New Paintings Outside the Lines: Beyond the Visible

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USFS Watershed Condition Scoping Workshop
Fort Collins, CO 6-7 September, 2017

Data Sources in Today's Talk

Satellite:

- RADARSAT (Gravimetric)
- TanDEM-X/PolnSAR (Dual DEM; Polarized Lidar SAR)

Suborbital:

- Hyper spectral (AVIRIS-NG)
- LiDAR/Imaging Spectrometry
- G-LiHT: Goddard's LiDAR, Hyperspectral & Thermal Imager
- UAVSAR/LVIS

Earth Science Missions

ISS Instruments

CATS, LIS, SAGE III
TSIS-1, OCO-3, ECOSTRESS, GEDI
CLARREO-PF

JPSS-2 Instruments

RBI, OMPS-Limb

- Formulation
- Implementation
- Primary Ops
- Extended Ops

Landsat 9
PACE
GeoCARB
TROPICS (12)
MAIA
Sentinel-6A/B
NI-SAR
SWOT
TEMPO
GRACE-FO (2)
ICESat-2
CYGNSS (8)
NISTAR, EPIC
(DSCOVR / NOAA)
SMAP
Landsat 7
(USGS)
QuikSCAT
SORCE,
TCTE (NOAA)
Suomi NPP
(NOAA)
Terra
Aqua
Landsat 8
(USGS)
CloudSat
CALIPSO
GPM
Aura
GRACE (2)
OSTM/Jason-2
(NOAA)
OCO-2

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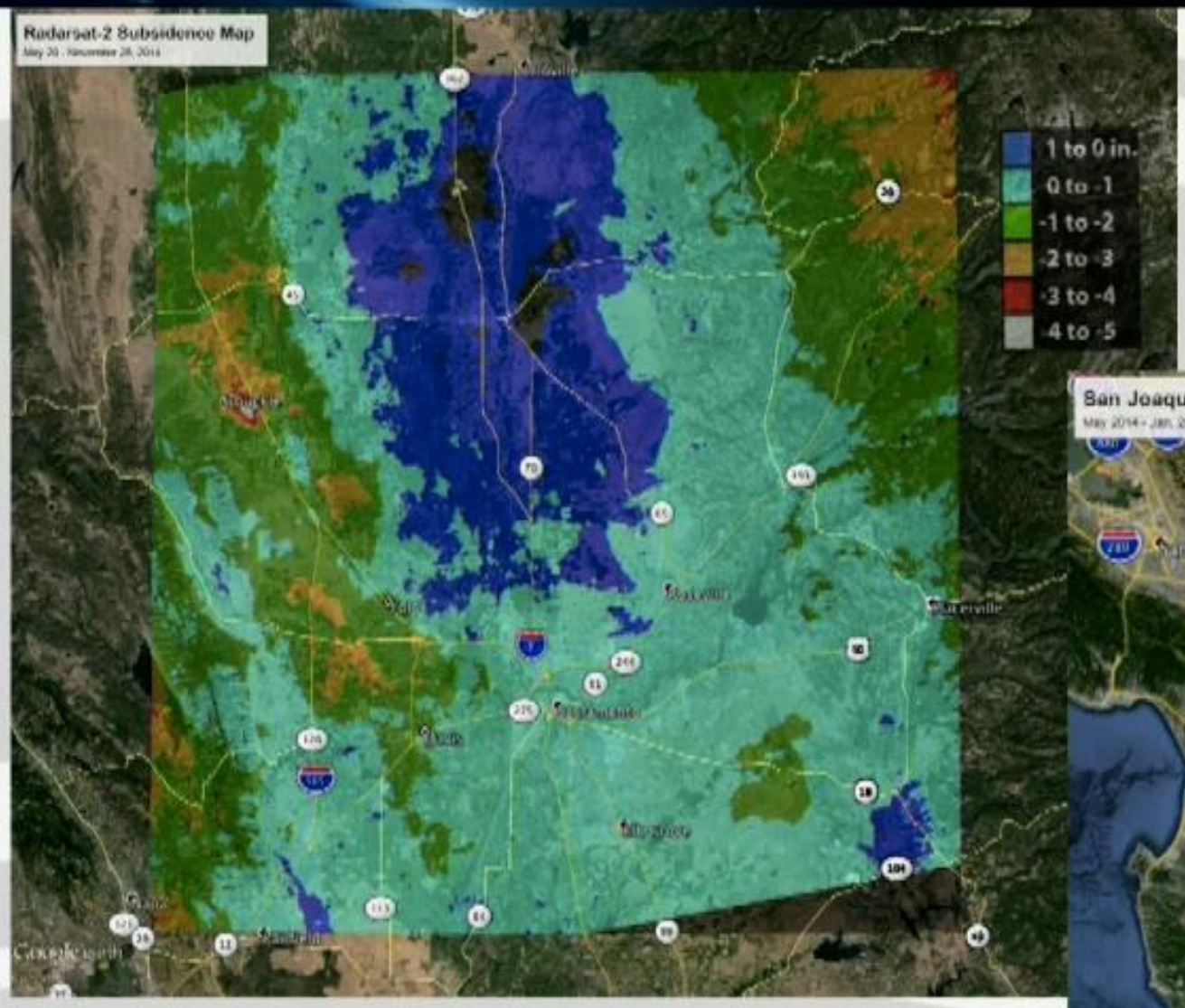
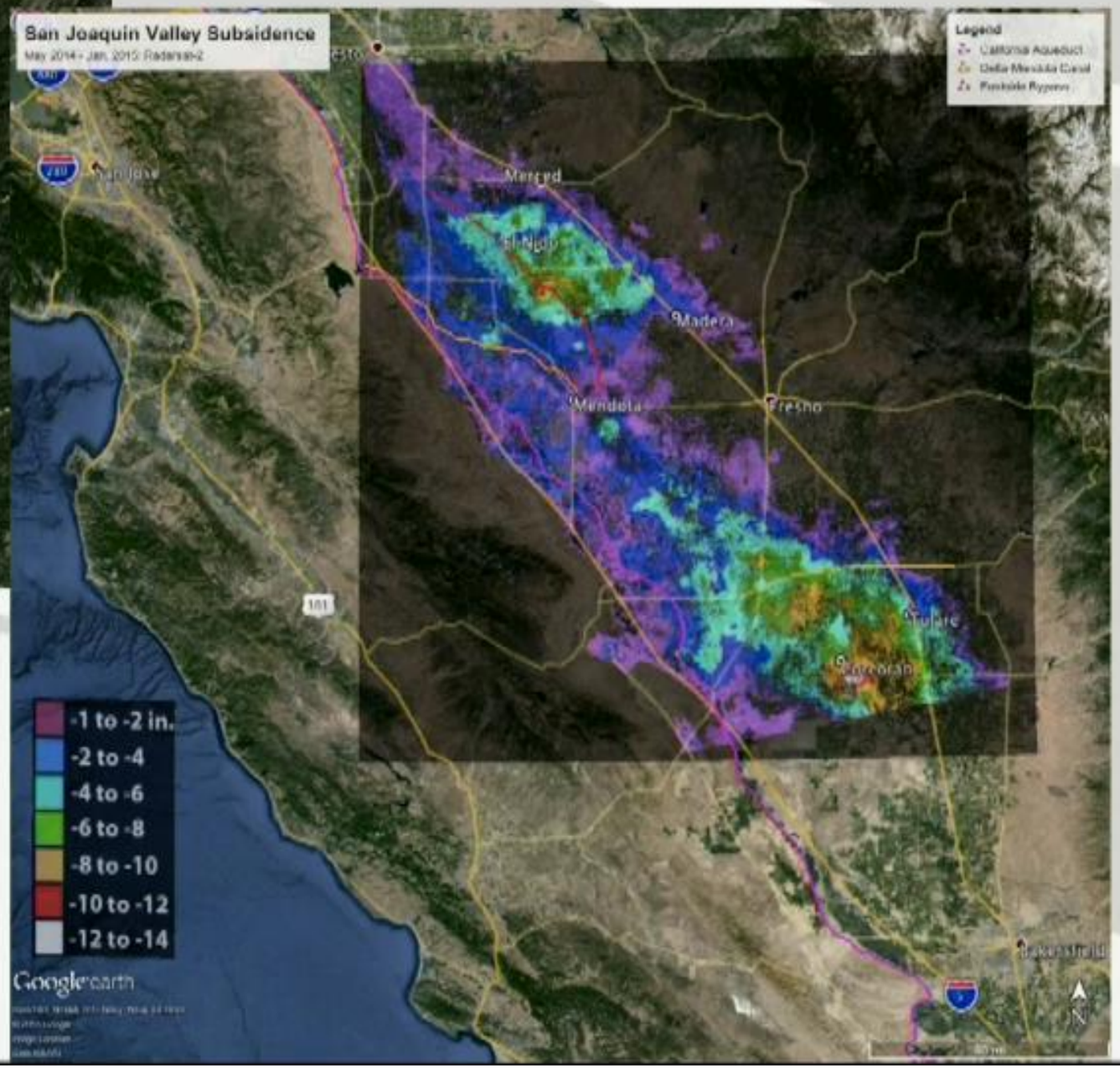
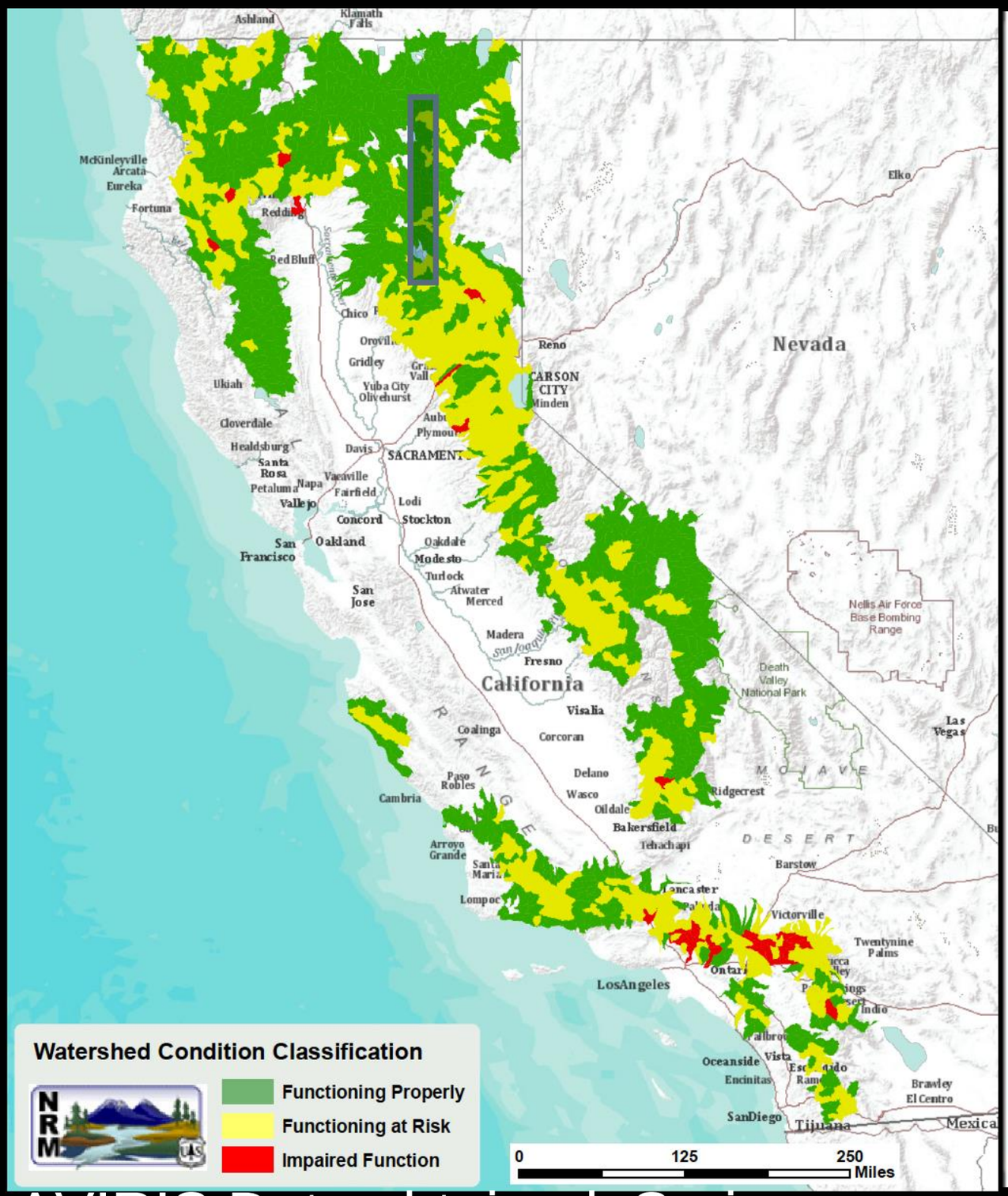
NASA and CA Department of Water Resources

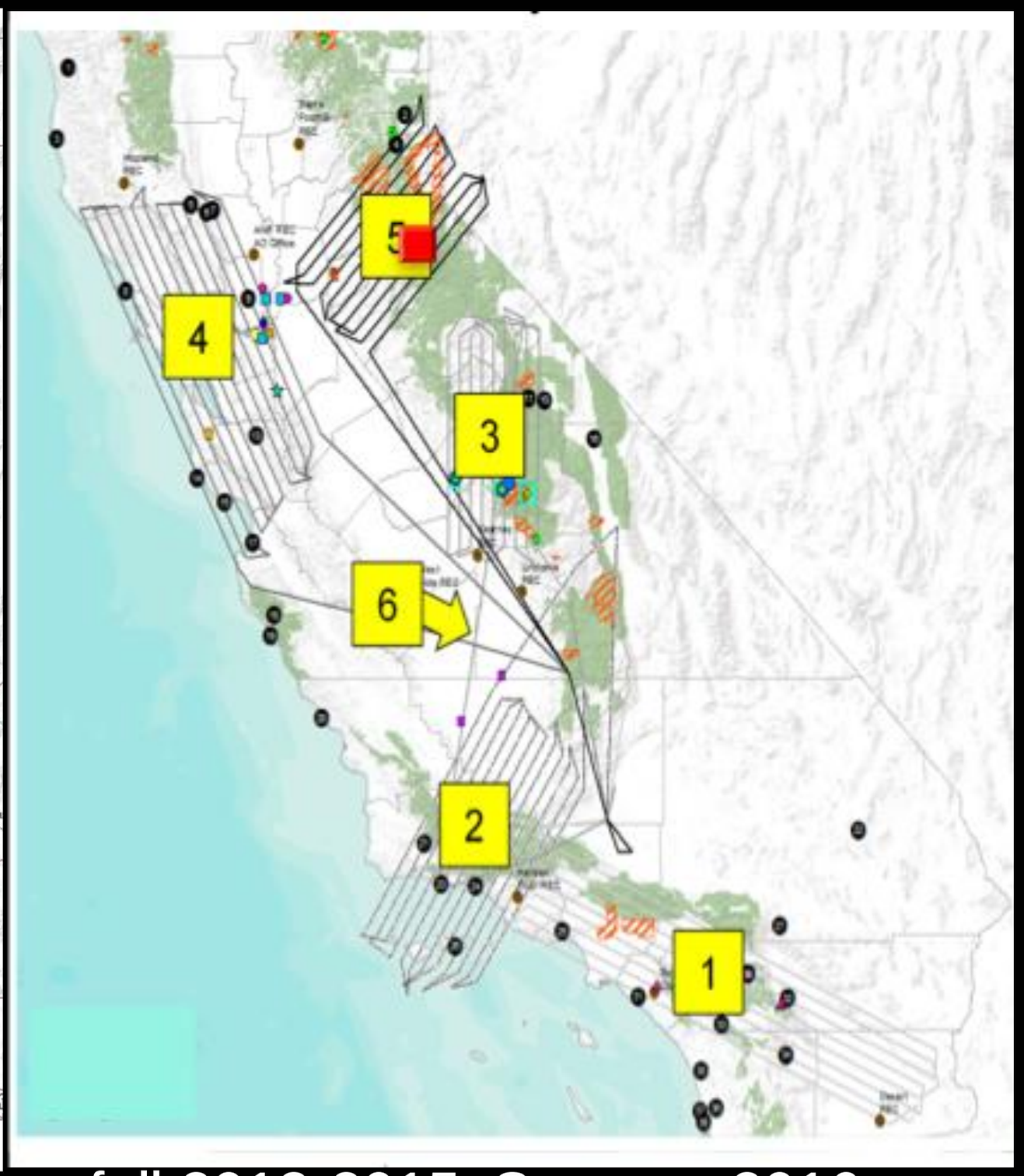




Radarsat-2 shows 3-13” subsidence 2014-2015

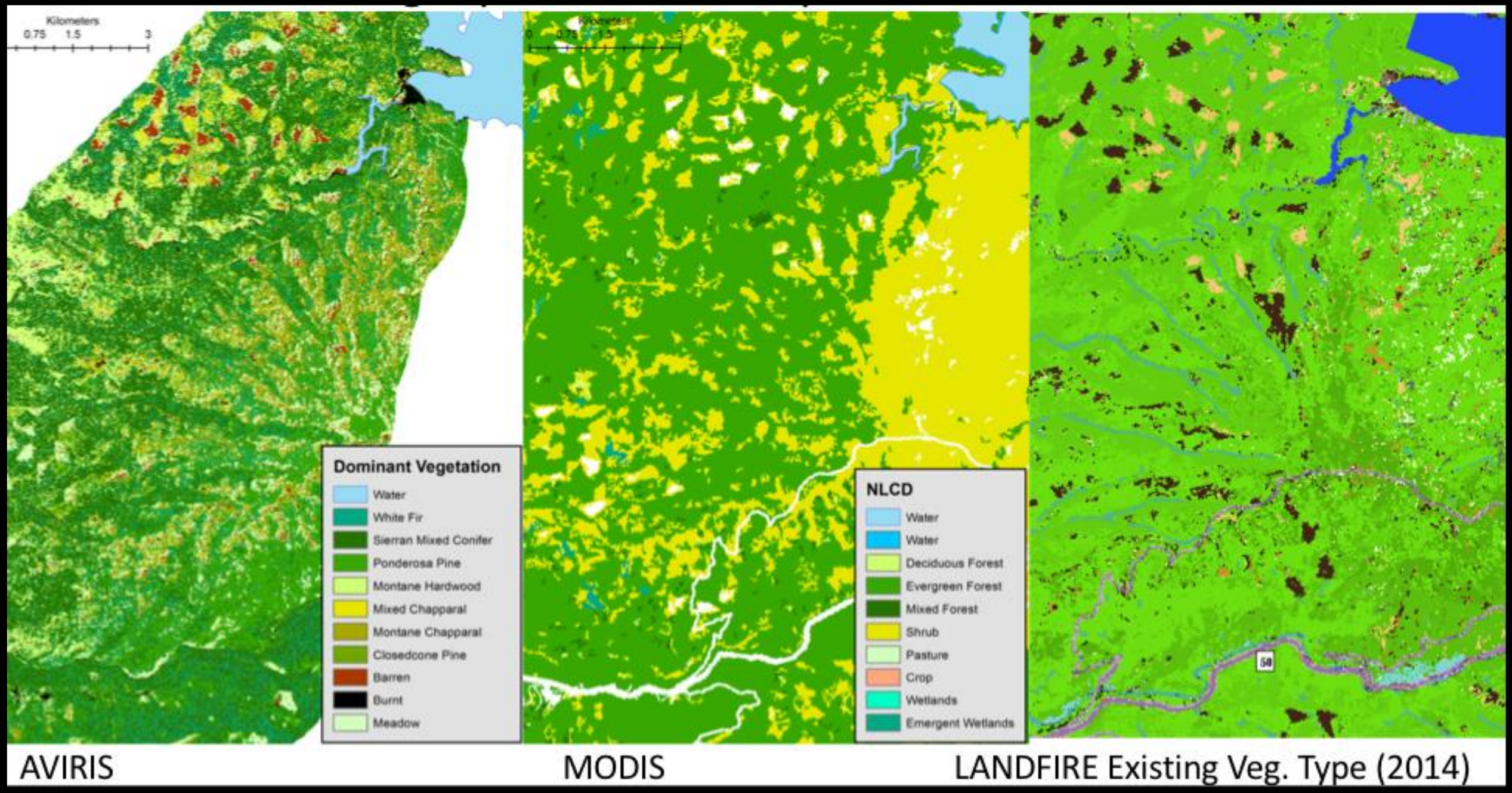
Pre-HyspIRI Airborne Campaign





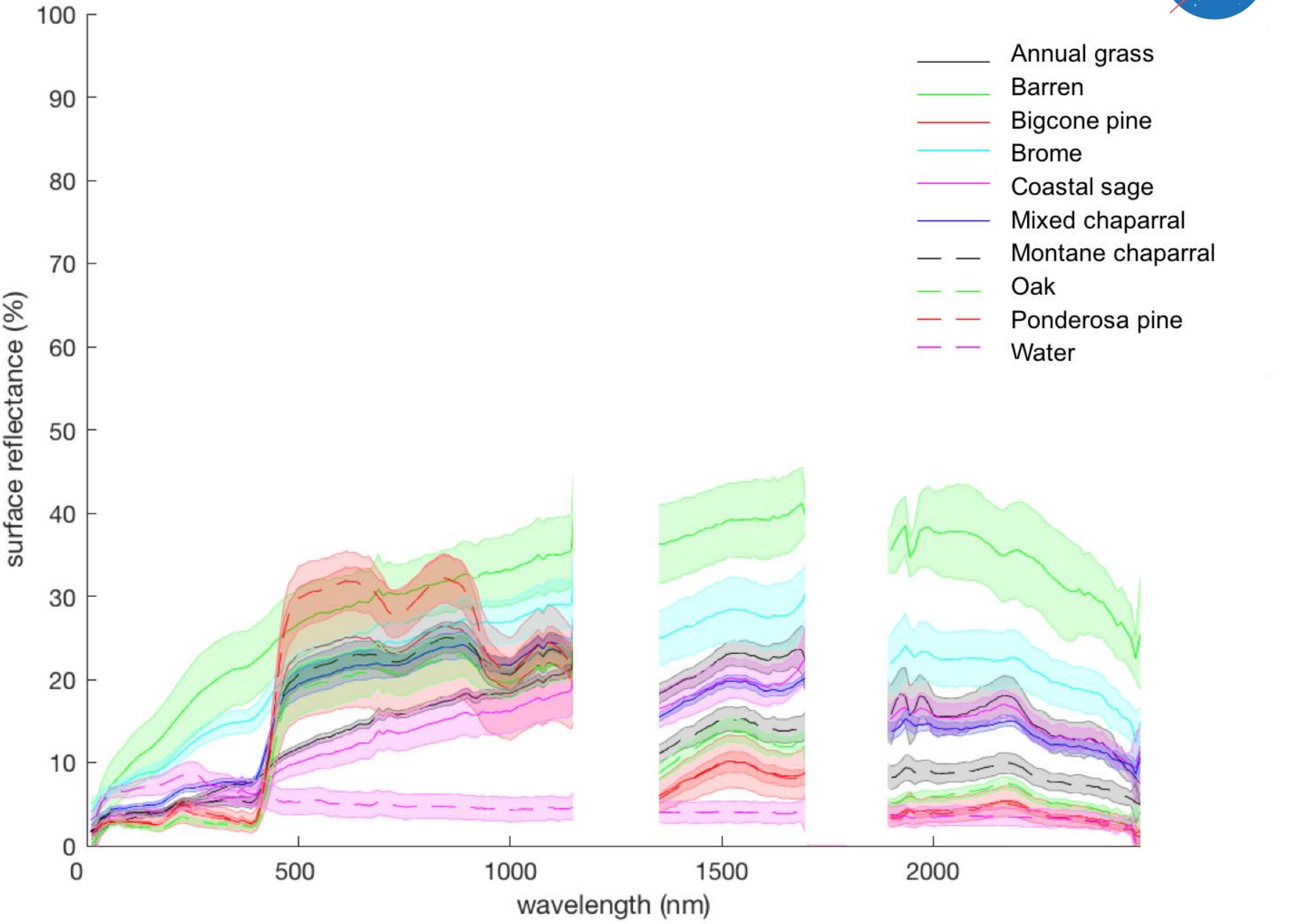
AVIRIS Data obtained: Spring, summer, fall 2013-2015; Summer 2016-2017

Pre-HyspIRI Airborne Campaign

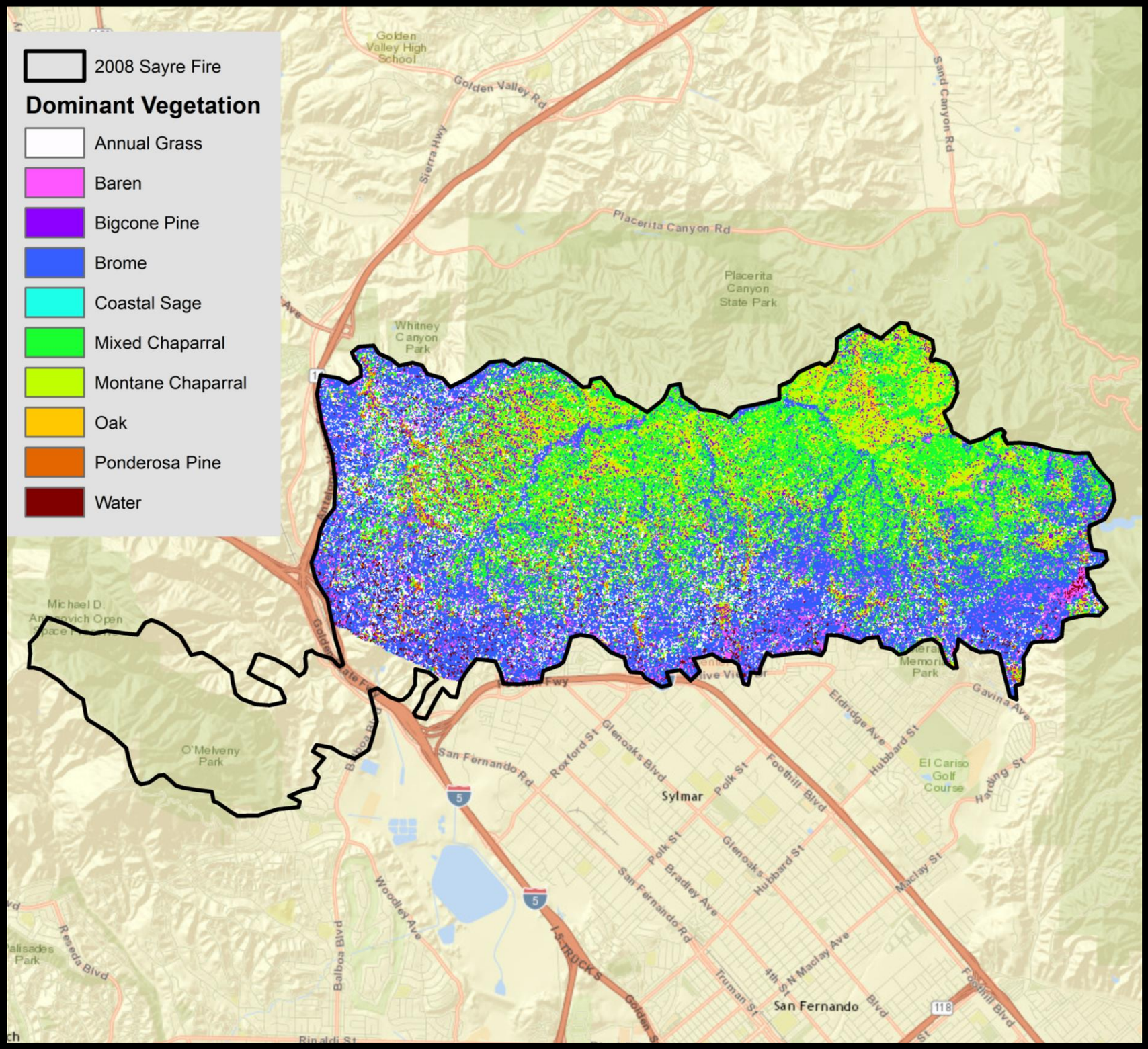


aviris.jpl.nasa.gov

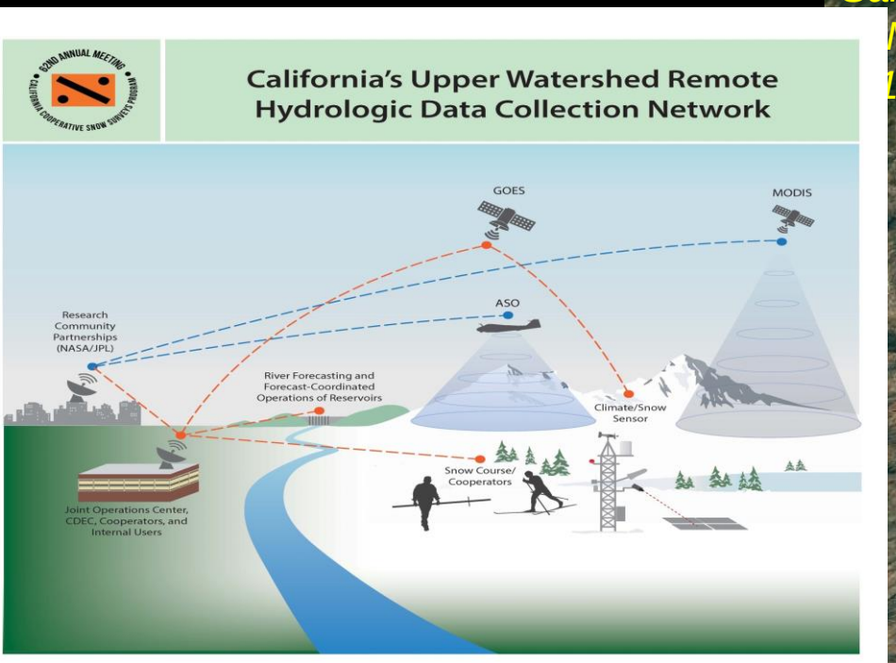
AVIRIS-NG Species Level Discrimination



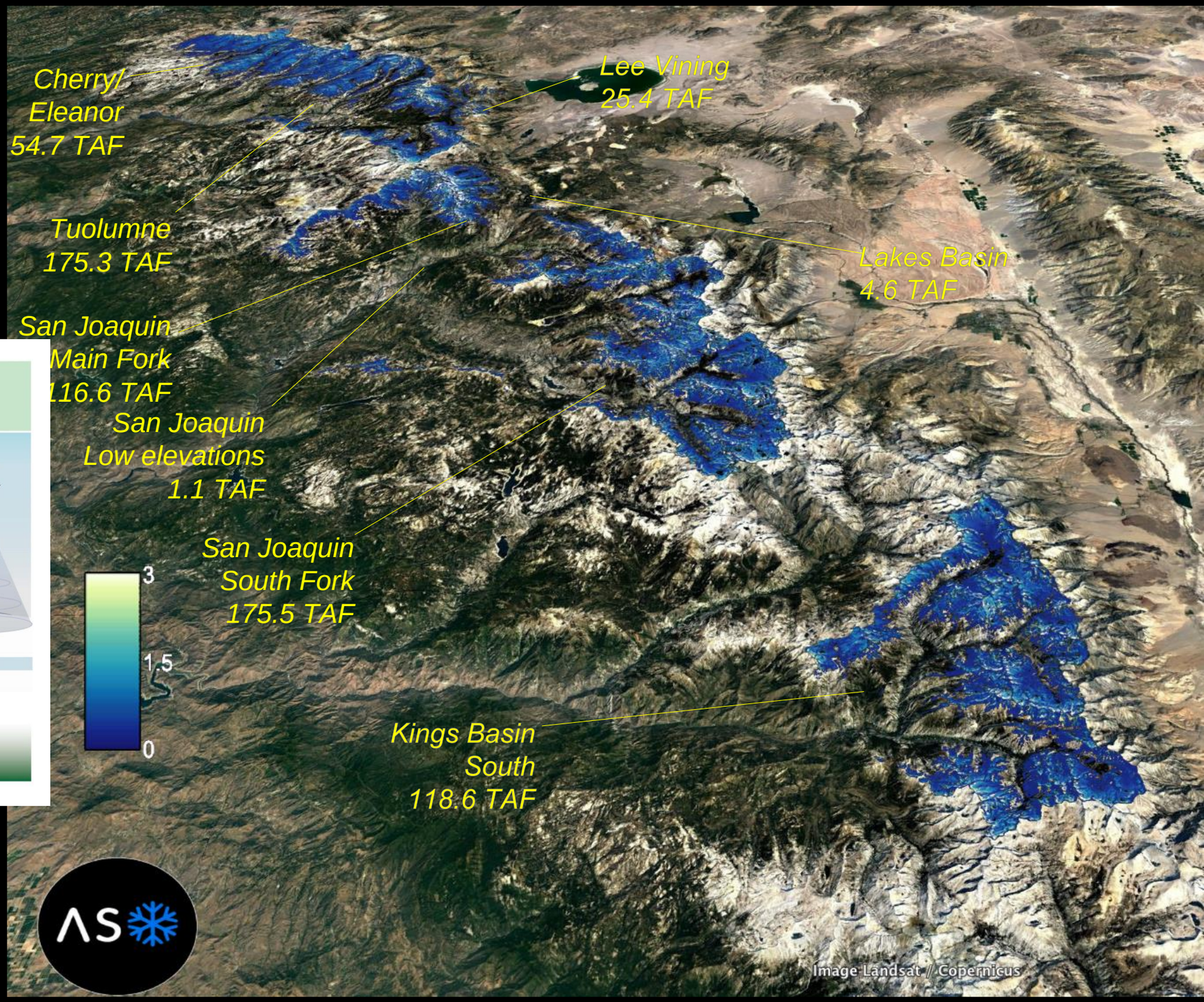
2008 Sayre Fire in LA:
Cheatgrass moving up drainages; scattered oaks at risk

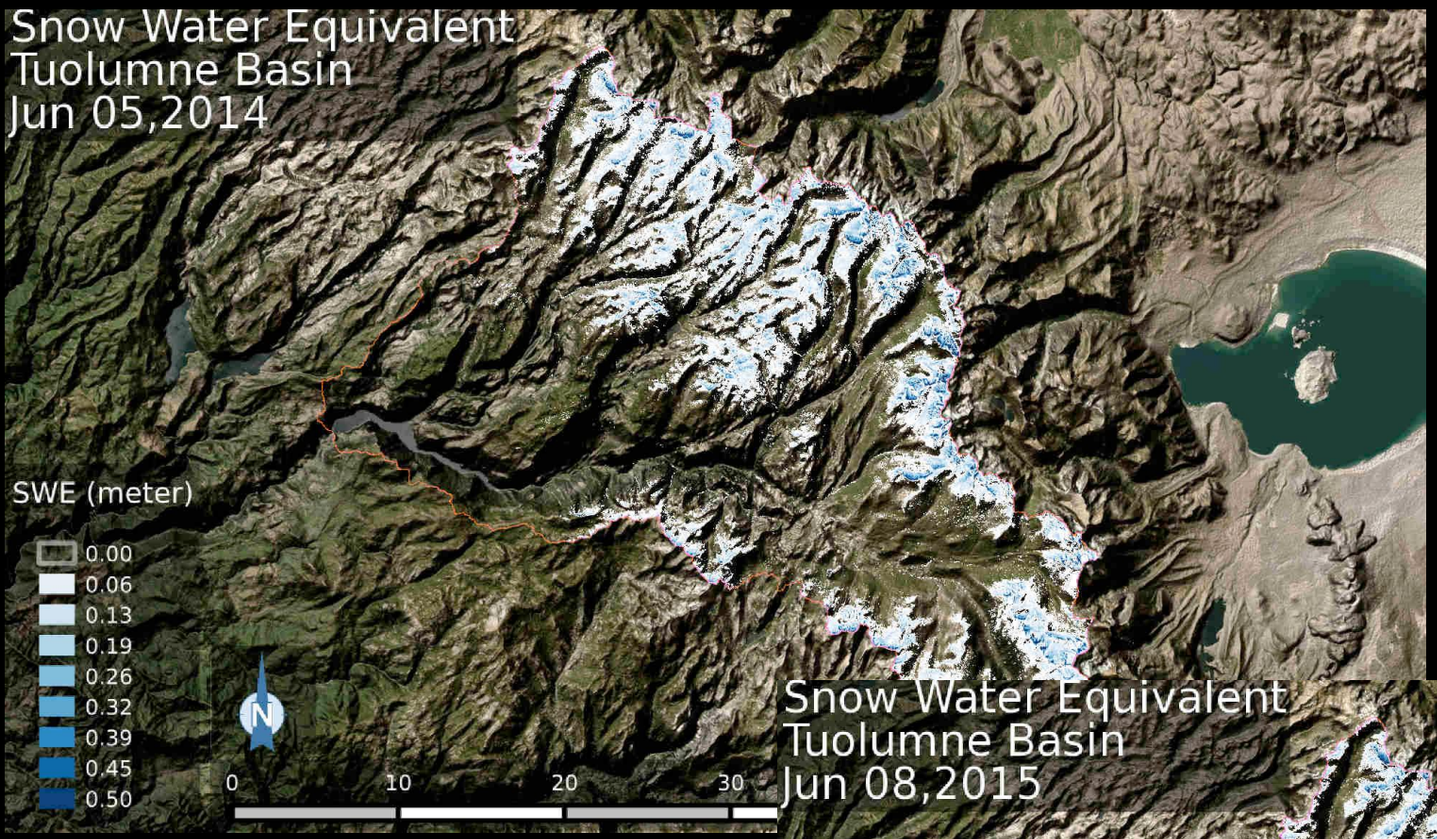


California ASO

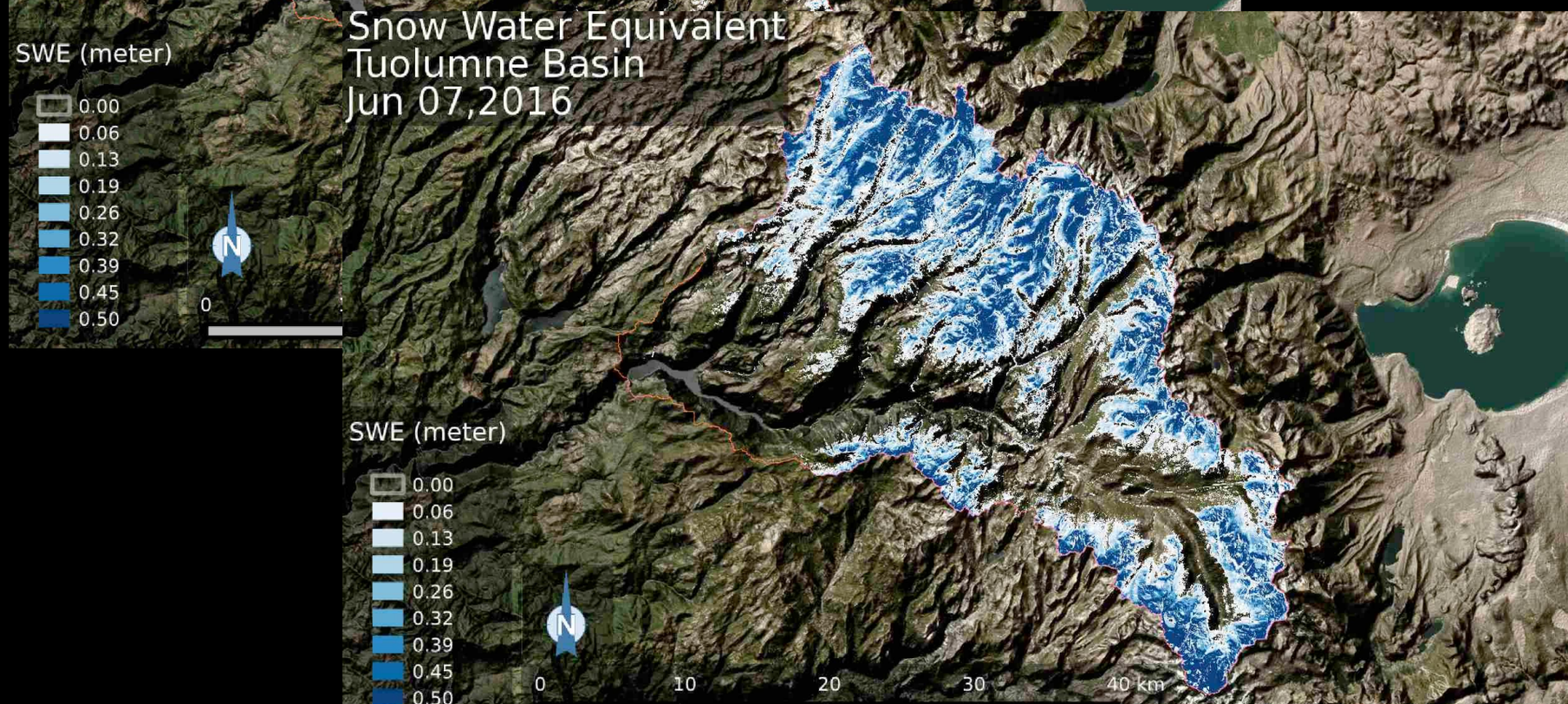


Airborne Snow Observatory

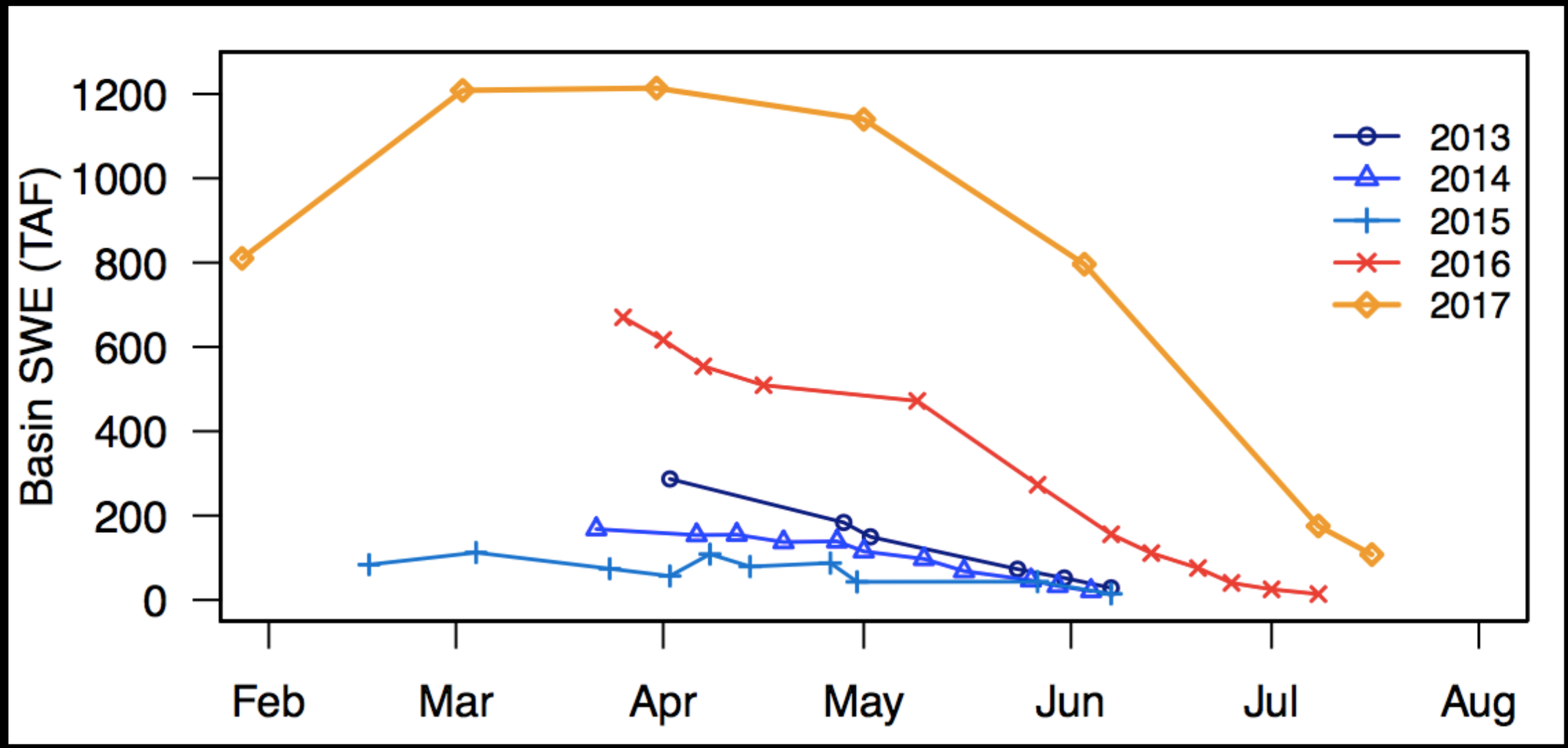




Three Years California ASO

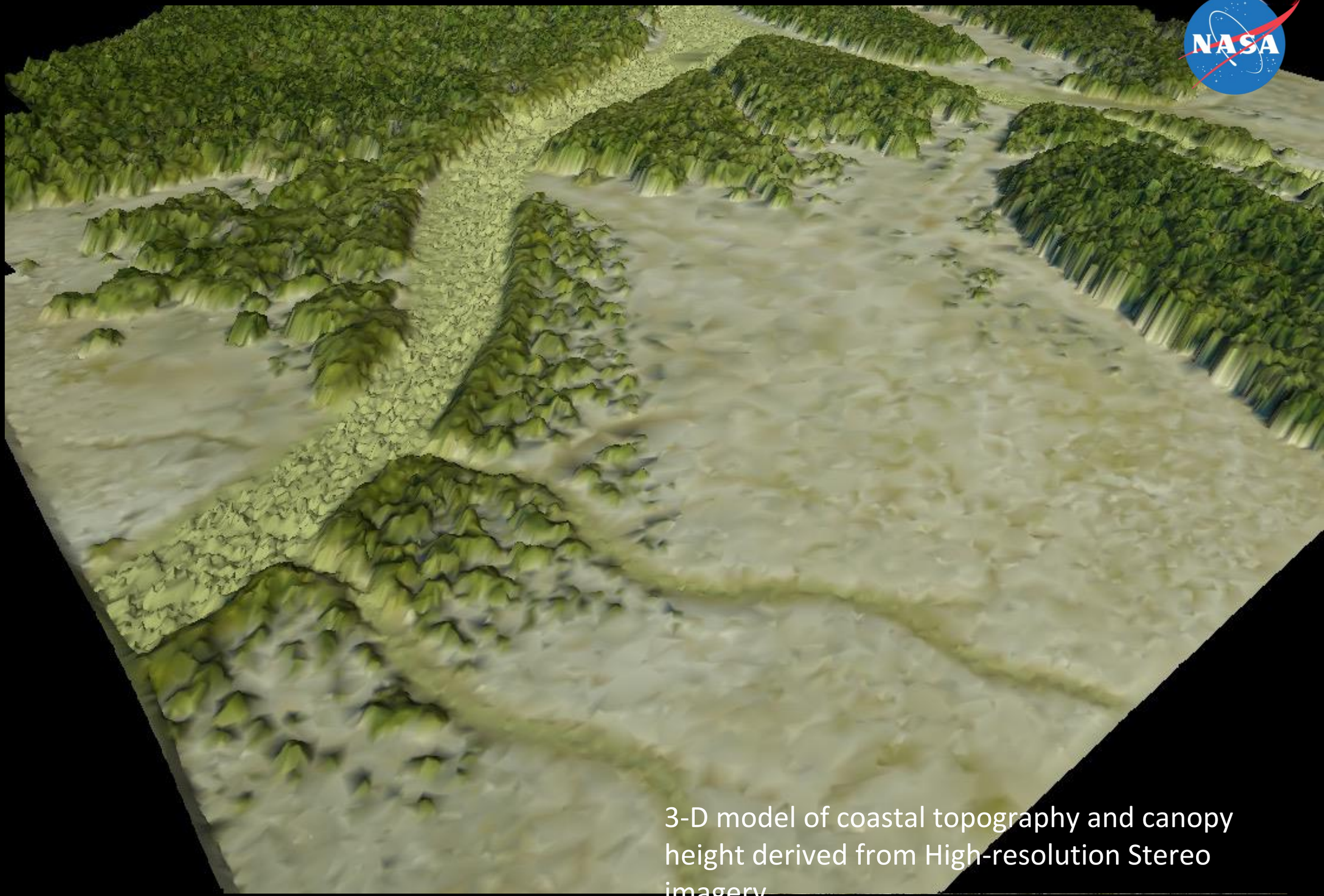


Total Basin Snow Water Equivalent



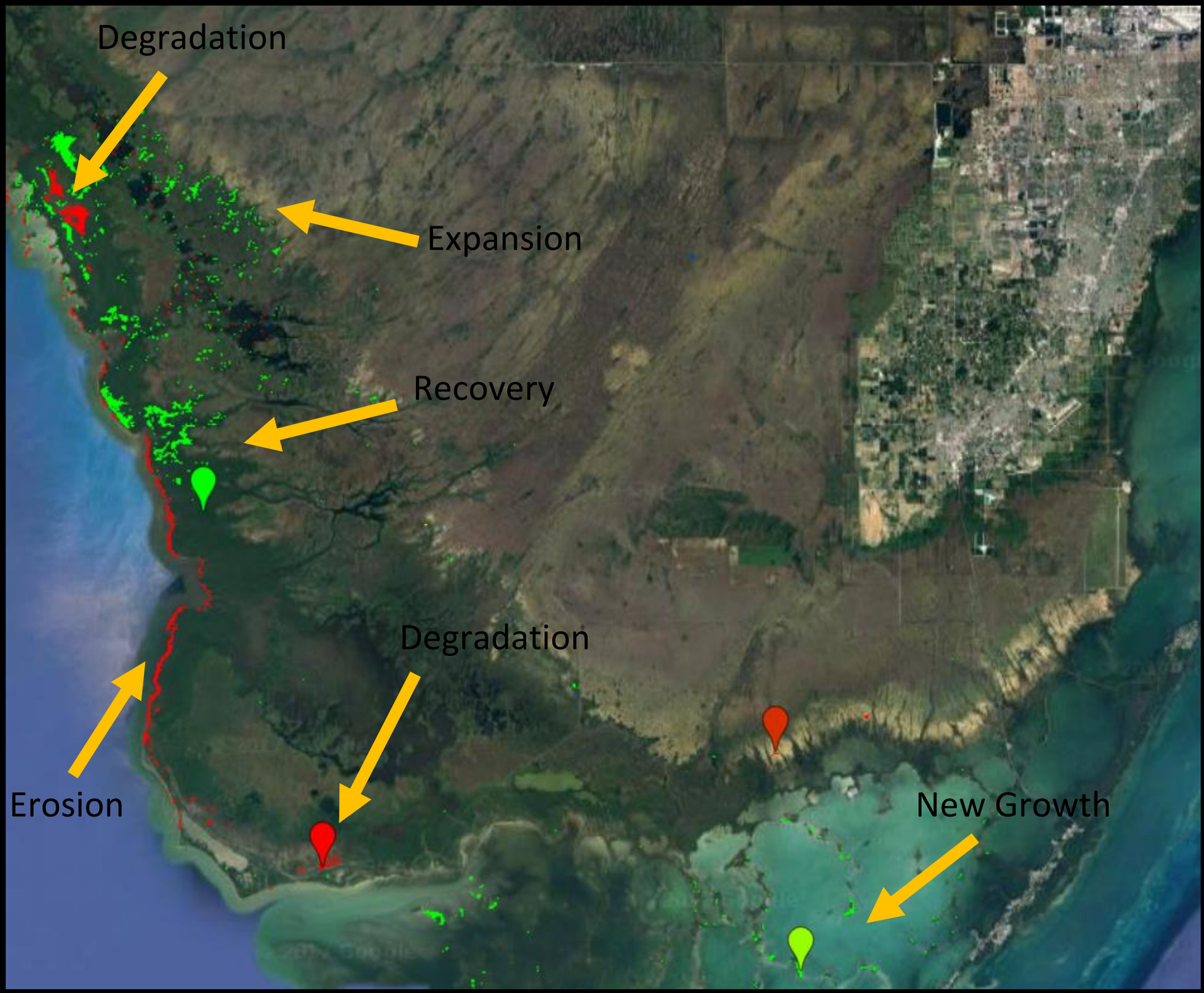
ASO – Tuolumne River Basin
5 year SWE volume

High resolution photo of peat collapse resulting from Sea Level Rise and Salt intrusion in the Florida Everglades taken by NASA G-Light instrument in 2017



3-D model of coastal topography and canopy height derived from High-resolution Stereo imagery

Spatio-temporal dynamics across ENP can be monitored through long-term (and continuous) satellite imagery



More information on Mangrove Science: https://mangrovescience.org/

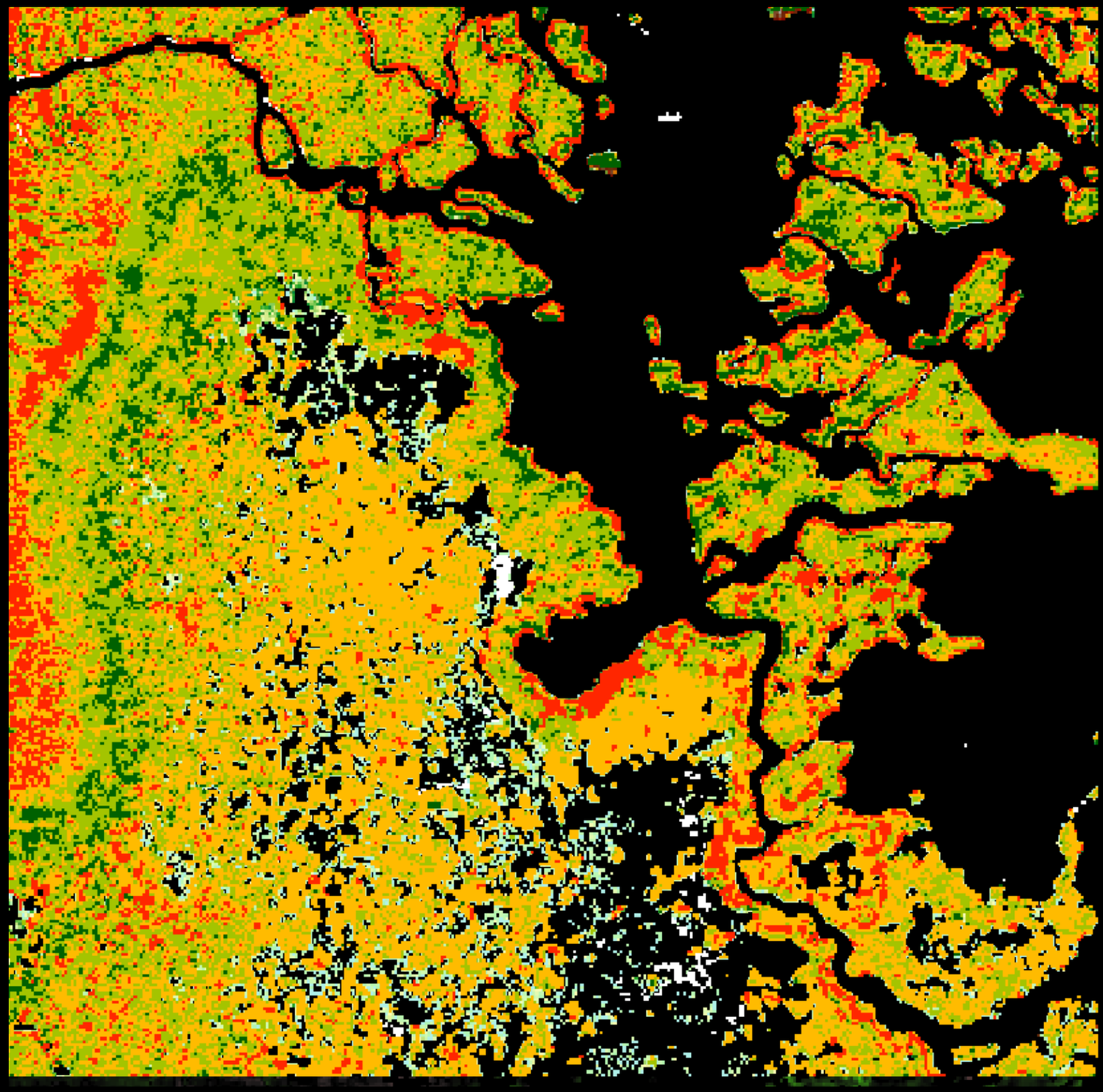
Combining the forest function and structure can provide better details to the changing coastline

Changes in NDVI

- Complete Loss
- Degrading/Loss
- Regeneration

Changes in Structure

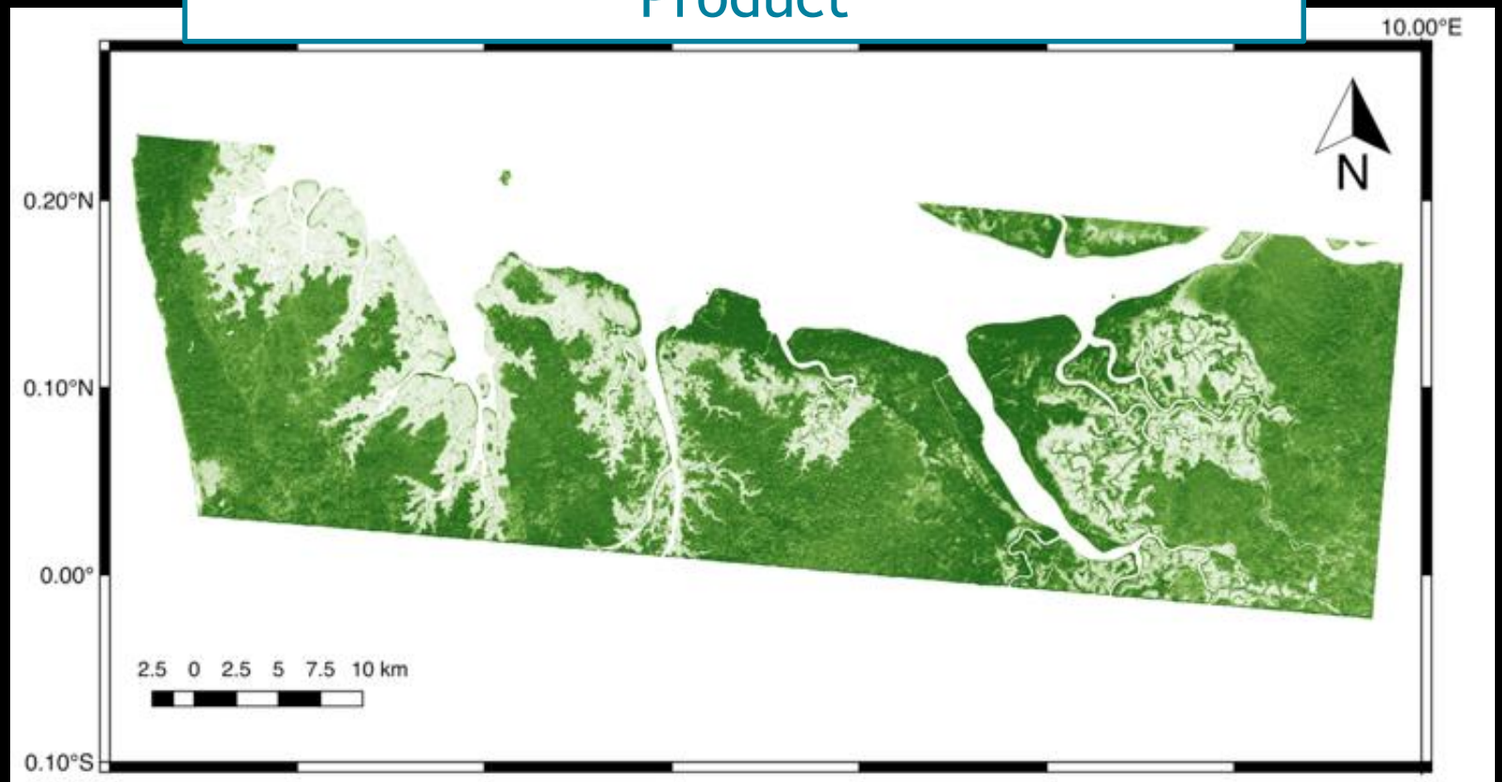
- Loss > 4 m
- Gain > 4 m
- No Change



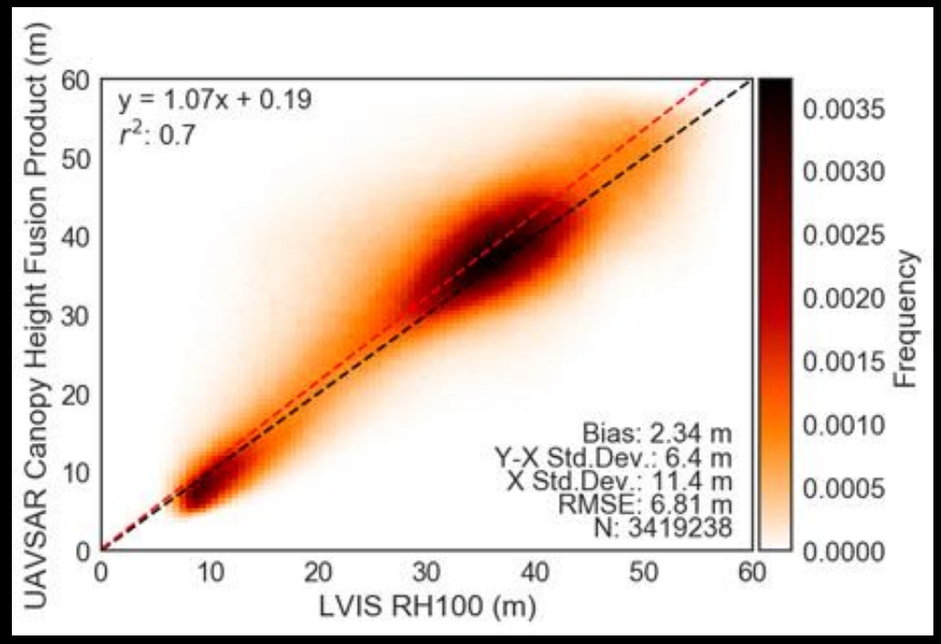
NASA Carbon Monitoring Systems

UAVSAR Pongara Wetlands Canopy Height Fusion Product

PolInSAR & Lidar Fusion Canopy Height Product

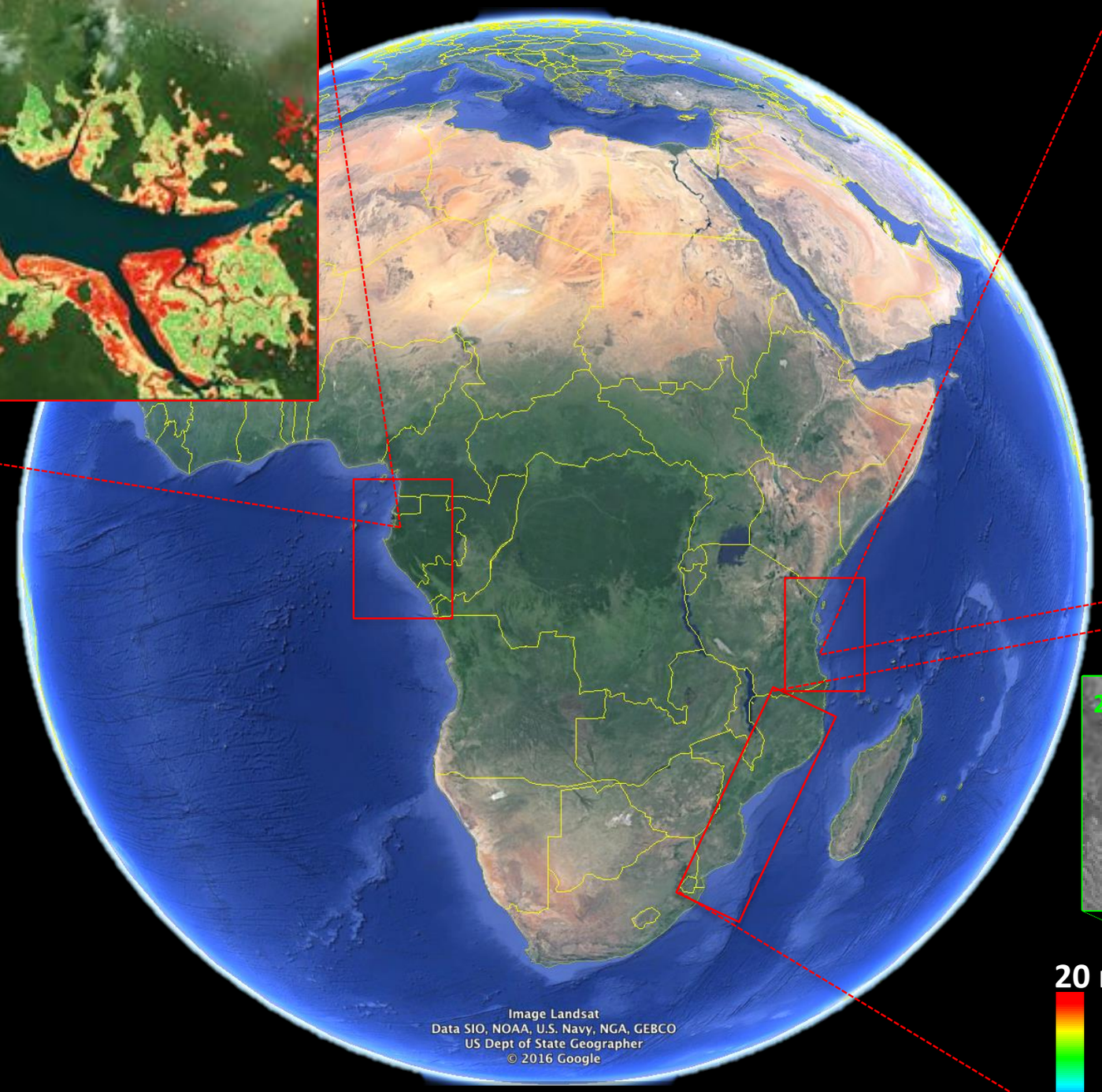


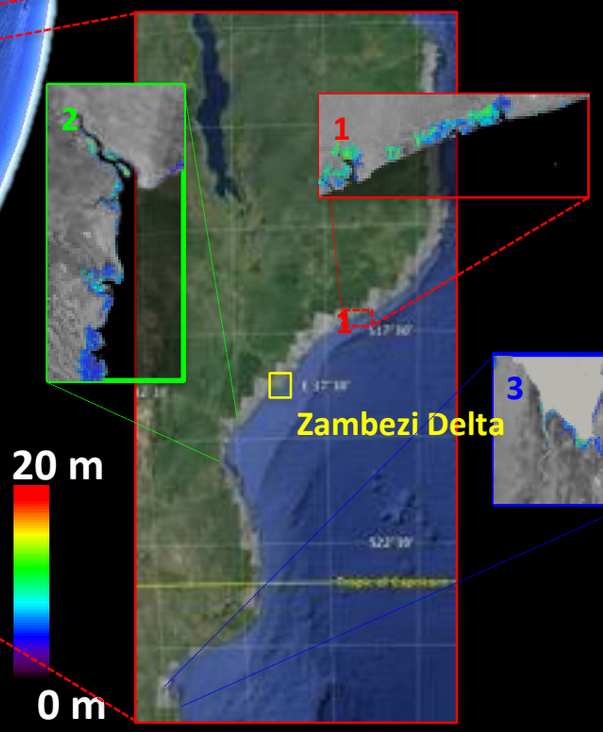
0 m 50 m



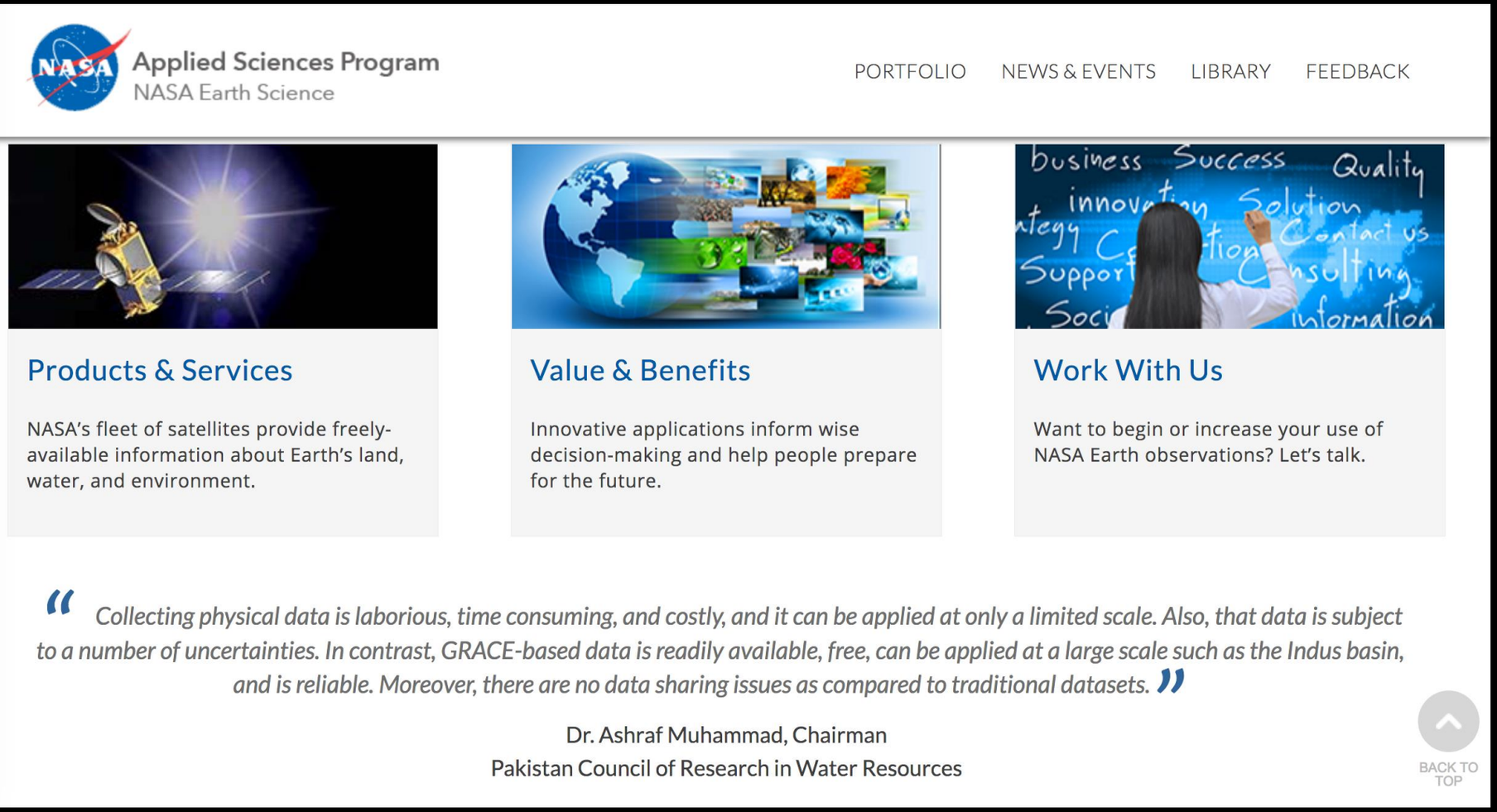
* M. Simard & M. Denbina

Mangrove Height Maps for Gabon, Tanzania and Mozambique at 12 m resolution from TanDEM-X





NASA Applied Sciences



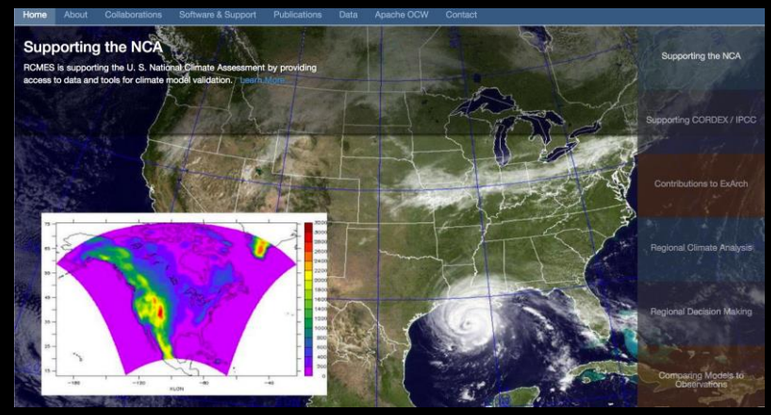
Focus Areas in Applied Sciences:

- Biodiversity/Ecological Forecasting
- Water Quality
- Food Security
- Natural Hazards (Tsunami/Hurricane, Earthquakes,..)

https://appliedsciences.nasa.gov/

NASA Enabling Tools

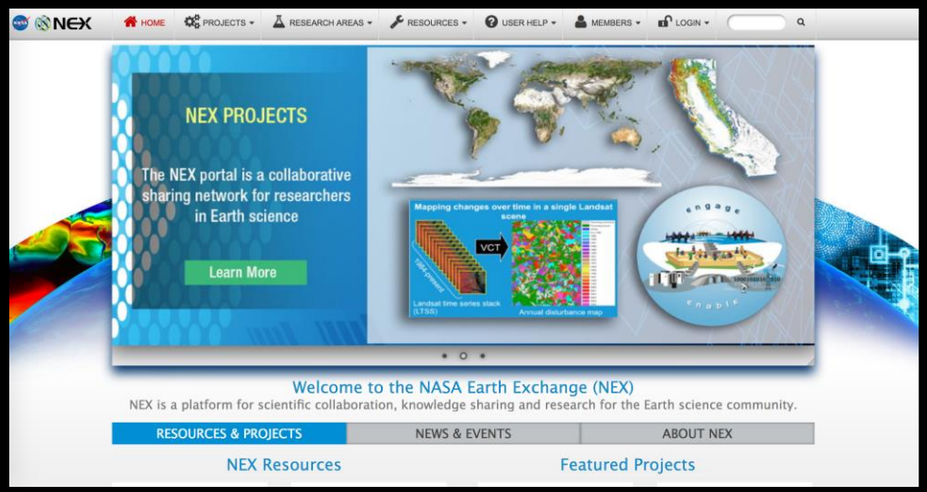
Regional Climate Modeling: https://rcmes.jpl.nasa.gov/



Land DA Systems: https://ldas.gsfc.nasa.gov/NCA-LDAS/

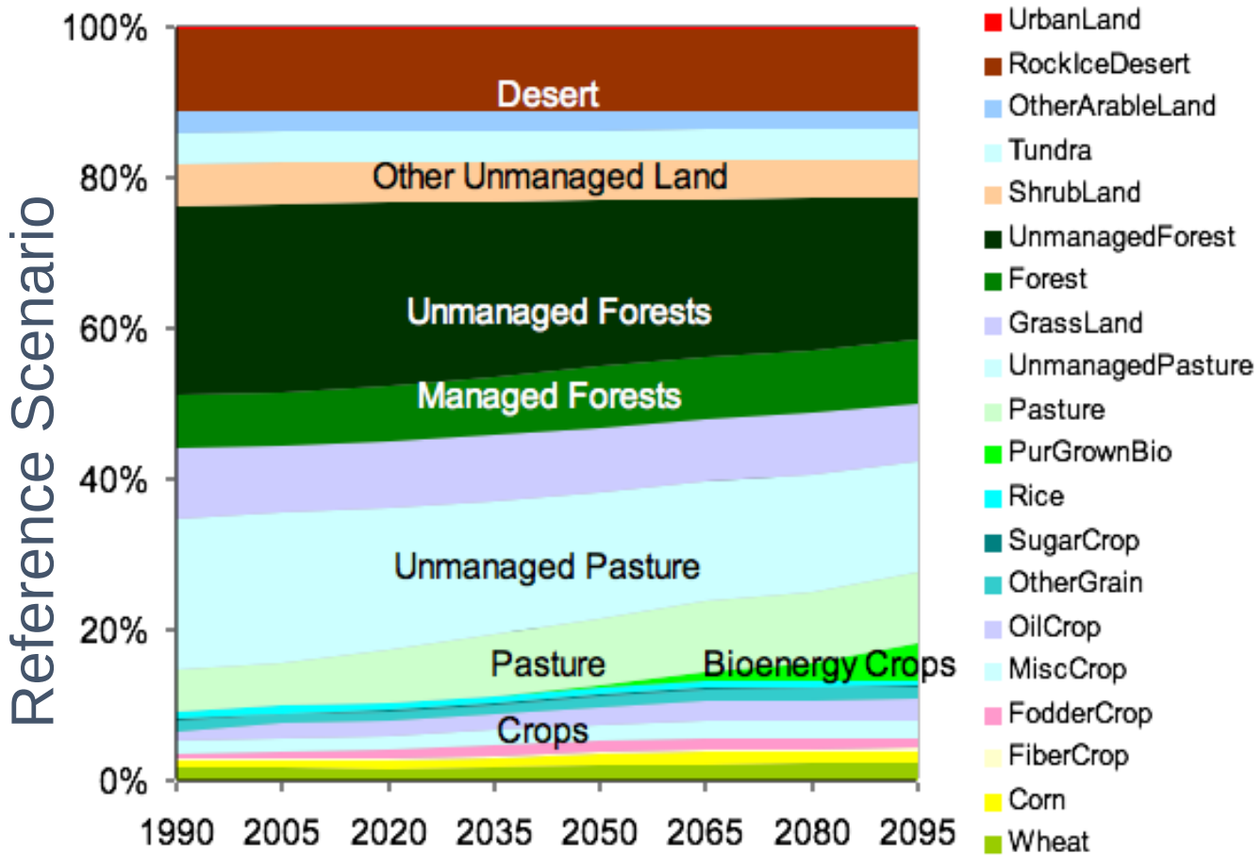
MERRA-2 Reanalysis: https://gmao.gsfc.nasa.gov/reanalysis

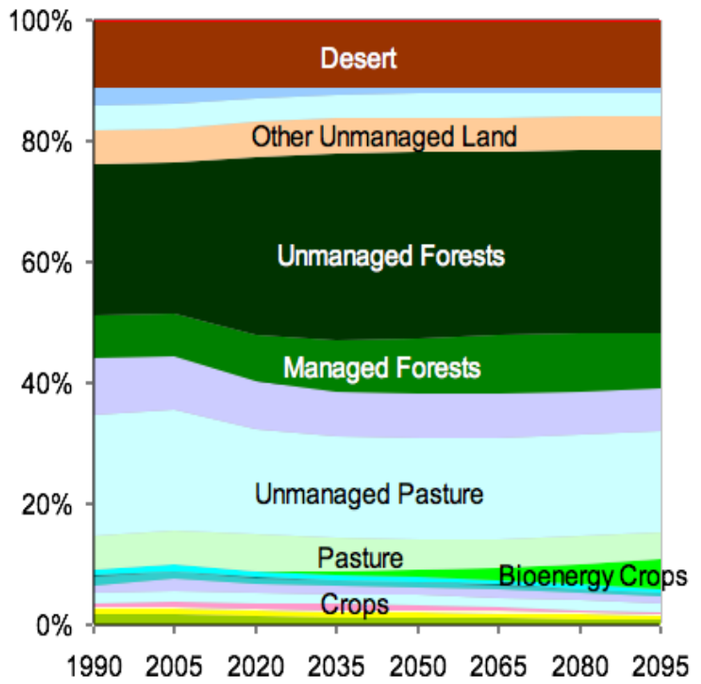
NASA Earth Exchange: https://nex.nasa.gov/nex/



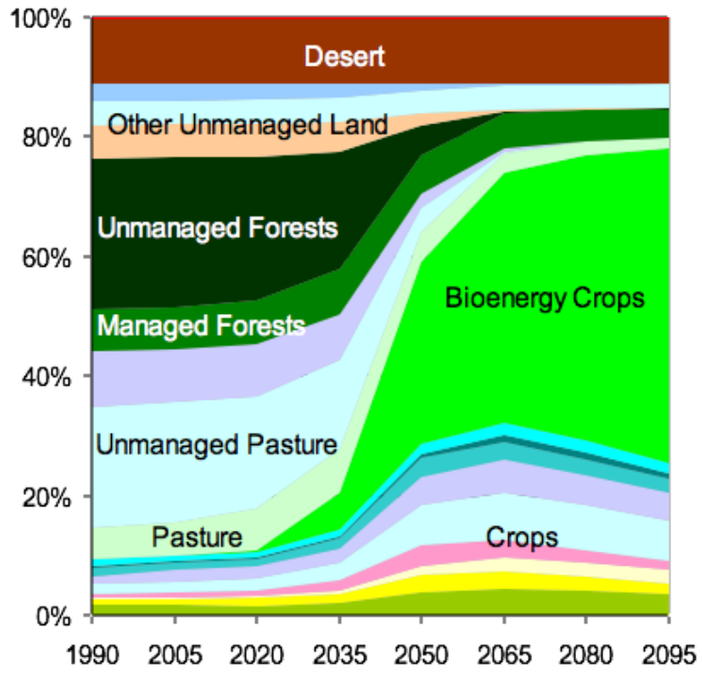
GCAM Land use: 450 ppm atmospheric CO_2

450 ppm Stabilization Scenario When ALL Carbon is Valued





450 ppm Stabilization Scenario When Terrestrial Carbon is NOT Valued



From Wise et al., 2009 Science

SUMMARY

New integrative capabilities to capture status/changes in landscape structure and function

Opportunity for new paradigms and process understanding for ecosystem and global modeling frameworks

EVI opportunities, Decadal Survey

SUMMARY

Ongoing and Future:

ECOSTRESS - measure plant temp for water stress

GEDI - Global Ecosystem Dynamics Investigation: high resolution laser observations of 3D structure of the Earth

NISAR - NASA-ISRO SAR: ecosystem disturbances, ice-sheet collapse, and natural hazards such as earthquakes, tsunamis, volcanoes and landslides.

PACE - Plankton, Aerosol, Cloud ocean Ecosystem: ocean/atmosphere, chlorophyll dynamics, HABs

SWOT - Surface Water Ocean Topography: water storage changes in wetlands, lakes, and reservoirs

EVI opportunities, Decadal Survey