



New Paintings Outside the Lines: Beyond the Visible

Kathy Hibbard

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



Data Sources in Today's Talk

Satellite:

RADARSAT (Gravimetric)

TanDEM-X/PolInSAR (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

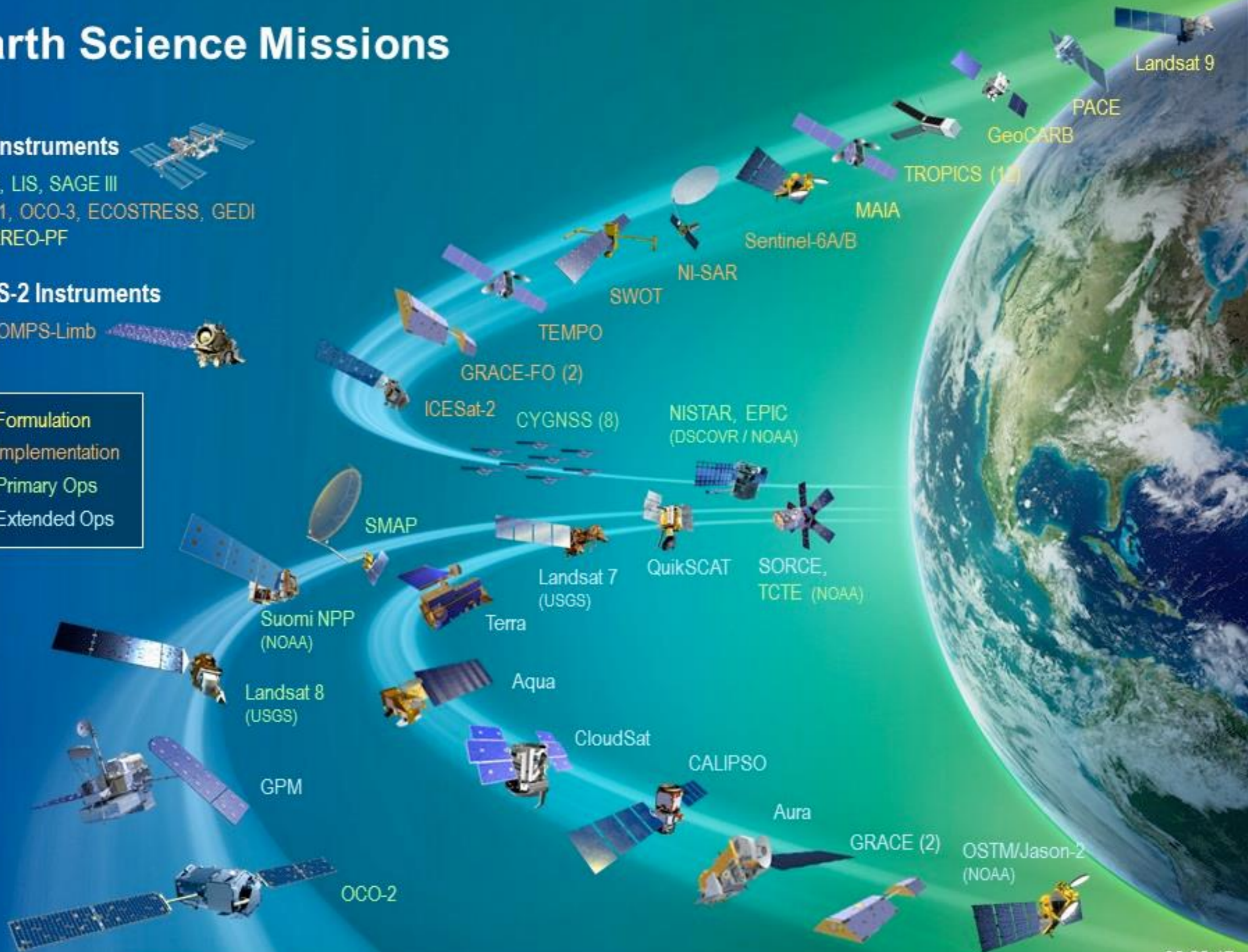
ISS Instruments

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

JPSS-2 Instruments

RBI, OMPS-Limb

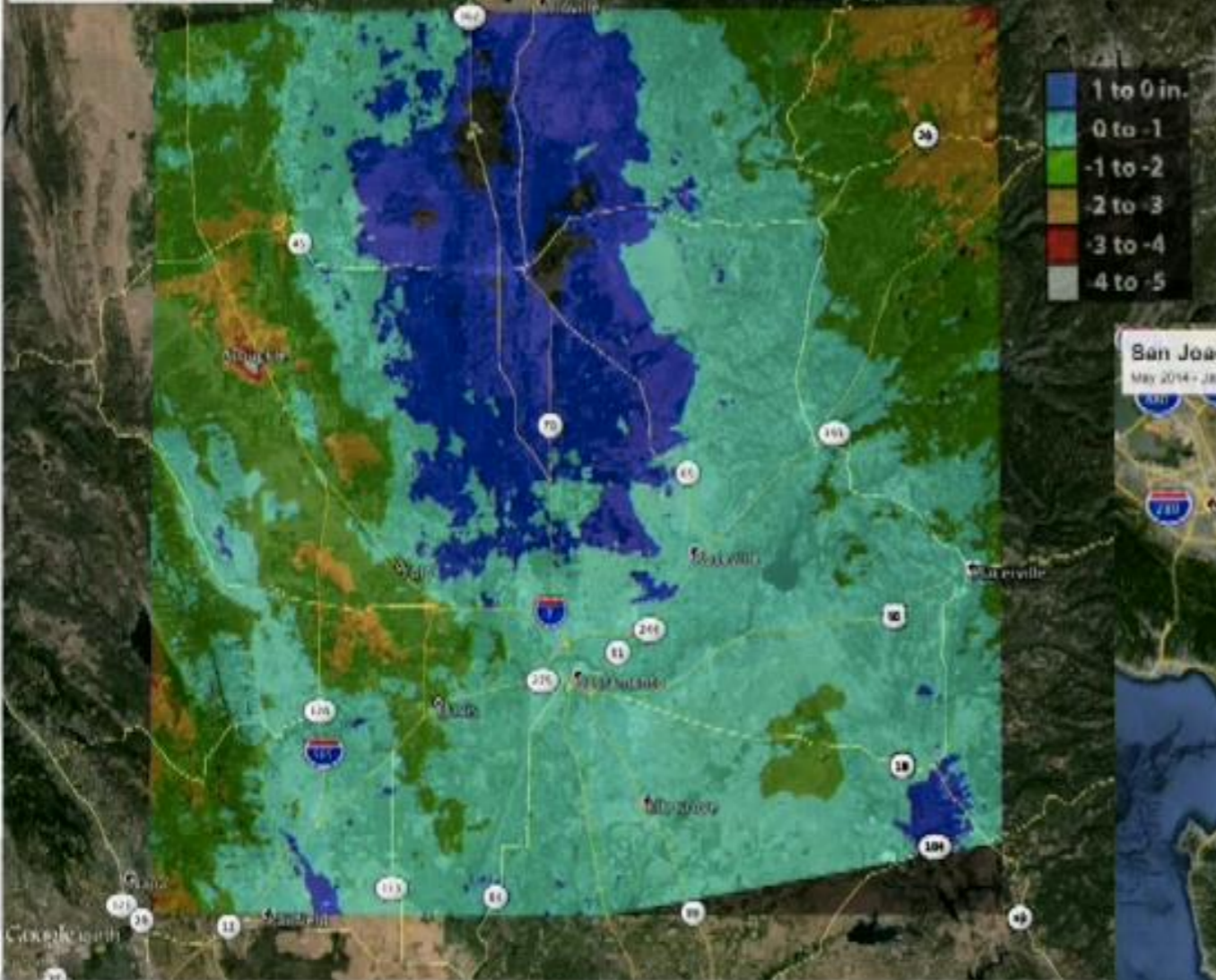
■	Formulation
■	Implementation
■	Primary Ops
■	Extended Ops



NASA and CA Department of Water Resources



Radarsat-2 Subsidence Map
May 2014 - November 28, 2014



Drought Information

Breaking News

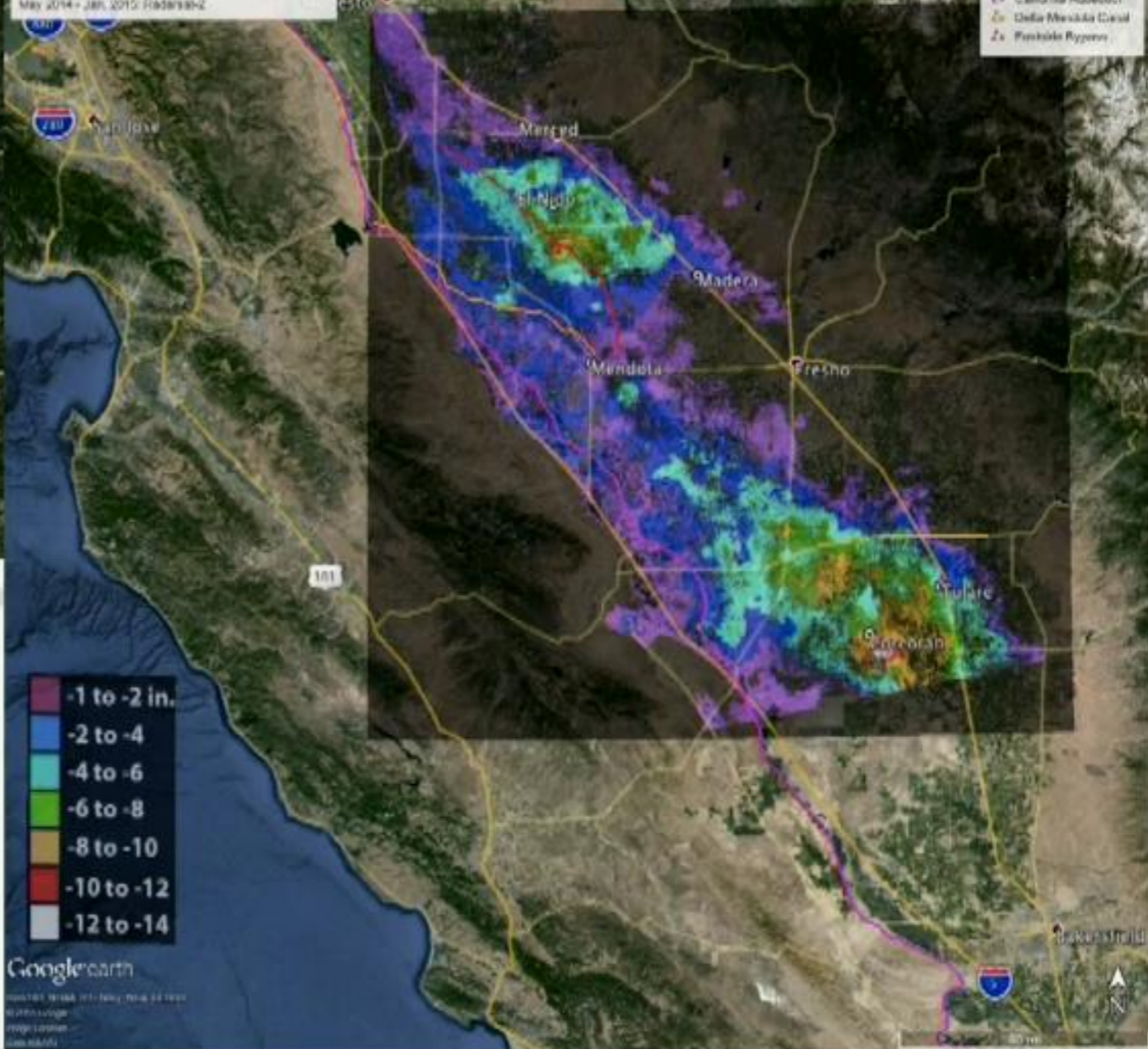
NASA Report: Drought Causing Valley Land to Sink

August 19, 2015

SACRAMENTO, CA - As Californians continue pumping groundwater in response to the historic drought, the Department of Water Resources today released a new NASA report showing land in the San Joaquin Valley is sinking faster than ever before, nearly two inches per month in some locations.

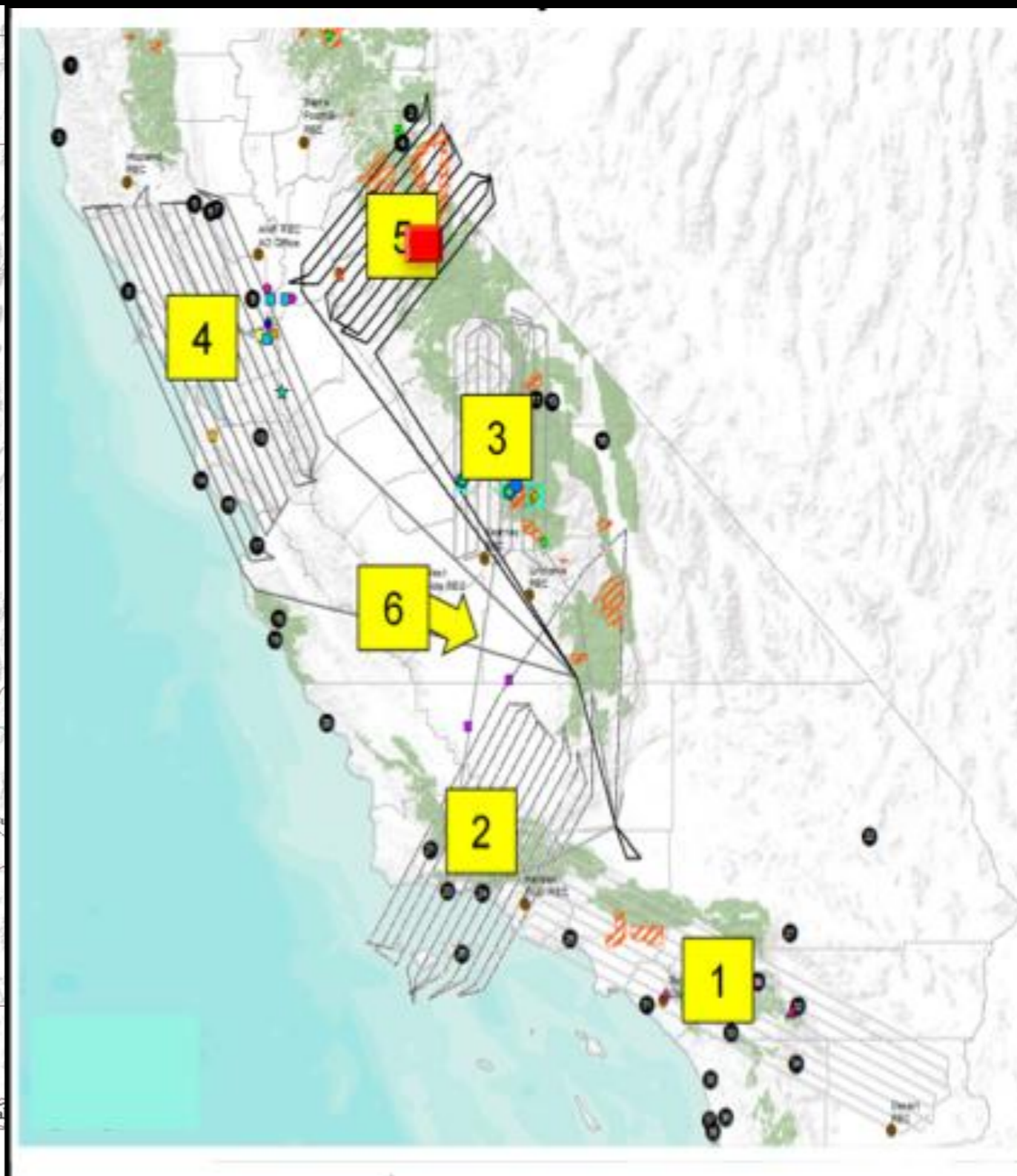
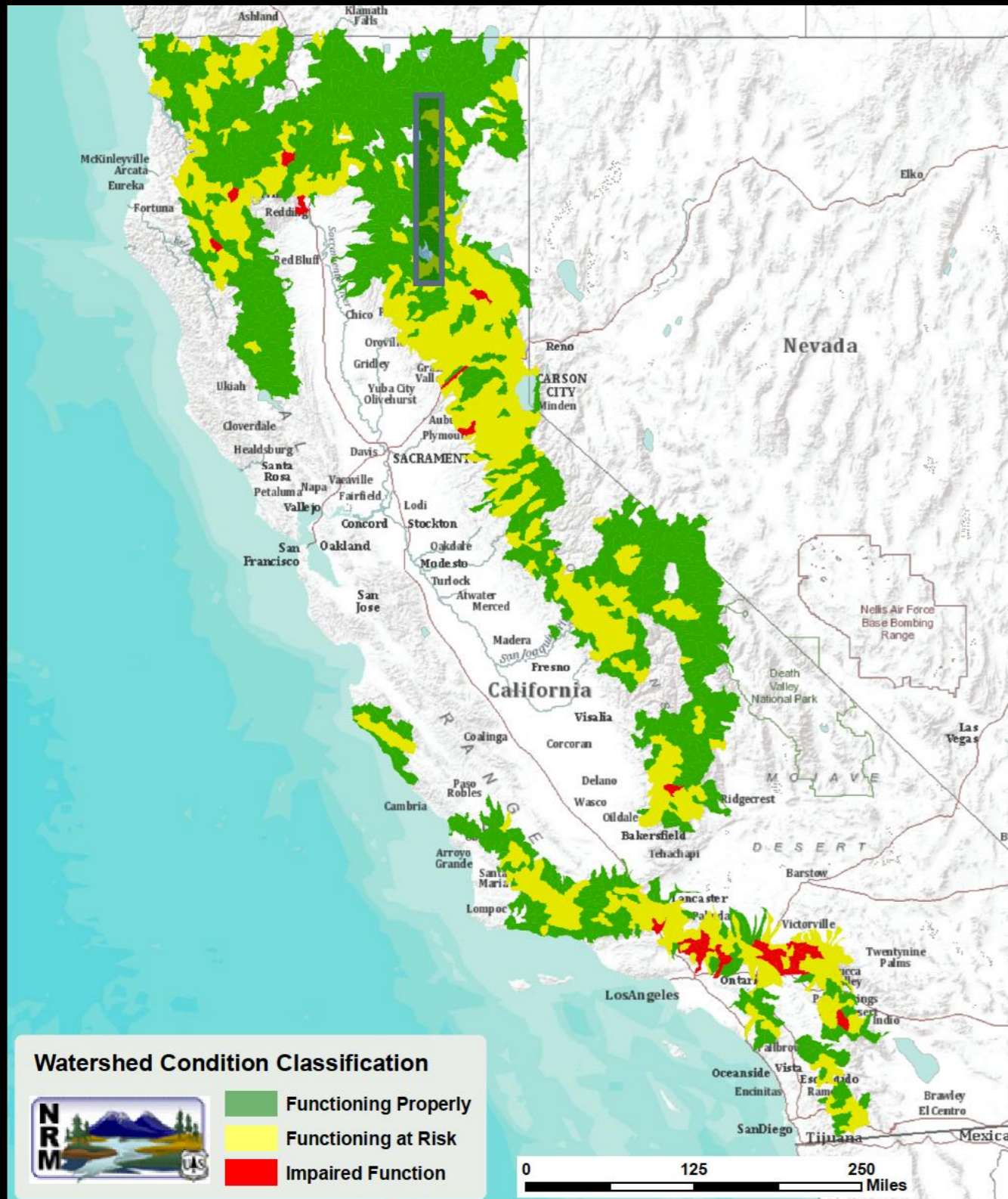
- Ag and Urban Water Management Plans
- California's Drought Update
- USGS Hydrologic Overview
- USGS Groundwater Monitoring System
- Turf Replacement Incentive

San Joaquin Valley Subsidence
May 2014 - Jan. 2015; Radarsat-2



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

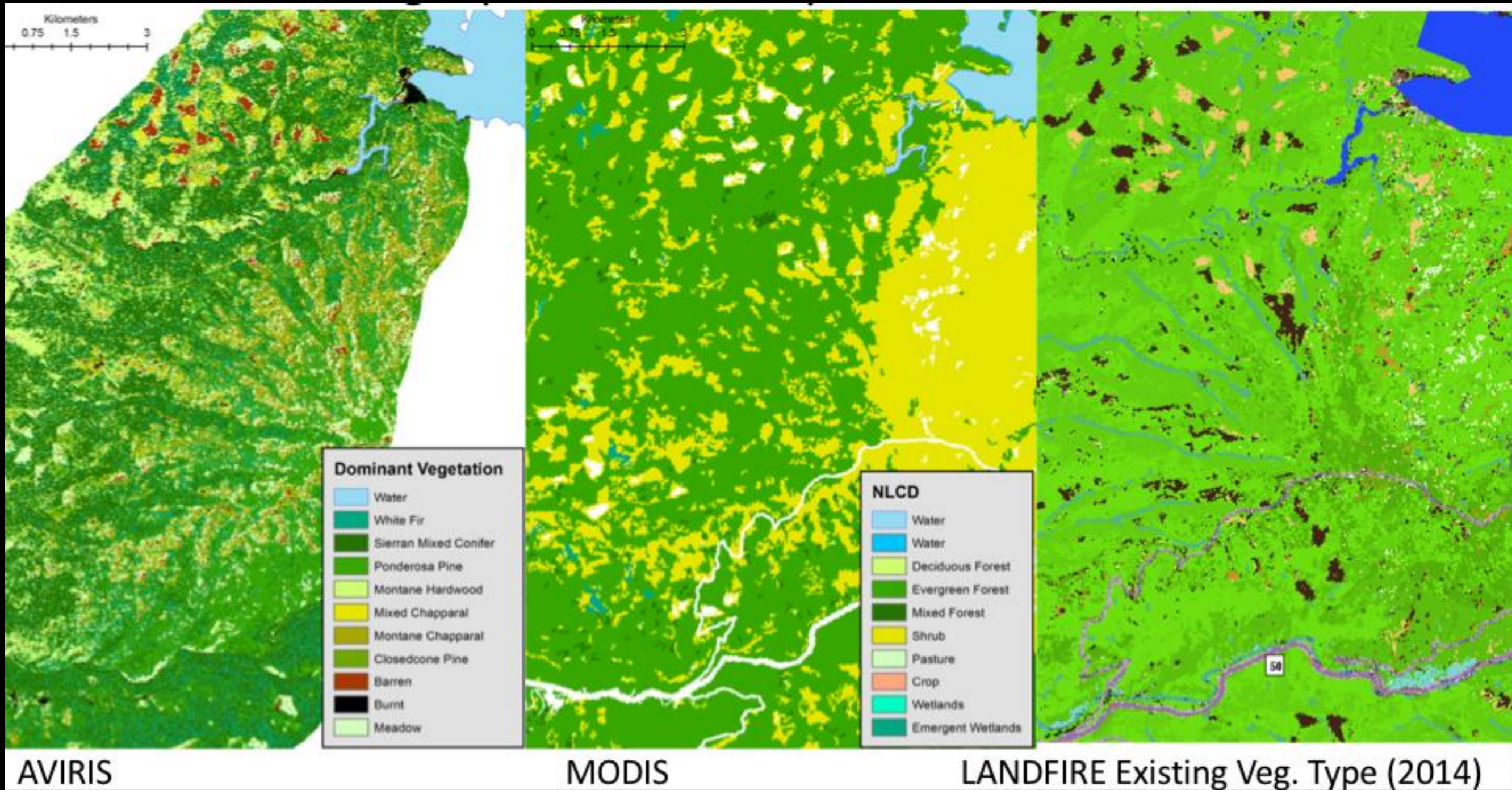
Pre-HyspIRI Airborne Campaign



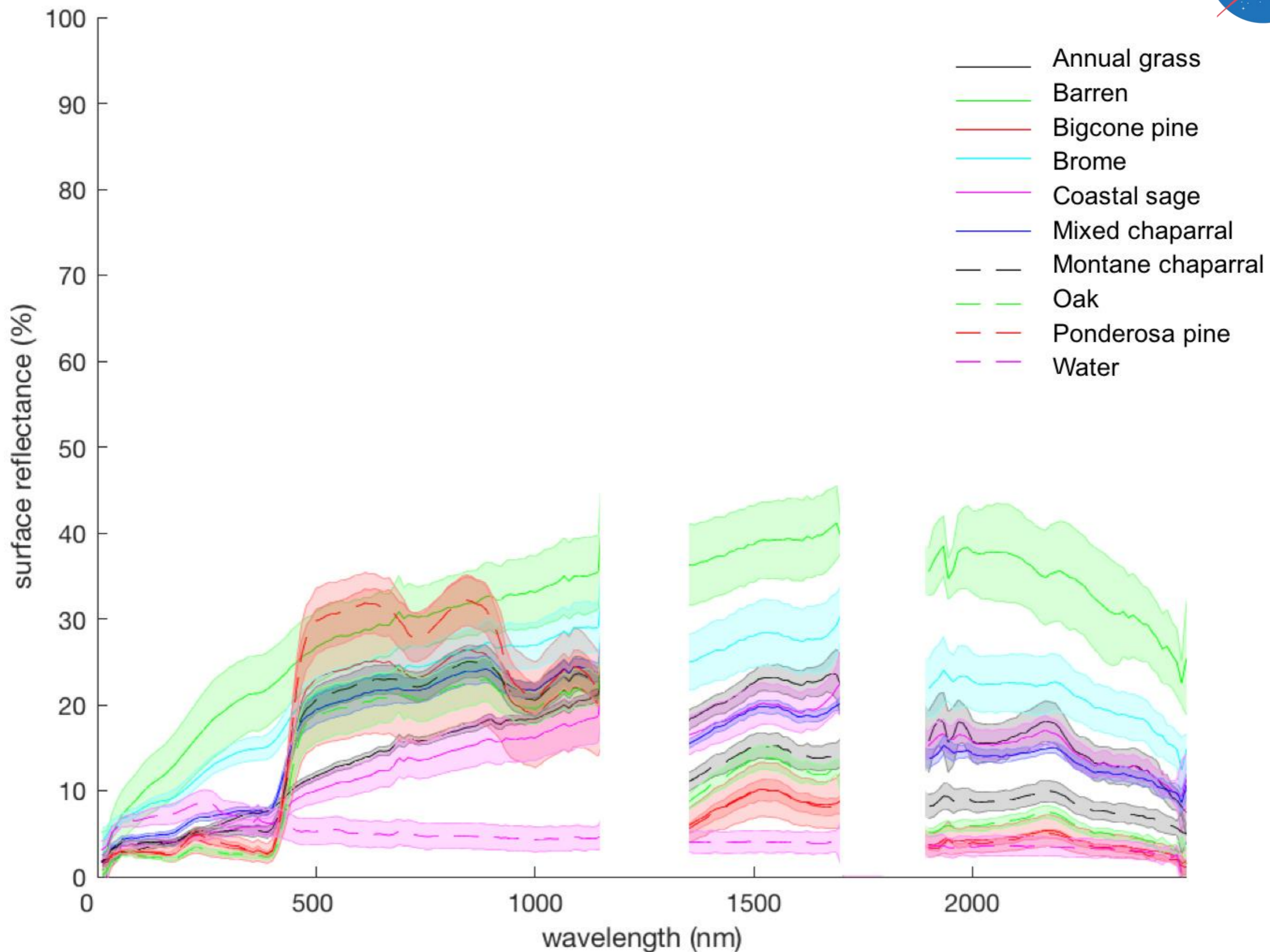
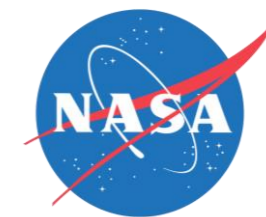
AVIRIS Data obtained: Spring, summer, fall 2013-2015; Summer 2016-2017



Pre-HyspIRI Airborne Campaign

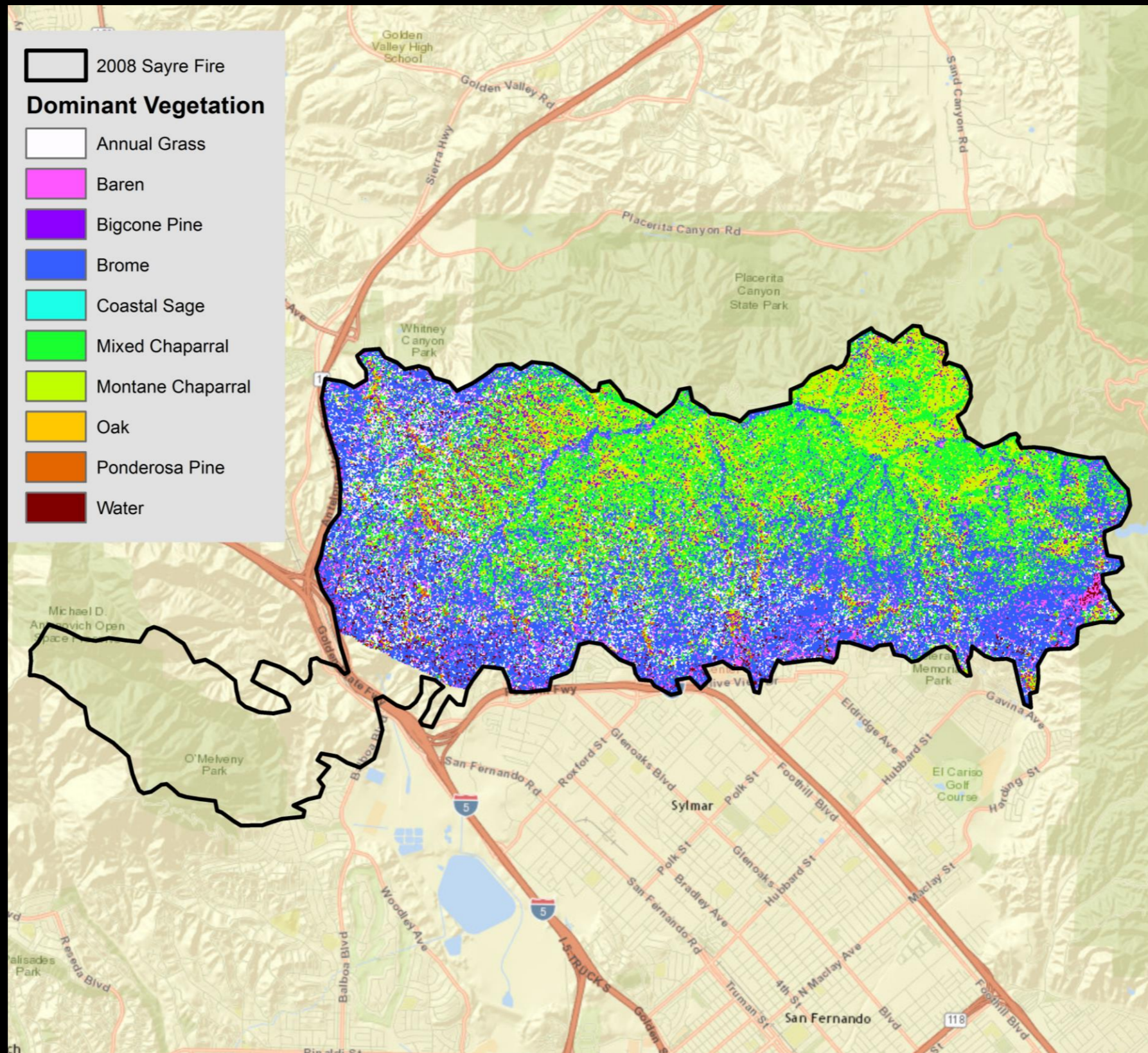


AVIRIS-NG Species Level Discrimination

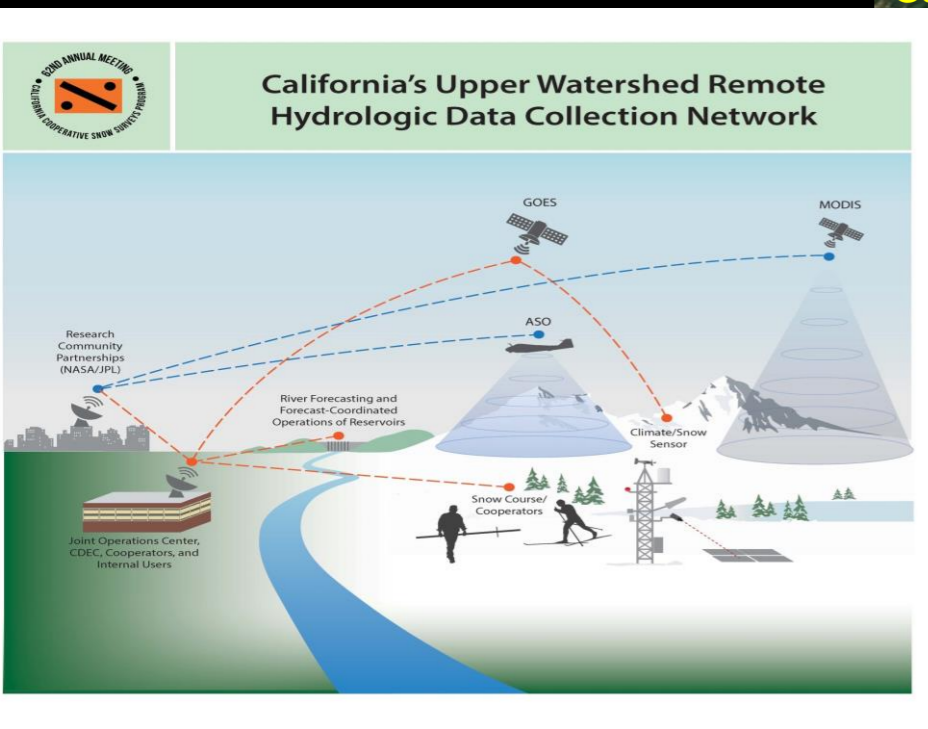
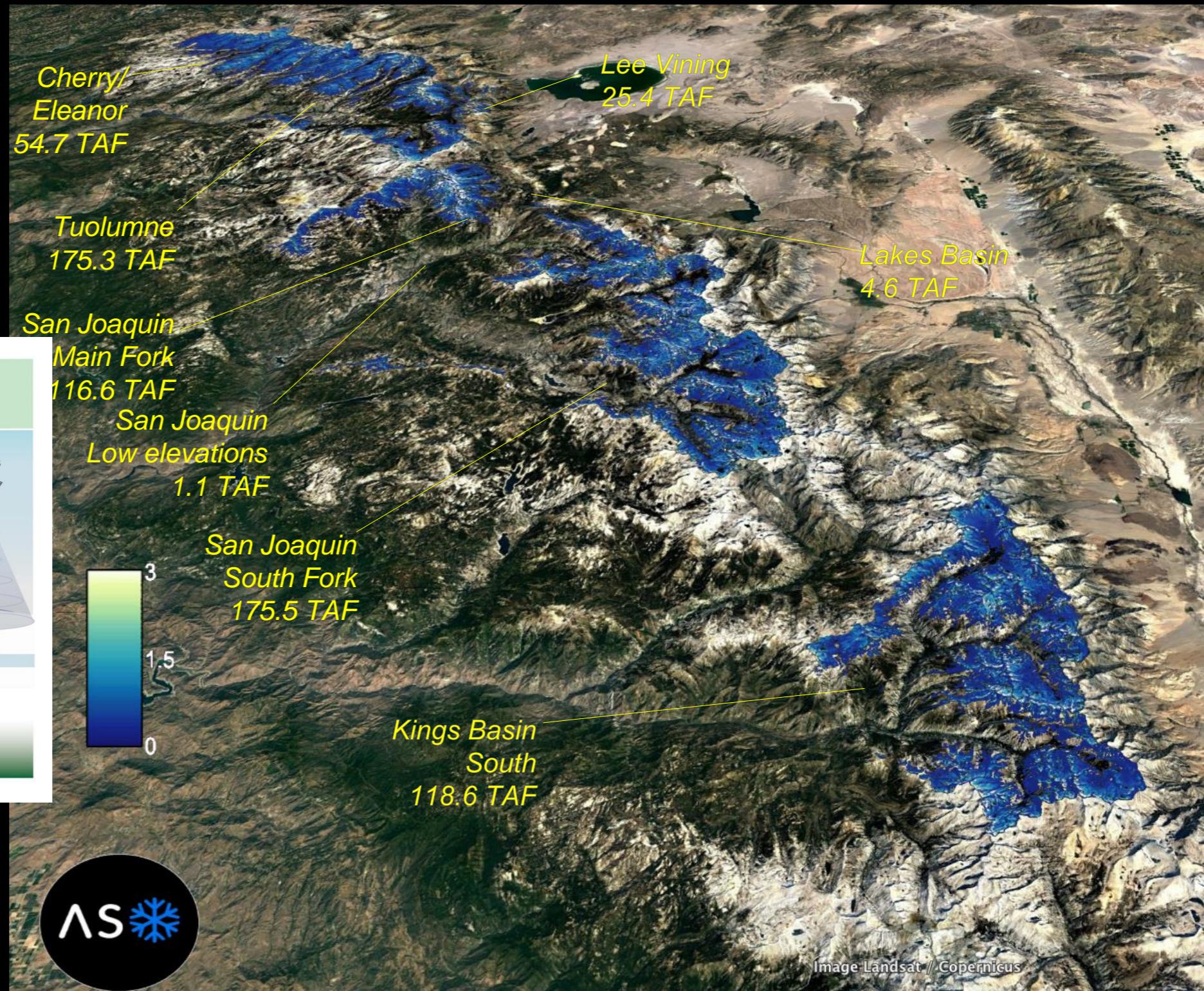




2008 Sayre Fire in LA: Cheatgrass moving up drainages; scattered oaks at risk



California ASO



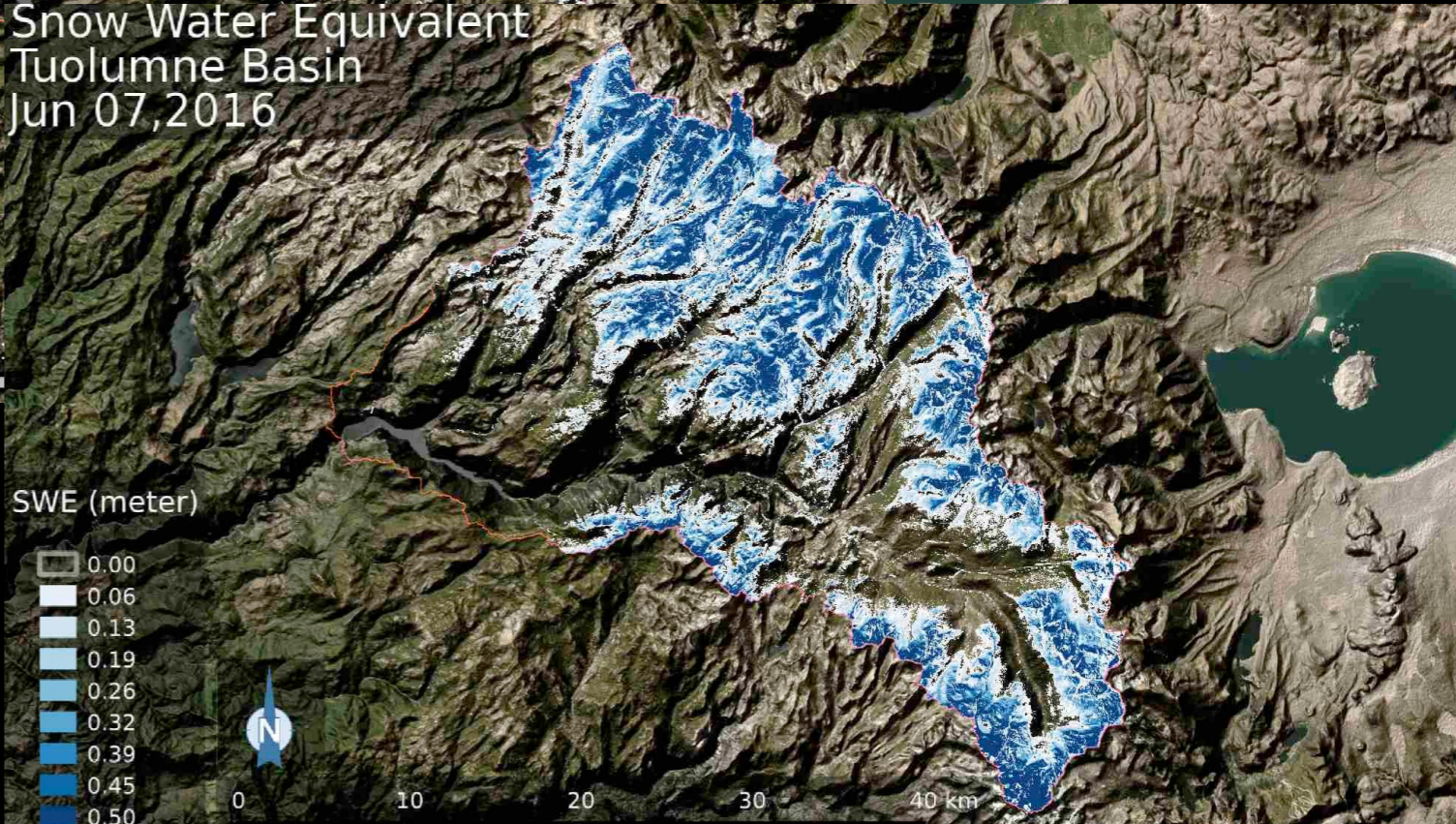
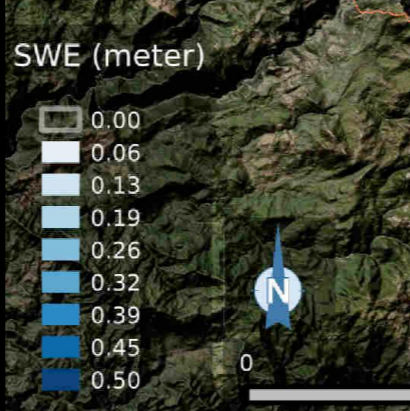
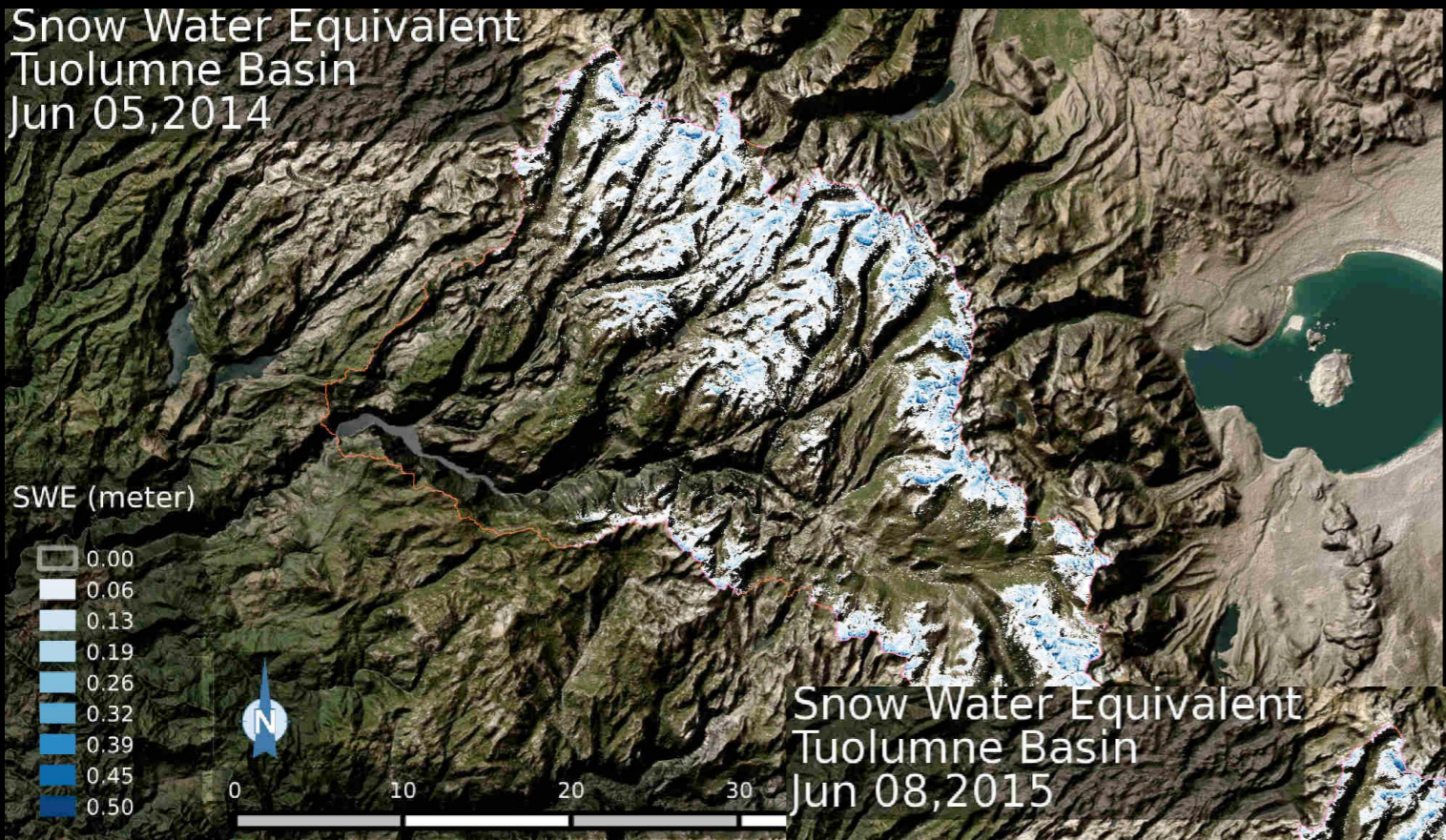
Airborne Snow Observatory

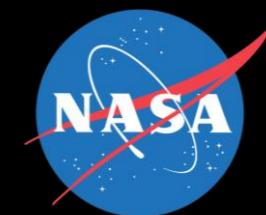


Snow Water Equivalent
Tuolumne Basin
Jun 05, 2014

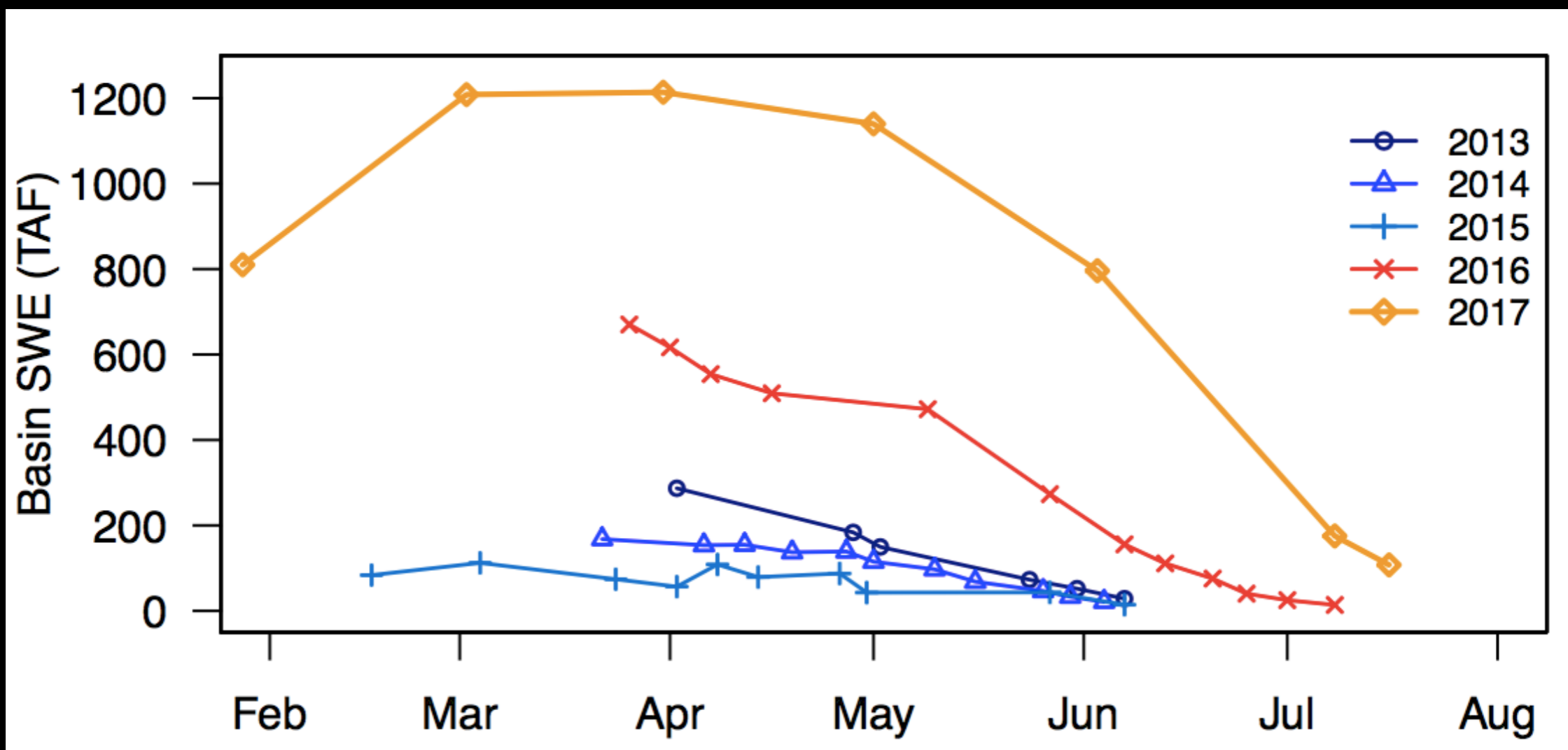


Three Years California ASO



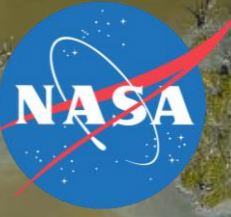


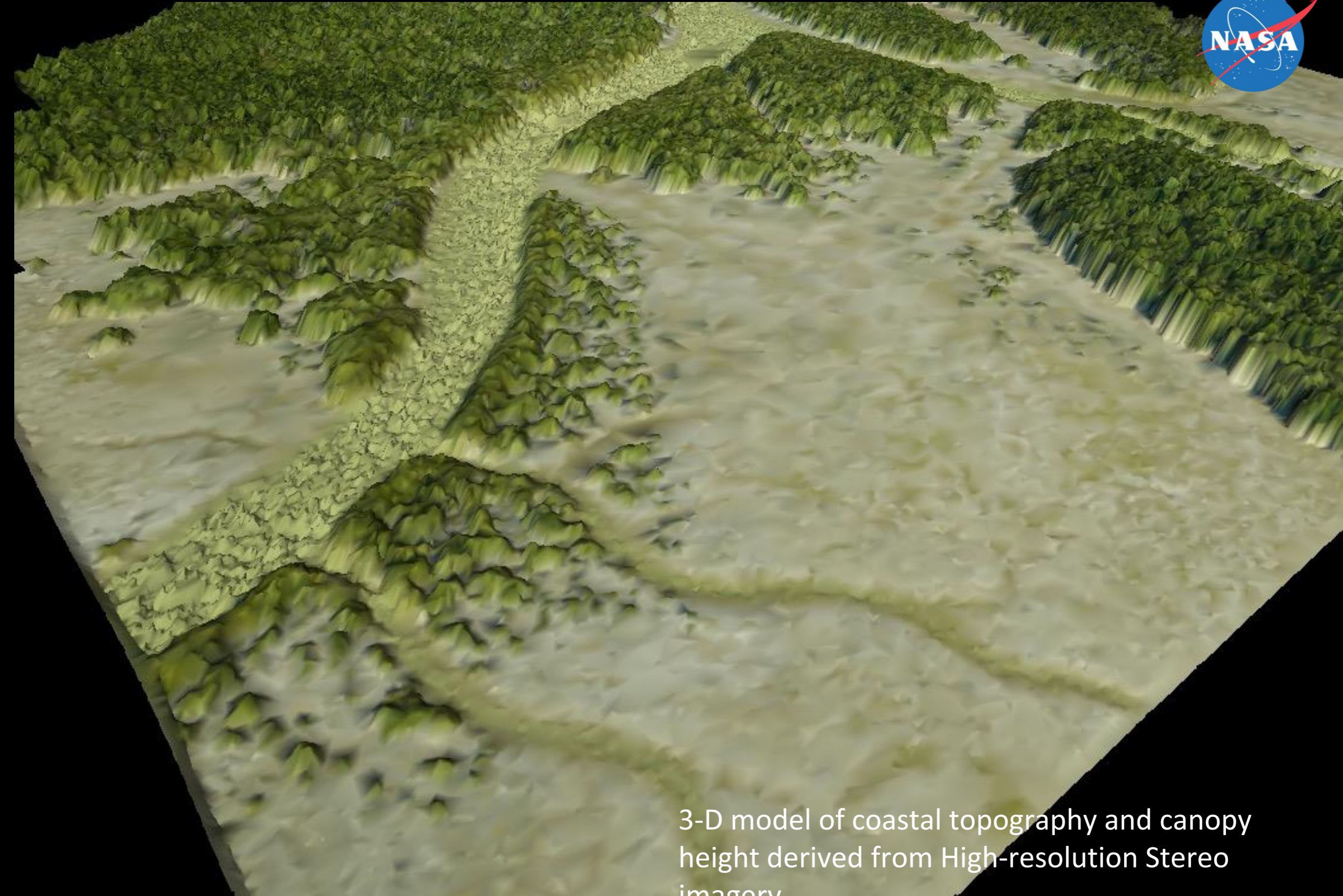
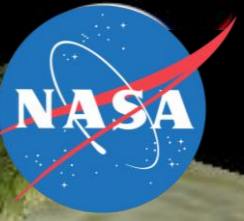
Total Basin Snow Water Equivalent



ASO – Tuolumne River Basin
5 year SWE volume

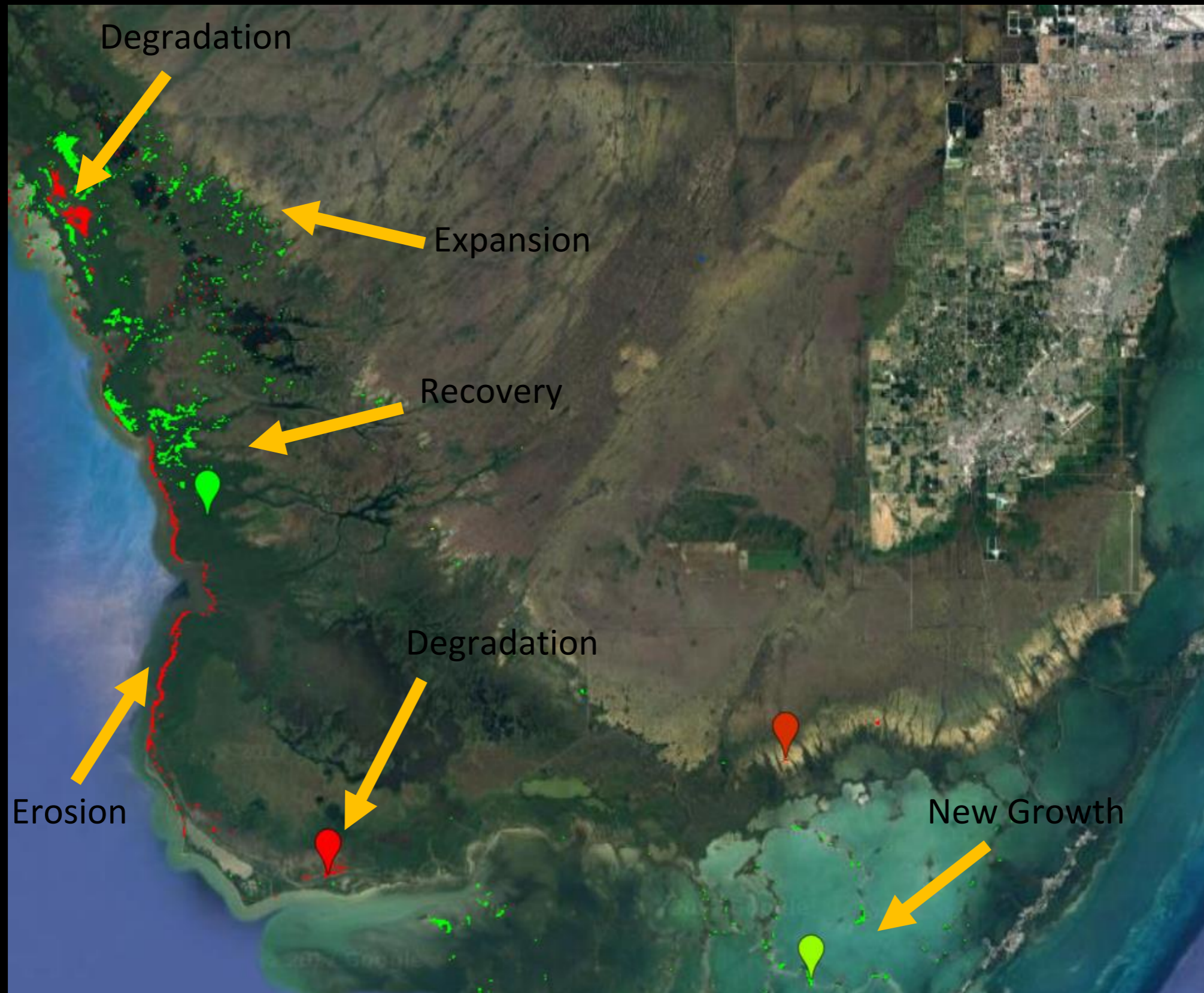
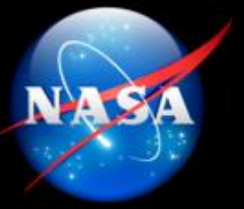
High resolution photo of peat collapse resulting from Sea Level Rise and Salt intrusion in the Florida Everglades taken by NASA G-Light instrument in 2017





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/>

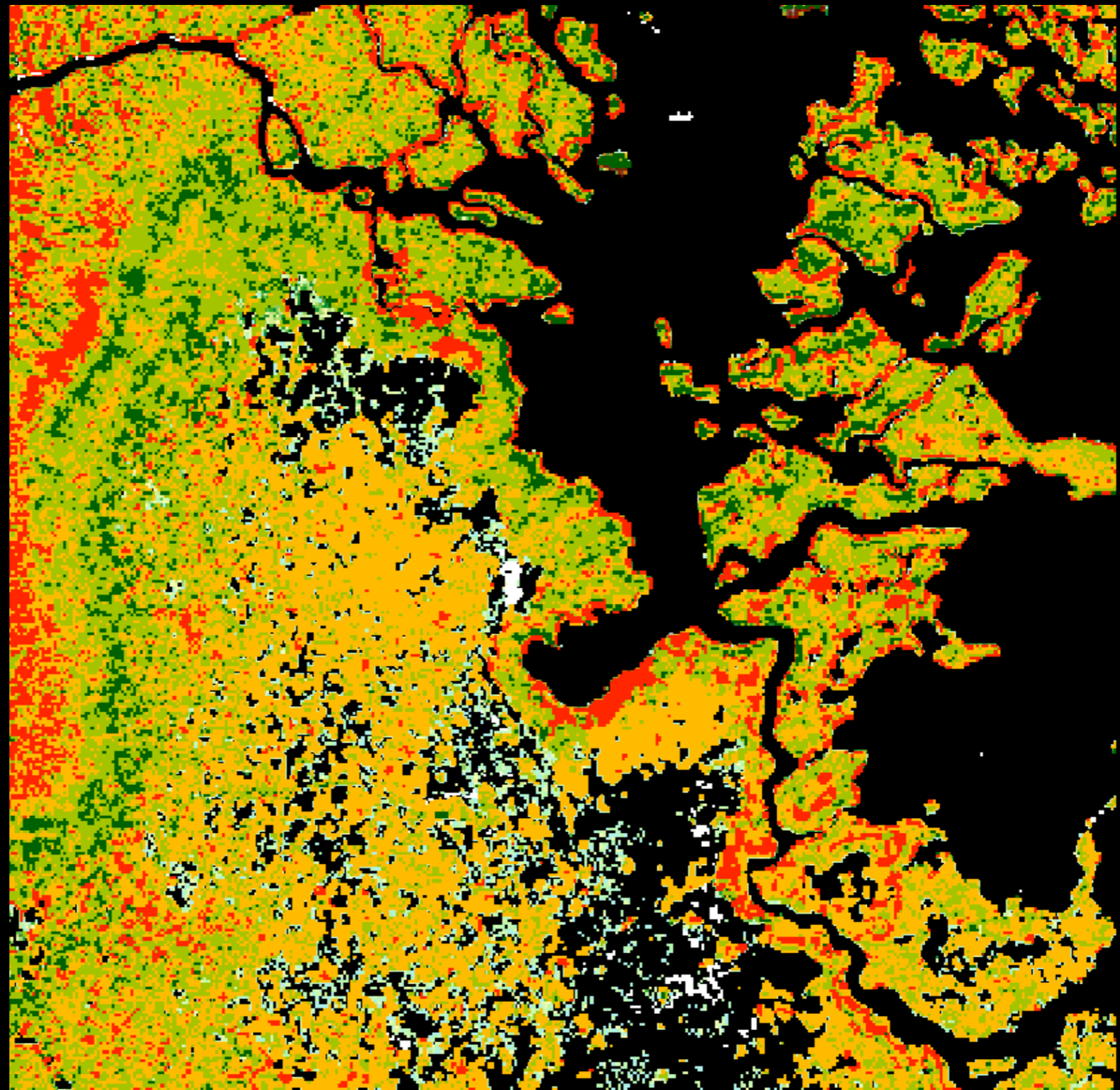
Combining the forest function and structure can provide better details to the changing coastline



Changes in NDVI

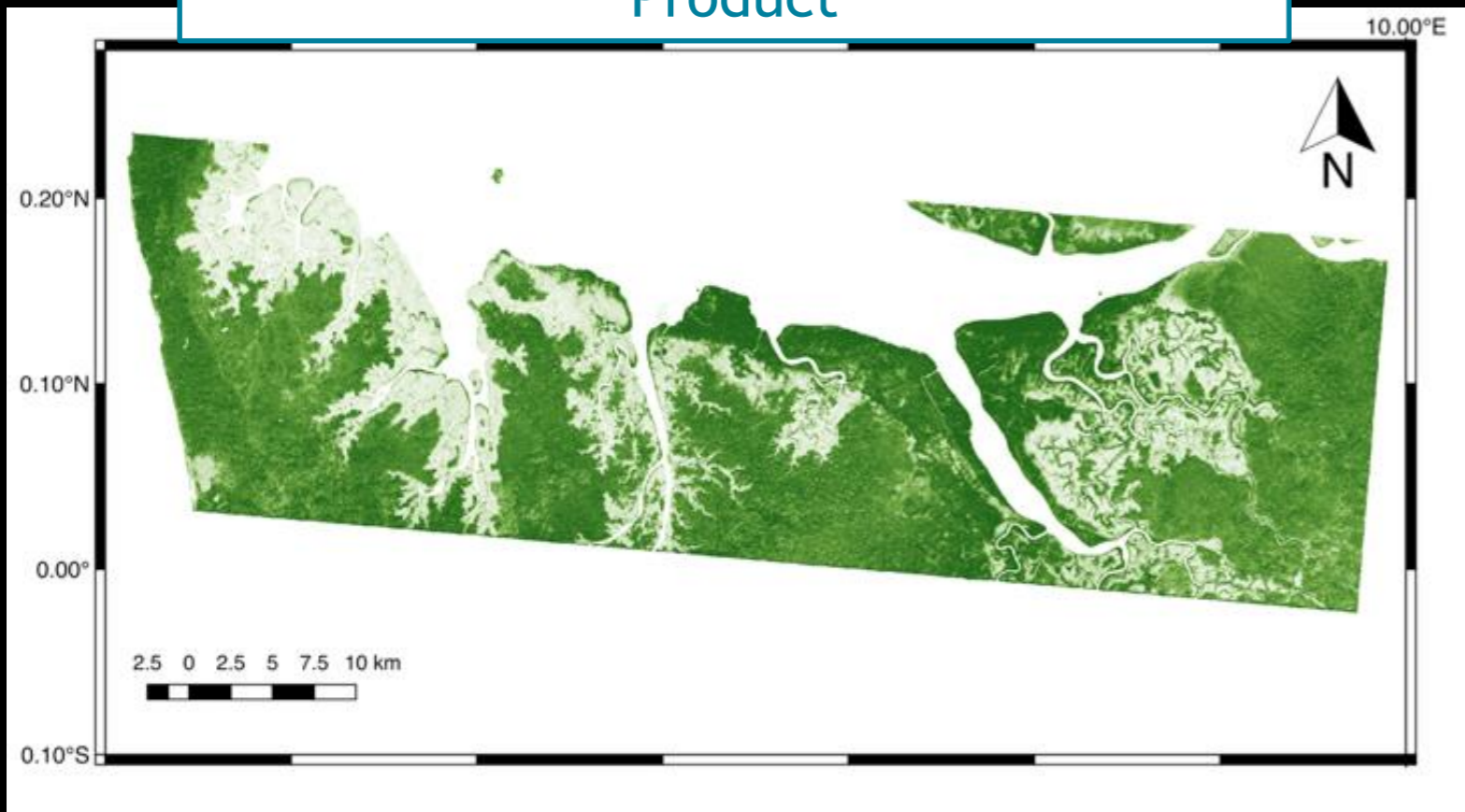


Changes in Structure

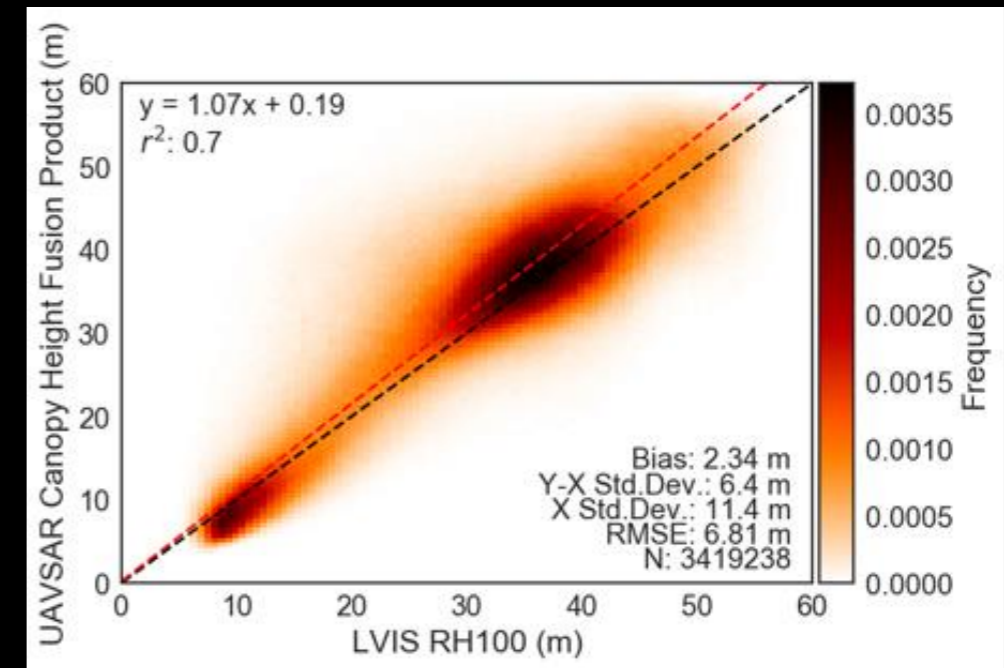


UAVSAR Pongara Wetlands Canopy Height Fusion Product

PolInSAR & Lidar Fusion Canopy Height Product

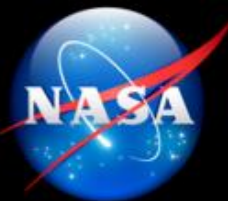


0 m 50 m



JPL

* M. Simard & M. Denbina



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

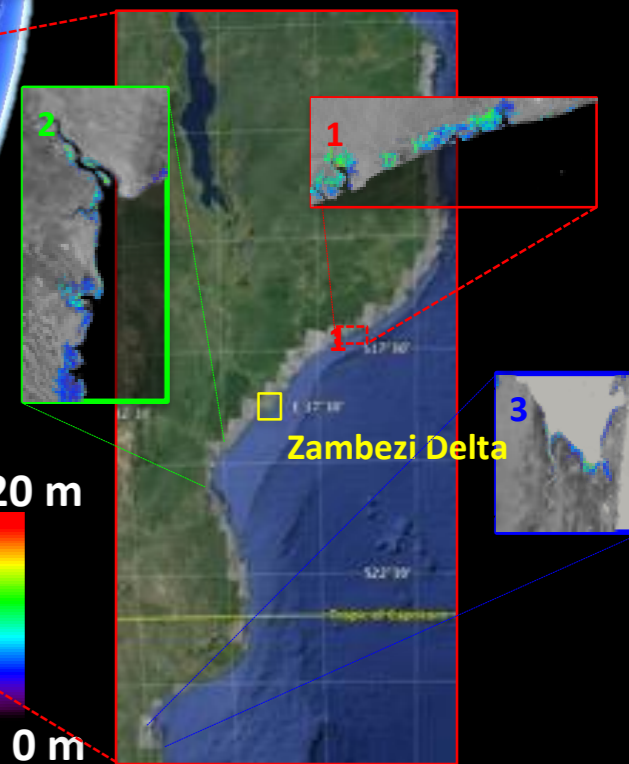
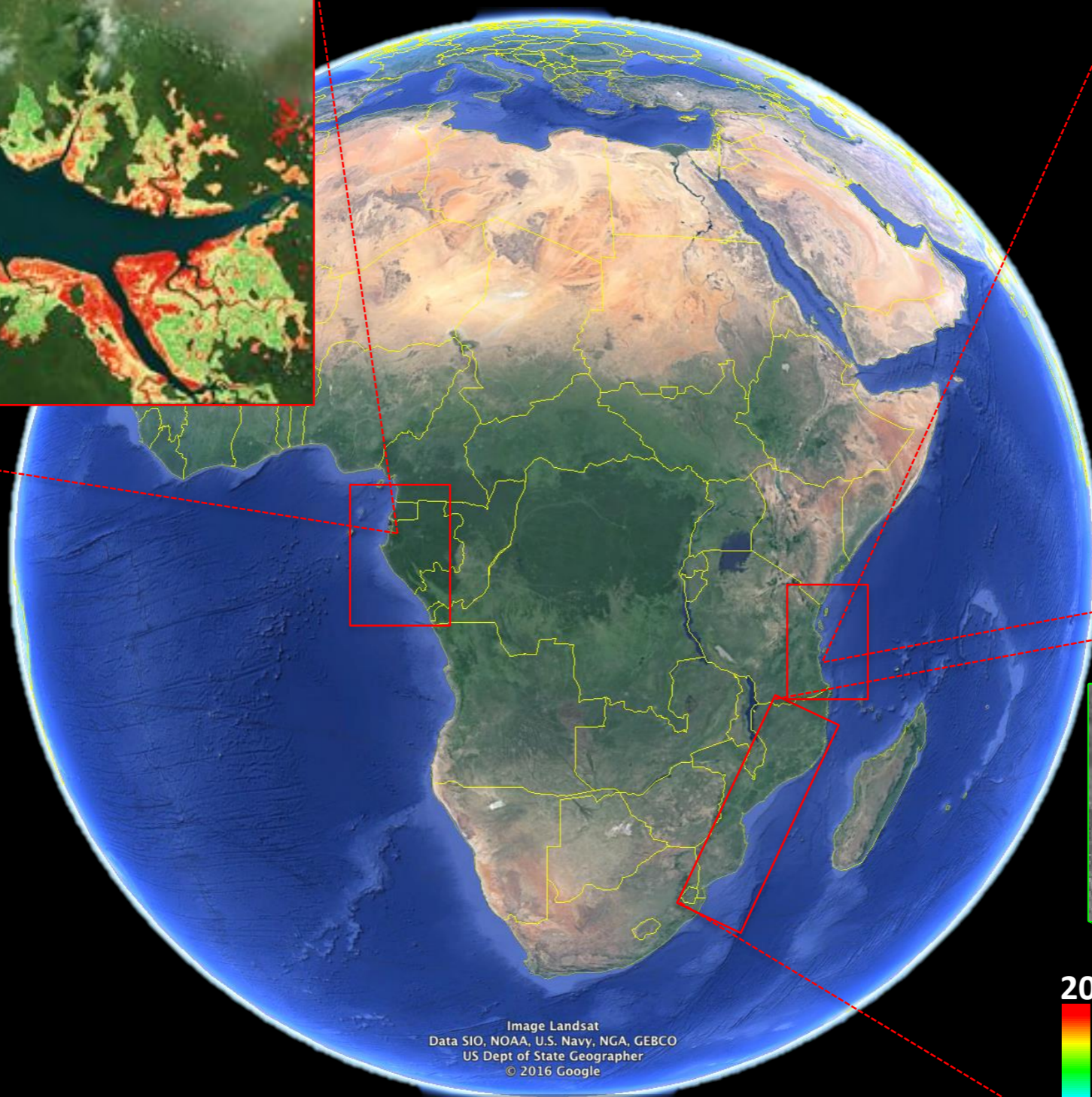


Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
US Dept of State Geographer
© 2016 Google

NASA Applied Sciences



PORTFOLIO NEWS & EVENTS LIBRARY FEEDBACK



Products & Services

NASA's fleet of satellites provide freely-available information about Earth's land, water, and environment.



Value & Benefits

Innovative applications inform wise decision-making and help people prepare for the future.



Work With Us

Want to begin or increase your use of NASA Earth observations? Let's talk.

“ Collecting physical data is laborious, time consuming, and costly, and it can be applied at only a limited scale. Also, that data is subject to a number of uncertainties. In contrast, GRACE-based data is readily available, free, can be applied at a large scale such as the Indus basin, and is reliable. Moreover, there are no data sharing issues as compared to traditional datasets. ”

Dr. Ashraf Muhammad, Chairman
Pakistan Council of Research in Water Resources

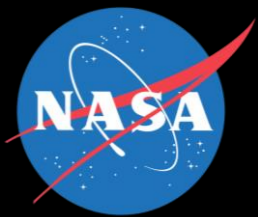


BACK TO TOP

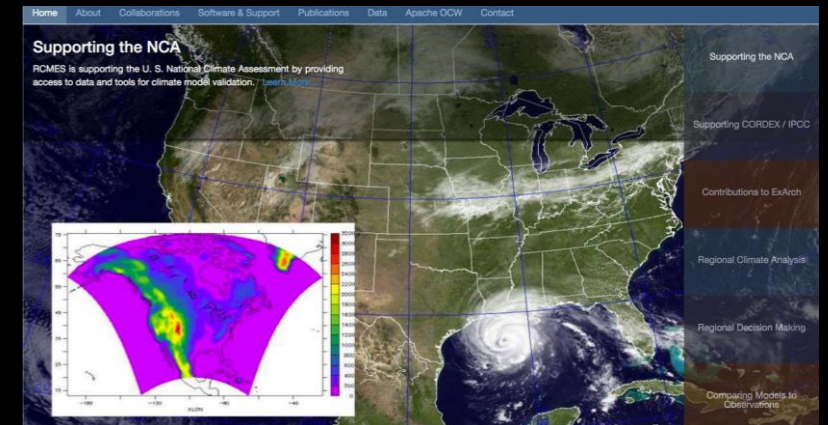
Focus Areas in Applied Sciences:

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

NASA Enabling Tools



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



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

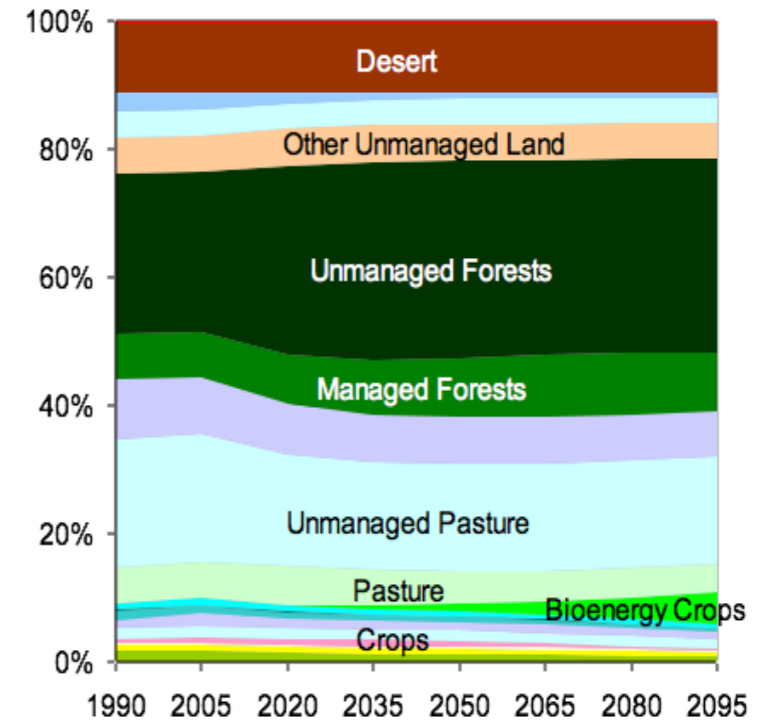
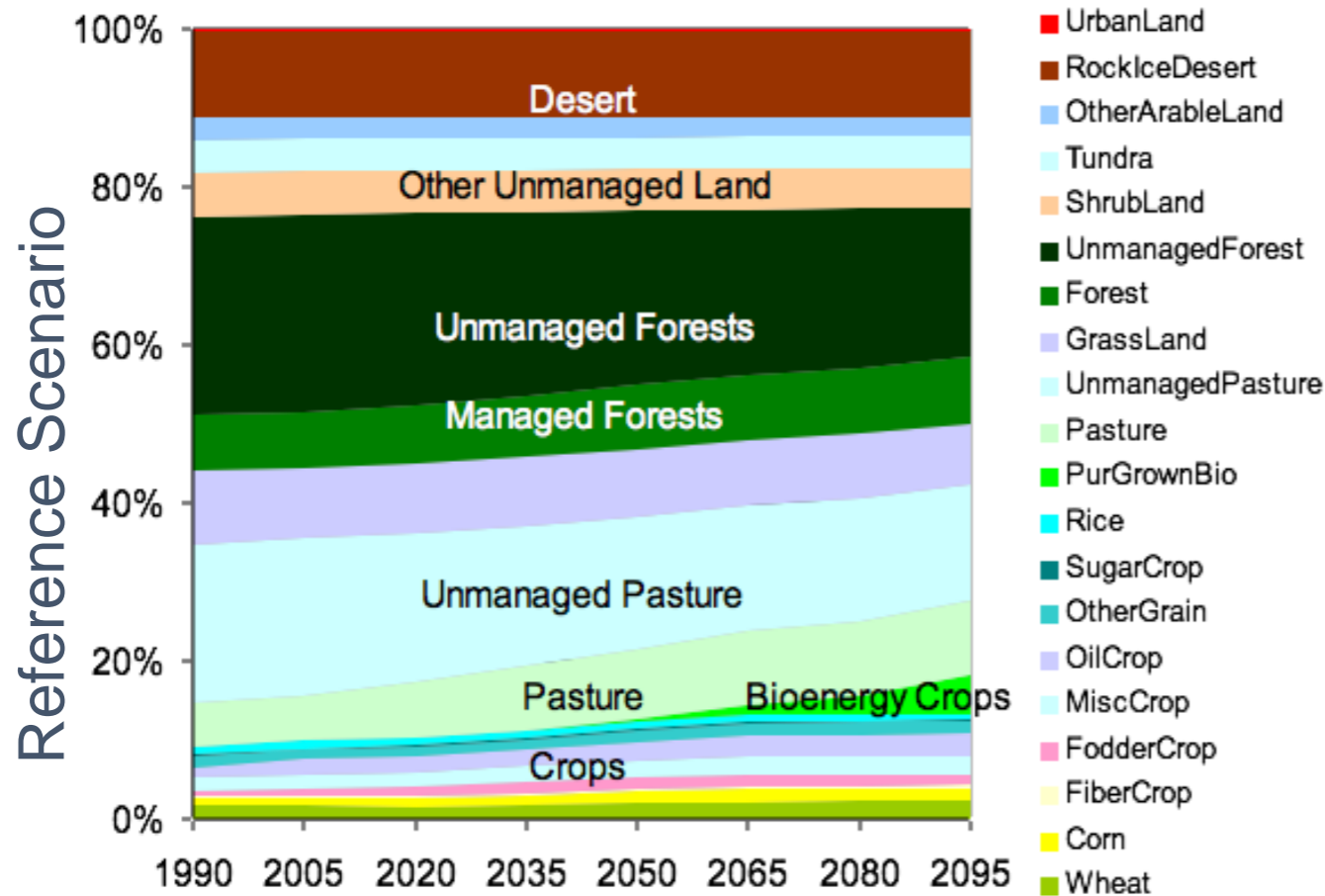
MERRA-2 Reanalysis: <https://gmao.gsfc.nasa.gov/reanalysis>

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

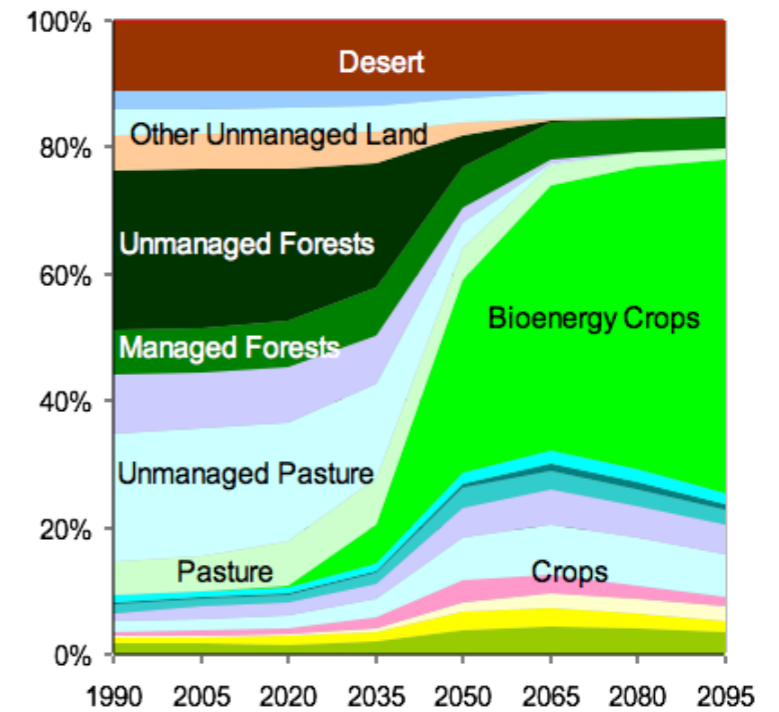


GCAM Land use: 450 ppm atmospheric CO₂

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

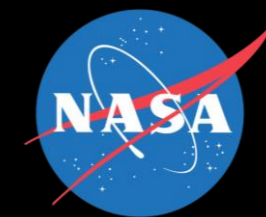


SUMMARY

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