat Bindlish, GSFC

- NISAR delivers a first-of-its-kind, high-resolution view of soil moisture — revealing wet and dry patterns at field scale, not blurred into county- or city-scale averages
- With NISAR's advanced radar, discovery comes in the details — pinpointing where areas dry out first, how quickly they recover after rain, and how plants and irrigation change the map

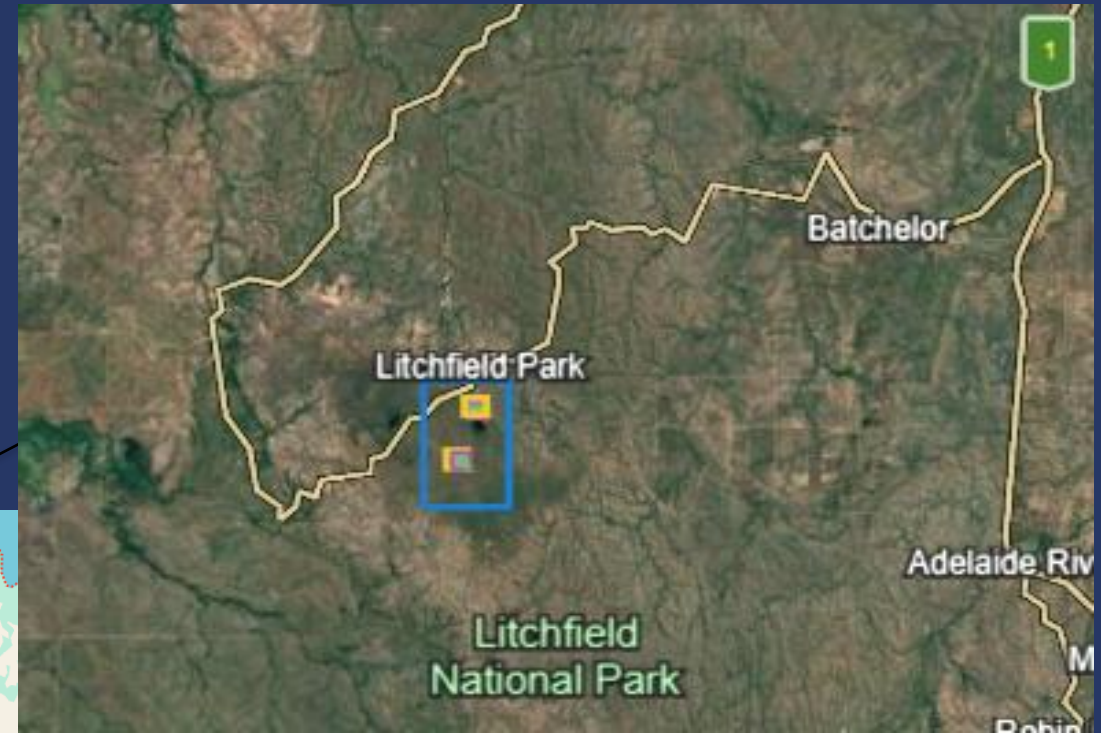
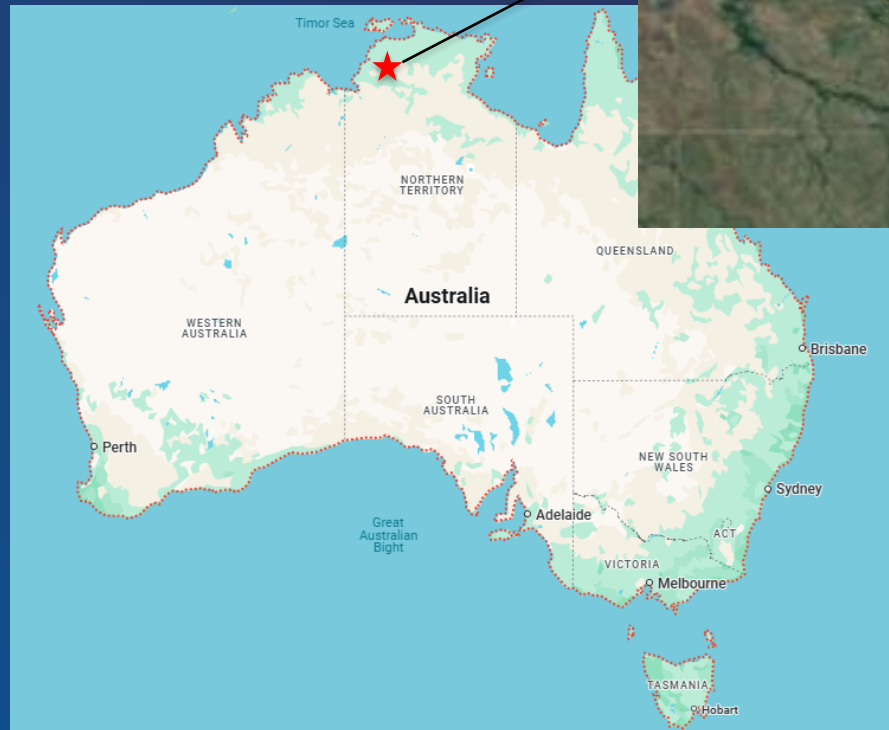
Soil moisture comparison (Nov. 11, 2025): NISAR at 200 m (left) and SMAP at 9 km (right). Darker blue indicates wetter soils; yellow indicates drier. The red box outlines the NISAR swath.



NISAR and SMAP- NISAR soil moisture Cal/Val

Joint NASA-Monash Univ. Soil and fuel moisture campaign April-May 2026, Litchfield Savanna, AUS (Jeffrey Walker/Monash; Rajat Bindlish/NASA)

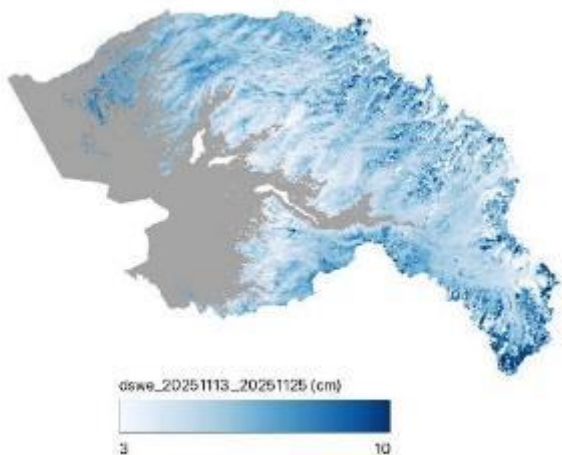
Towards High-Altitude
Platform Observatory
For Drought and Wildfire



NISAR Snow Experimental Products and Cal/Val



Tuolumne NISAR change in
Snow Water Equivalent Nov.
13-25, 2025 (credit: Jack
Tarricone, GSFC)

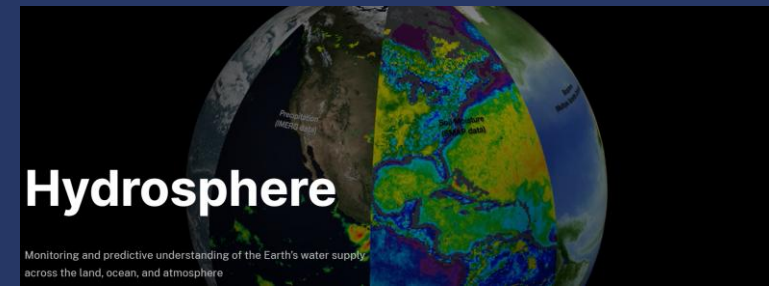


2025-2026

- NASA-supported SINTER Snow Measurement Field School, Granby, CO
- NASA-US Army Corp of Engineers Helicopter Lidar Snow Depth Surveys coincident w/ NISAR (~12-daily), Boise, Idaho
- NASA SNOWWI (X, dual Ku-band) Instrument Incubator Flights (1-week)
- July 8-9 NISAR SWE Community Workshop at U. of Utah (poc: Shadi Oveisgharan/JPL)

TH Main Message:

Engage with NASA Community, program managers, PIs, but especially NASA Center scientists (**Wed: JPL, GSFC, and LaRC talks**). Also, Acknowledge NASA support of your impactful work.



Program Direction (FY26-29)

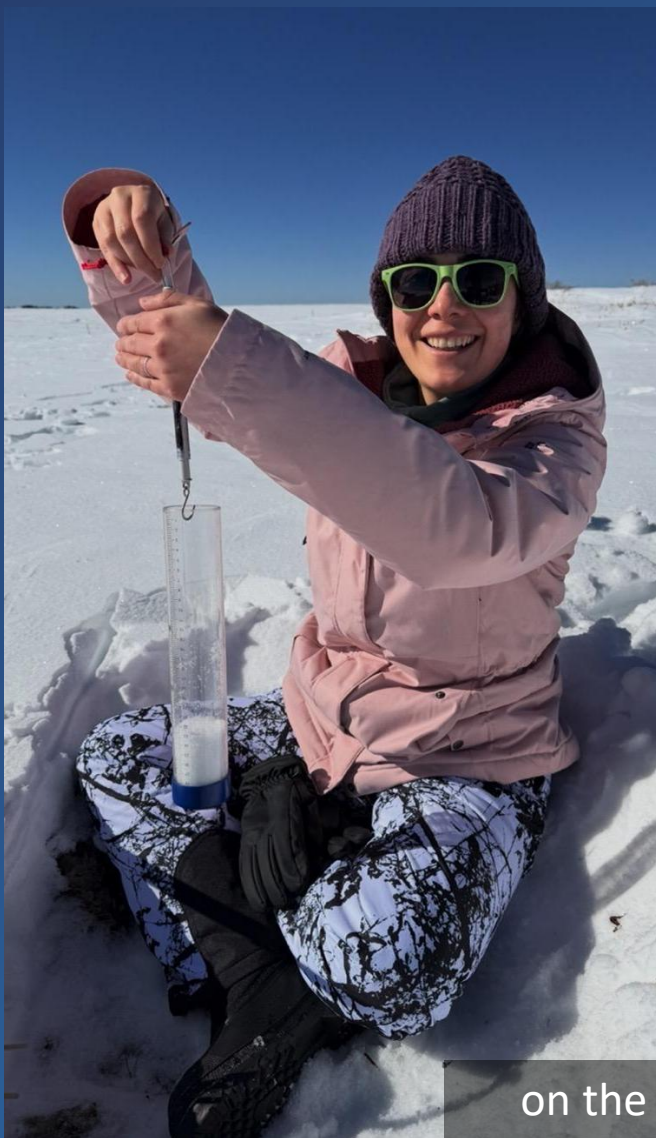
- Snow remote sensing and modeling. SnowEx-ALPINE w/ focus on retrieval algorithms (esp. L-band SAR, X-, Ka-/Ku- band) and active+passive distributed system approaches
- Strong partnering with ESTO: SNOWWI (Snow Water-equivalent Wide Swath Interferometer and Scatterometer), FLORA (Fluorescence Lidar for Ocean Research Airborne for Snow), but also GLOWS (The Global L-Band Observatory for Water Cycle Studies)
- **Expand as funds allow:** Space PBL mission-incubator activities (i.e., GEWEX GLAFO), PANGEA and ARID campaigns w/Terrestrial Ecosystem program

SNOWEX-ALPINE 2027-2028 (PI: Carrie Vuyovich, GSFC);

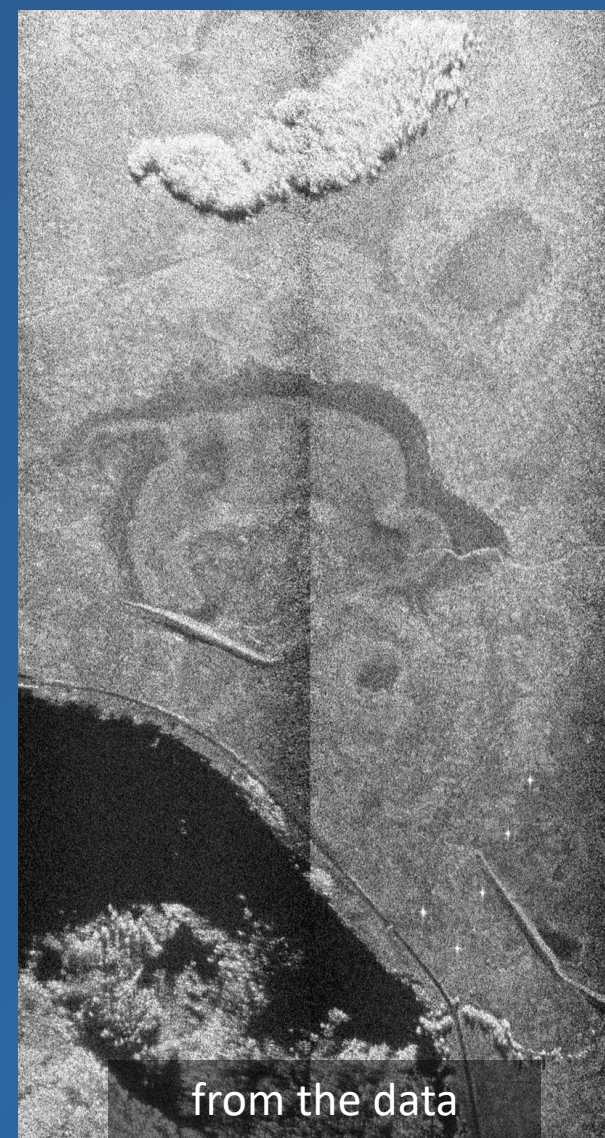
*images from ESTO 2026 SNOWWI Demo



in the flight



on the ground



from the data

FINNISH METEOROLOGICAL INSTITUTE · DYNAMICUM · HELSINKI

NEXT-GENERATION MICROWAVE RADIOMETRY COMMUNITY FORUM

26–28 JANUARY 2027

Algorithms · Cal/Val · Applications for land surfaces

Soil moisture

VOD

Freeze/thaw

Snow

LST

Surface water



ABSTRACTS

30 Sep 2026

submission opens 1 Sep

NOTIFICATIONS

30 Oct 2026

acceptance by e-mail

REGISTRATION

Free of charge

register by 30 Nov 2026

SPECIAL SESSIONS

Future L-band & multi-frequency concepts · Freeze/thaw algorithms

SCIENTIFIC STEERING COMMITTEE

Simone Bircher (MeteoSwiss) · Iris de Gélis (Estellus-MW) · Hyunglok Kim (GIST)
John Kimball (U. Montana) · Yann Kerr (CESBIO) · Giovanni Macelloni (IFAC)
Sidharth Misra (JPL) · Colleen Mortimer (ECCC) · Ghislain Picard (U. Grenoble)
María Piles (U. Valencia) · Alexandre Roy (UQTR) · Mike Schwank (WSL/Gamma)
Jeff Walker (Monash Univ.) · Pierre Zeiger (U. Grenoble)

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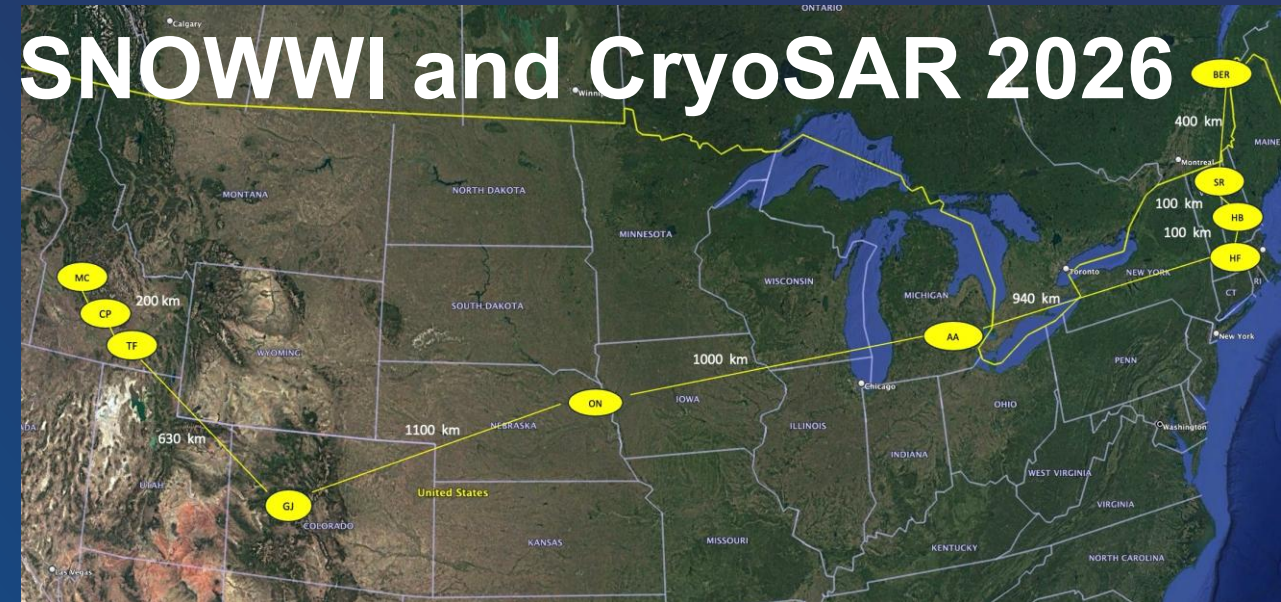
International Collabs for Greater Impact

HYDROSPACE 2027

1–5 March 2027 | Toulouse, France



SNOWWI and CryoSAR 2026





NASA Earth

Your Home.

Our Mission.

science.nasa.gov/earth

Making your Discussions Here Relevant to NASA

Highlight achievable scientific breakthroughs necessary to better understand Earth and advance models that capture the intricacies of the Earth system

- Focus on things that only NASA can do, considering NASA's unique capabilities and infrastructure
- Prioritize recommendations based on relevance, feasibility, and cost
- Align with NASA's Earth Science to Action Strategy to strengthen the linkage between discovery and impact of science

