

RHEAS

THE **R**EGIONAL **H**YDROLOGICAL **E**XTREMES **A**SSESSMENT **S**YSTEM

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KONSTANTINOS ANDREADIS (HYDRO-MODELING), ALI BEHRANGI (PRECIP),
NARENDRA DAS (SOIL MOISTURE), STEPHANIE GRANGER (APPLICATIONS), FELIX
LANDERER (GROUNDWATER), THOMAS H. PAINTER (SNOW), JOE TURK (PRECIP)

JET PROPULSION LABORATORY, CALIFORNIA INSTITUTE OF TECHNOLOGY

ET

P

snow

soil
moisture

ΔS

UNCERTAINTY
UNCERTAINTY IN
H₂O RESOURCES

runoff



UNCERTAINTY



MODIS→
HyspIRI
AIRS-CERES



TRMM
→GPM



MODIS
MODSCAG
→HyspIRI



AMSR-E
→SMAP



GRACE
InSAR
→GRACE-FO

UNCERTAINTY
IN
H₂O RESOURCES

UNCERTAINTY

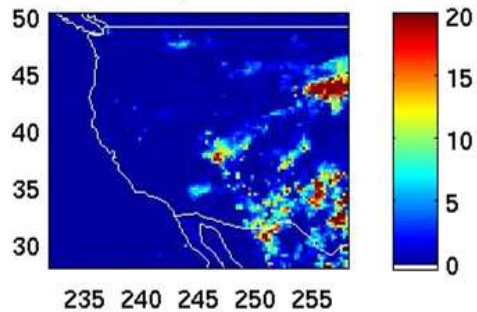


→SWOT

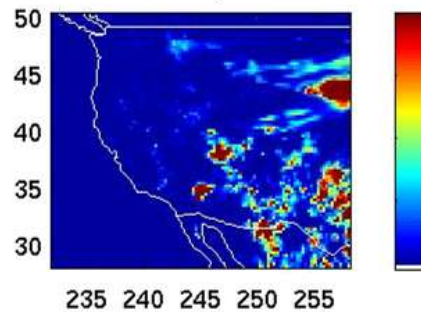


PRECIPITATION

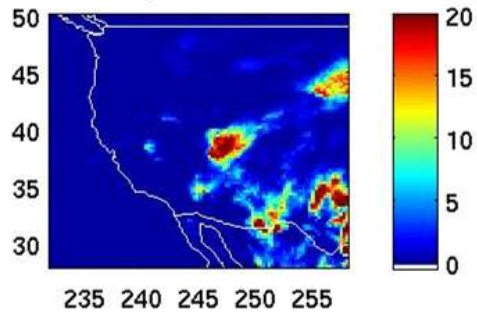
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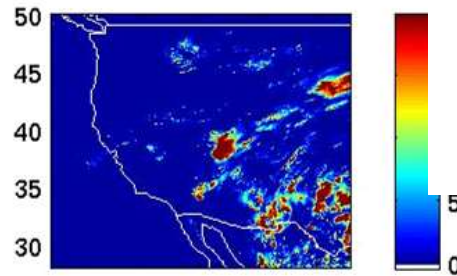
cmorph



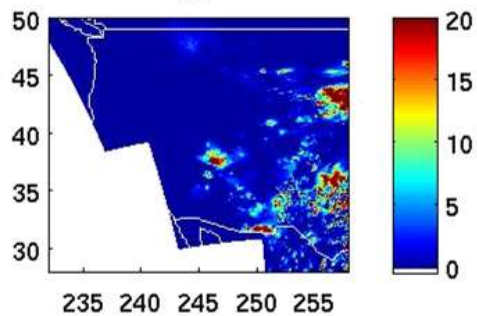
persiann



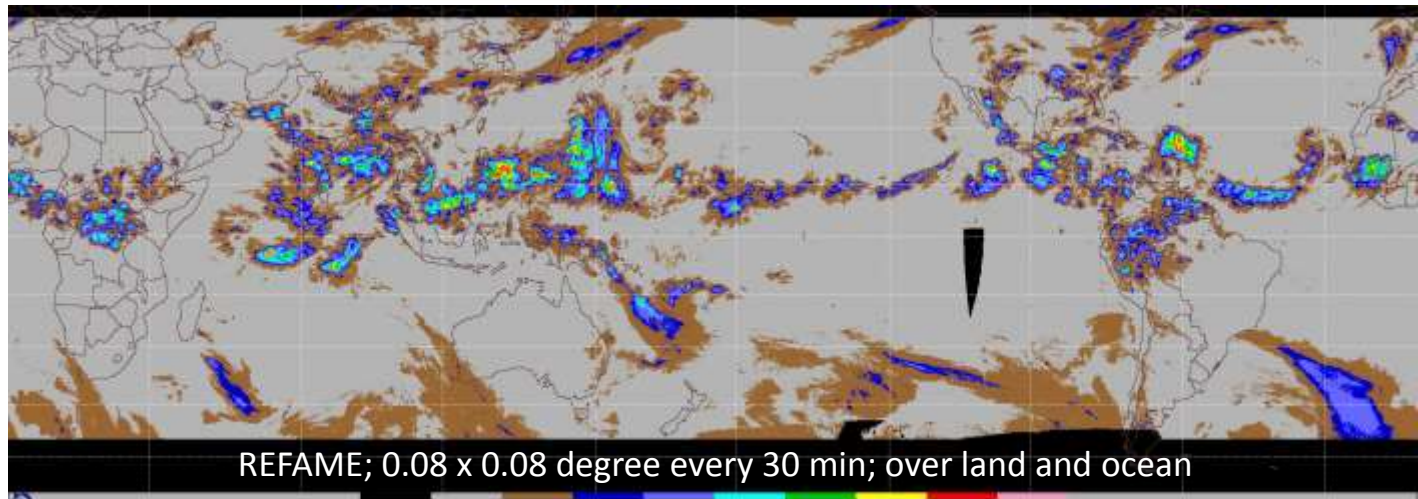
ccs



st4



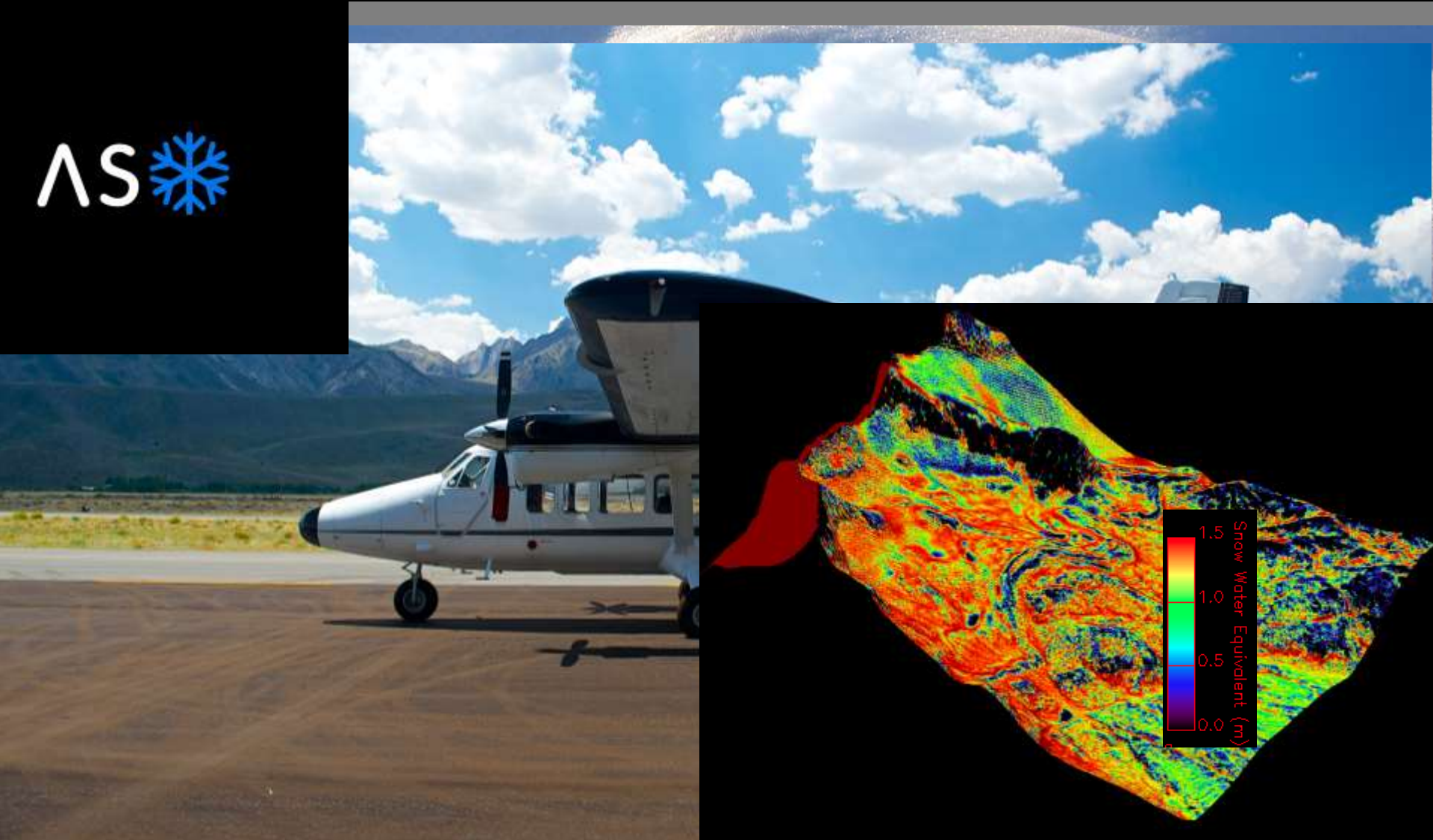
Global Precipitation Mission (GPM)



REFAME; 0.08 x 0.08 degree every 30 min; over land and ocean

SNOW

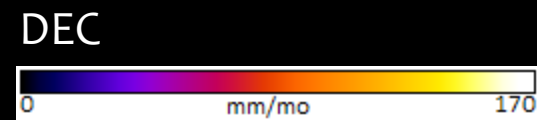
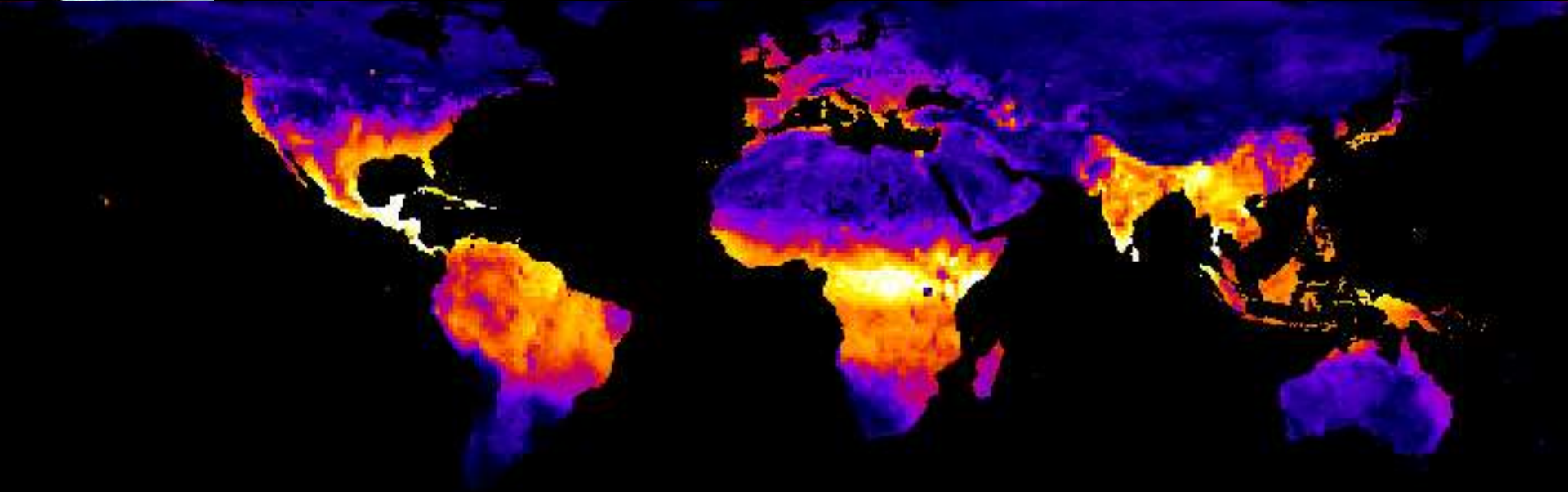
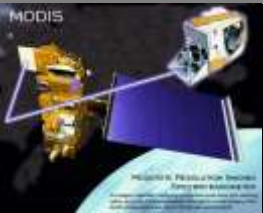
AS 



Dust Radiative Forcing in Snow from MODIS
Painter and Bryant, 2012

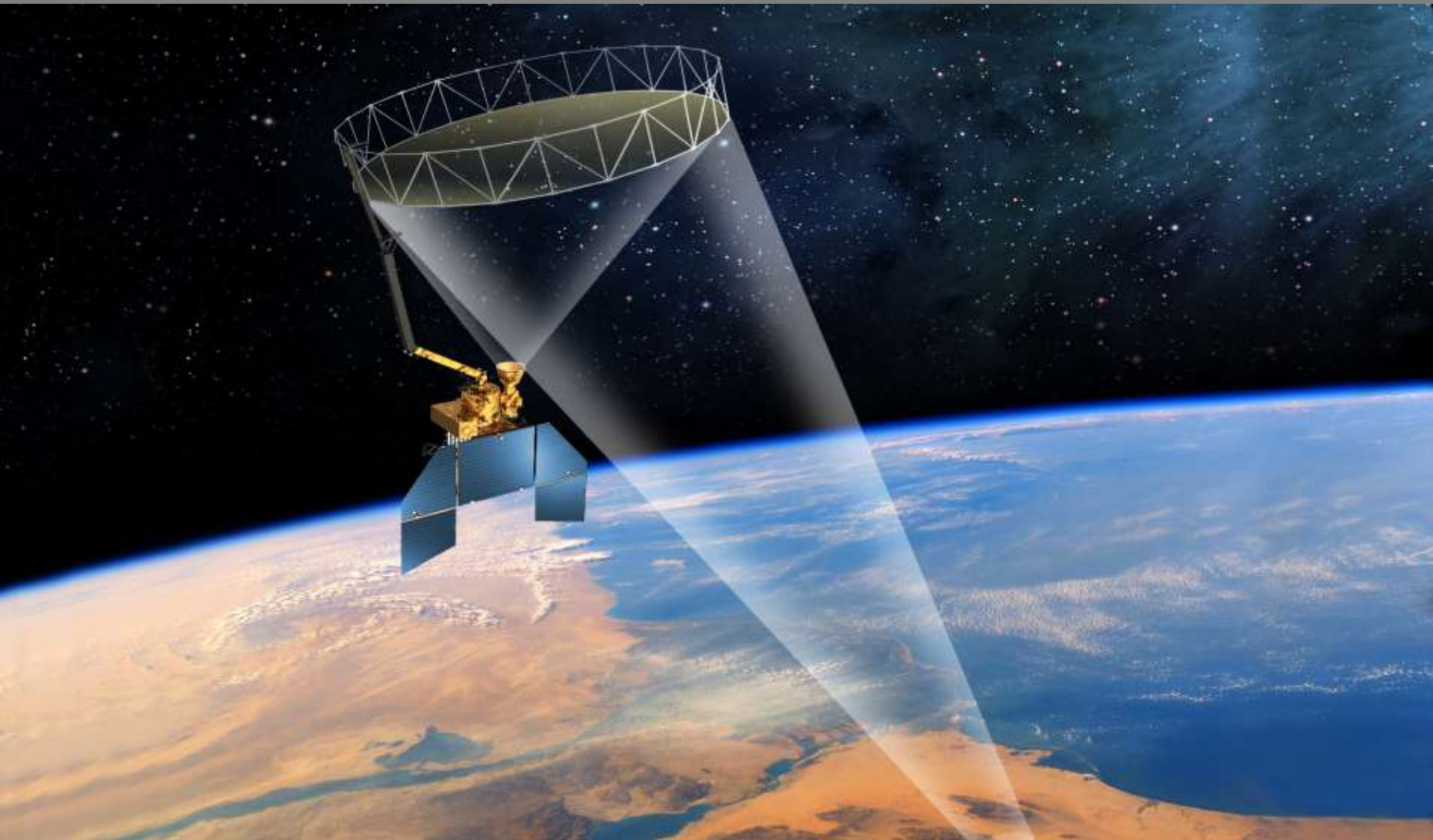
Fractional Snow Cover from MODIS
Painter et al 2009

EVAPOTRANSPIRATION



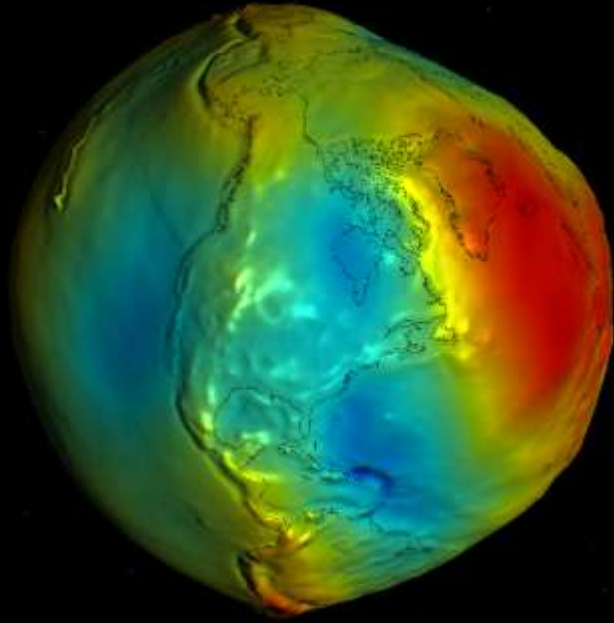
Jan – Dec 2004

SOIL MOISTURE



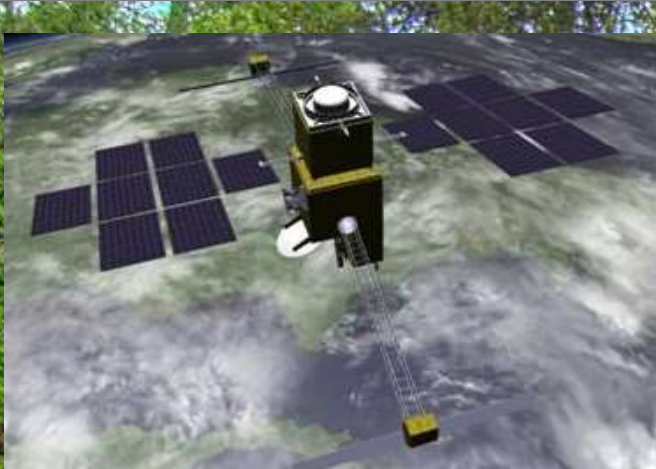
SOIL MOISTURE ACTIVE PASSIVE (SMAP)

GROUNDWATER TOTAL WATER STORAGE

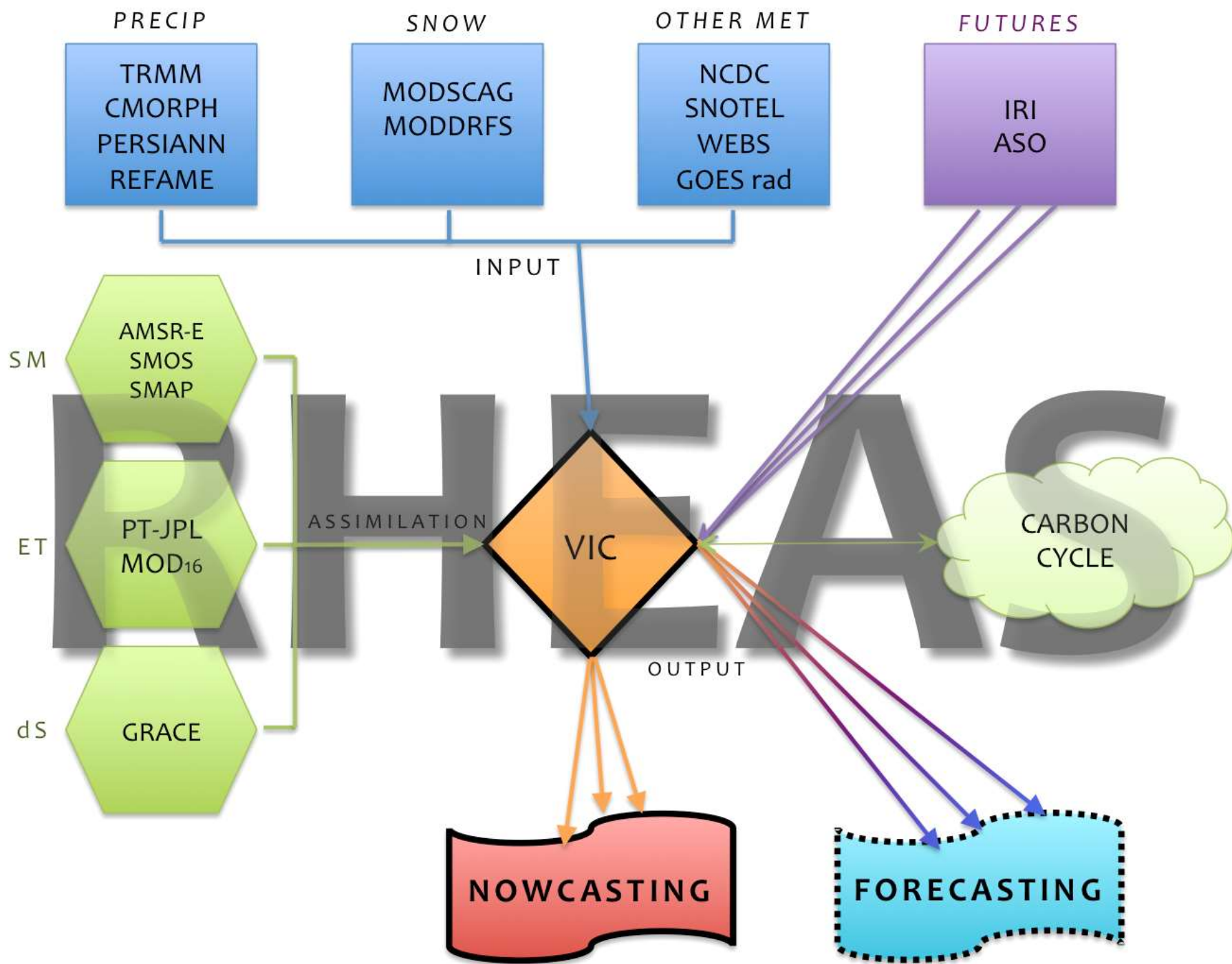


California's Central Valley

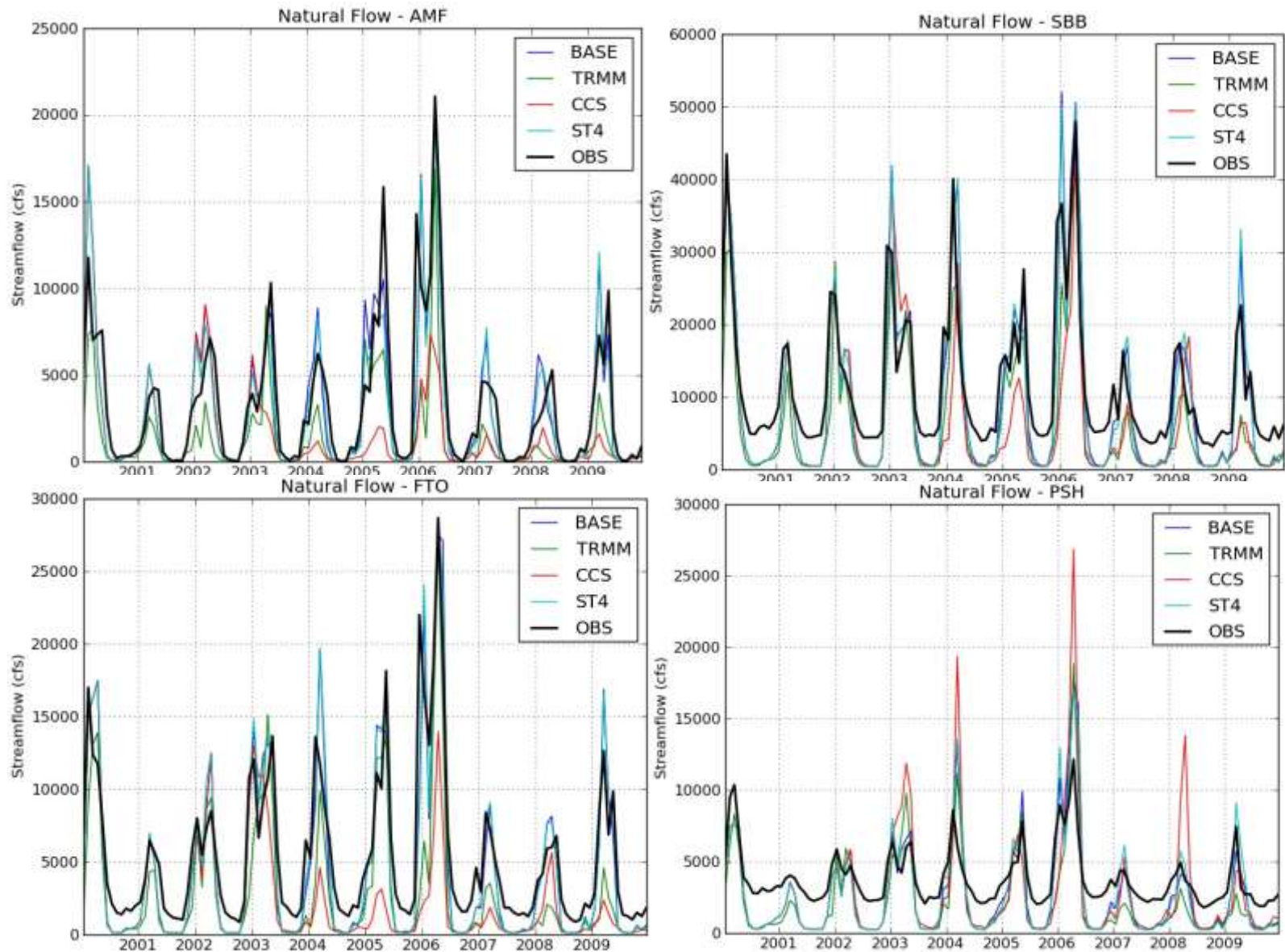
DISCHARGE



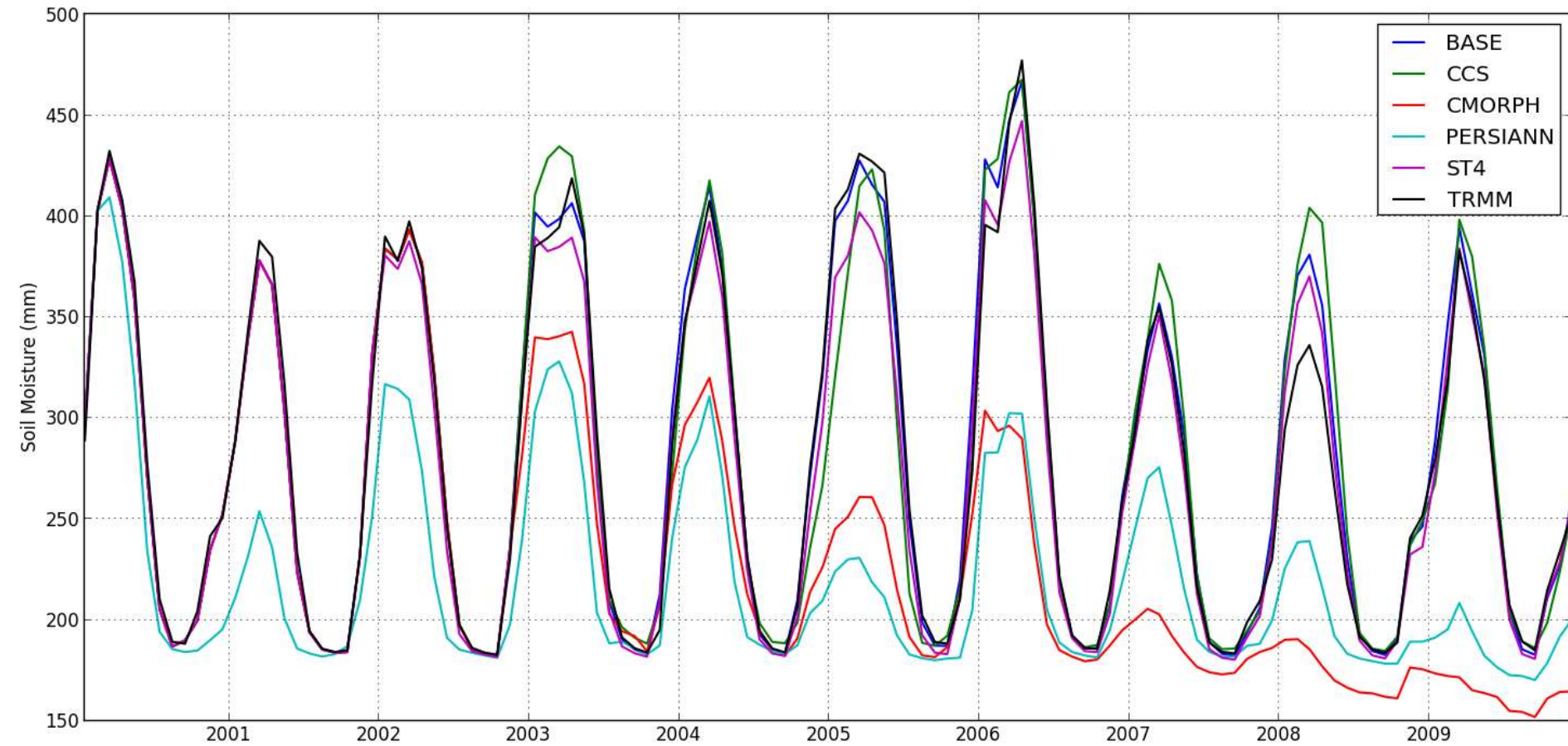
SURFACE WATER OCEAN TOPOGRAPHY (SWOT)



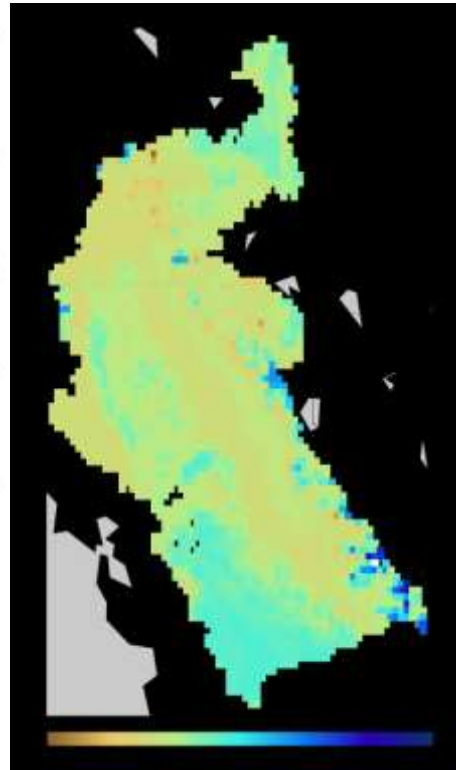
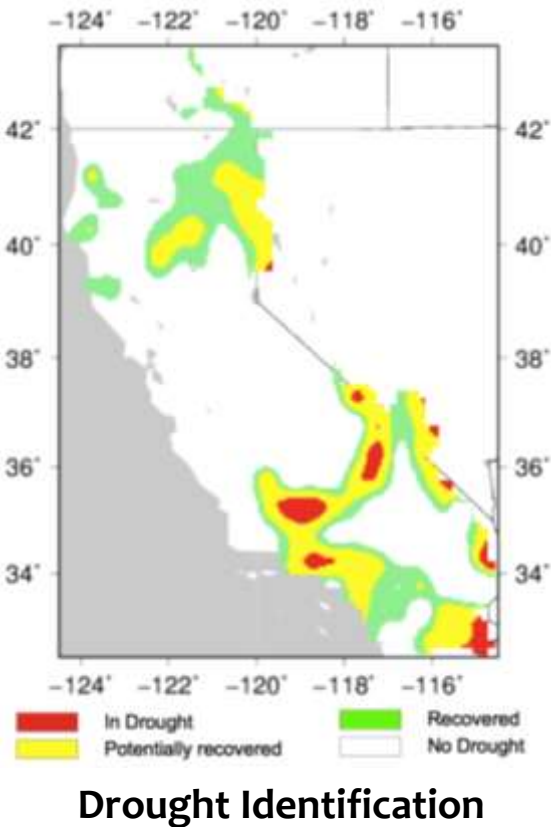
VALIDATION – BASELINE SIMULATION



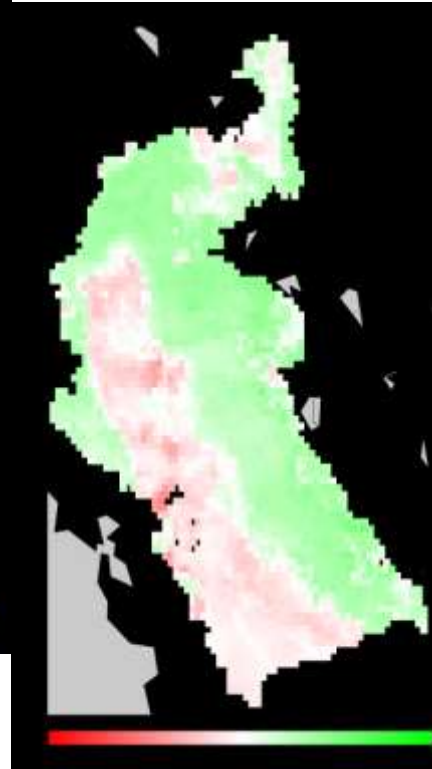
RHEAS – ENSEMBLE SOIL MOISTURE PREDICTION



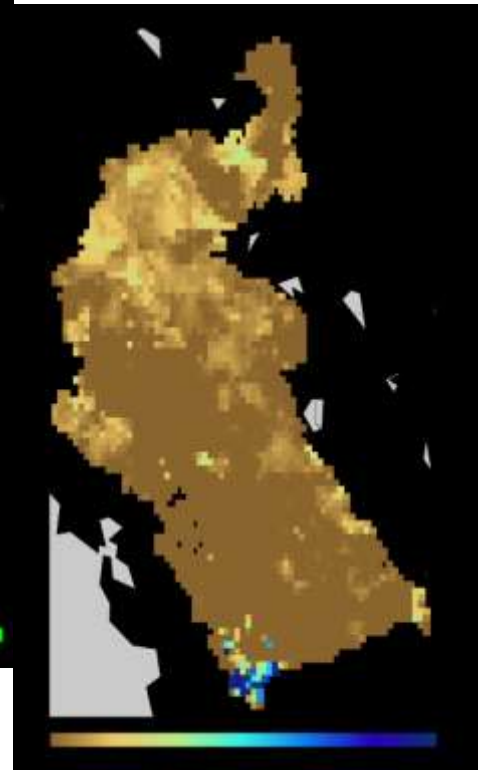
RHEAS - PRODUCTS



Change in total soil
moisture – 15 day
forecast

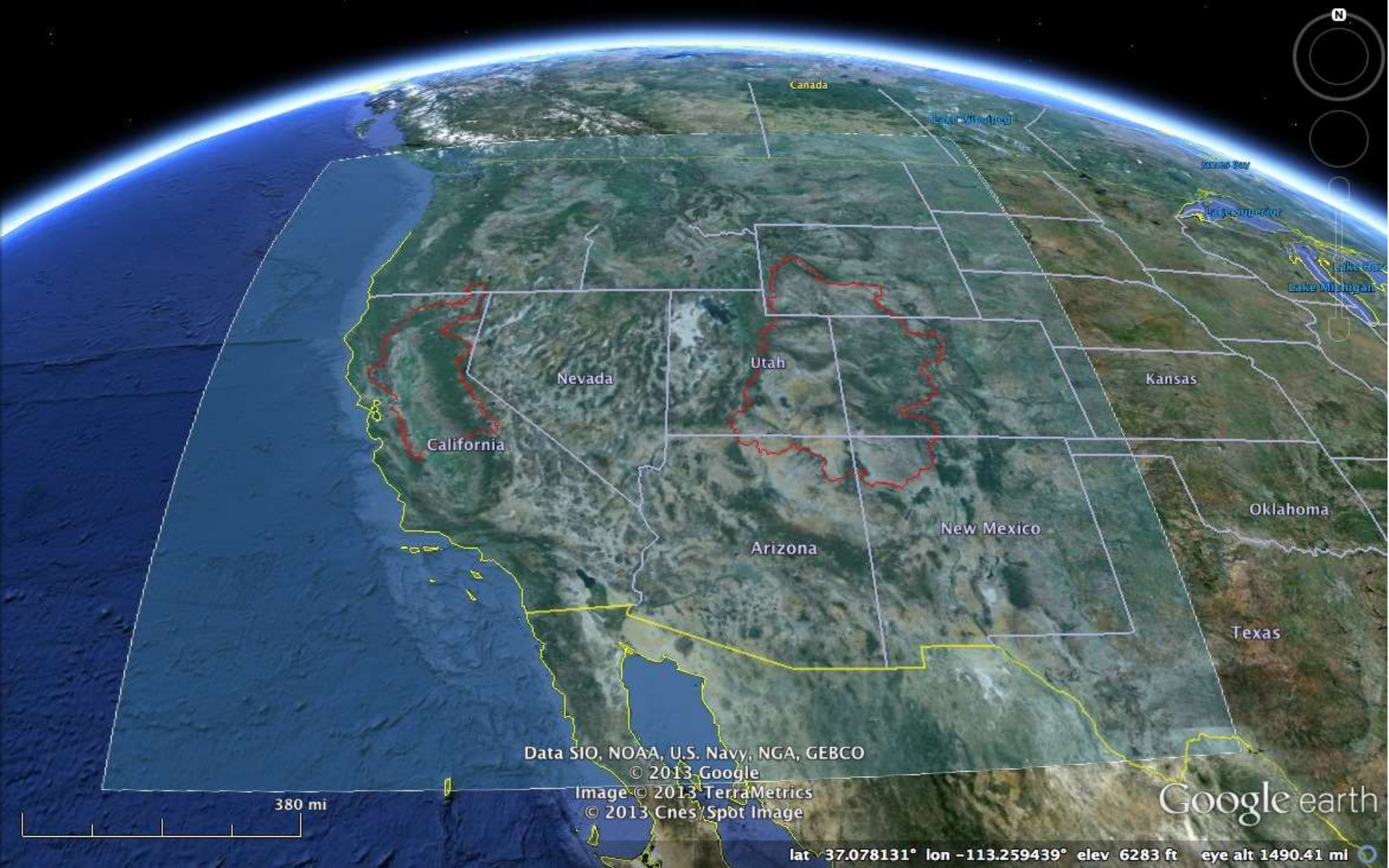


Change in vegetation
greenness – 15 day
forecast

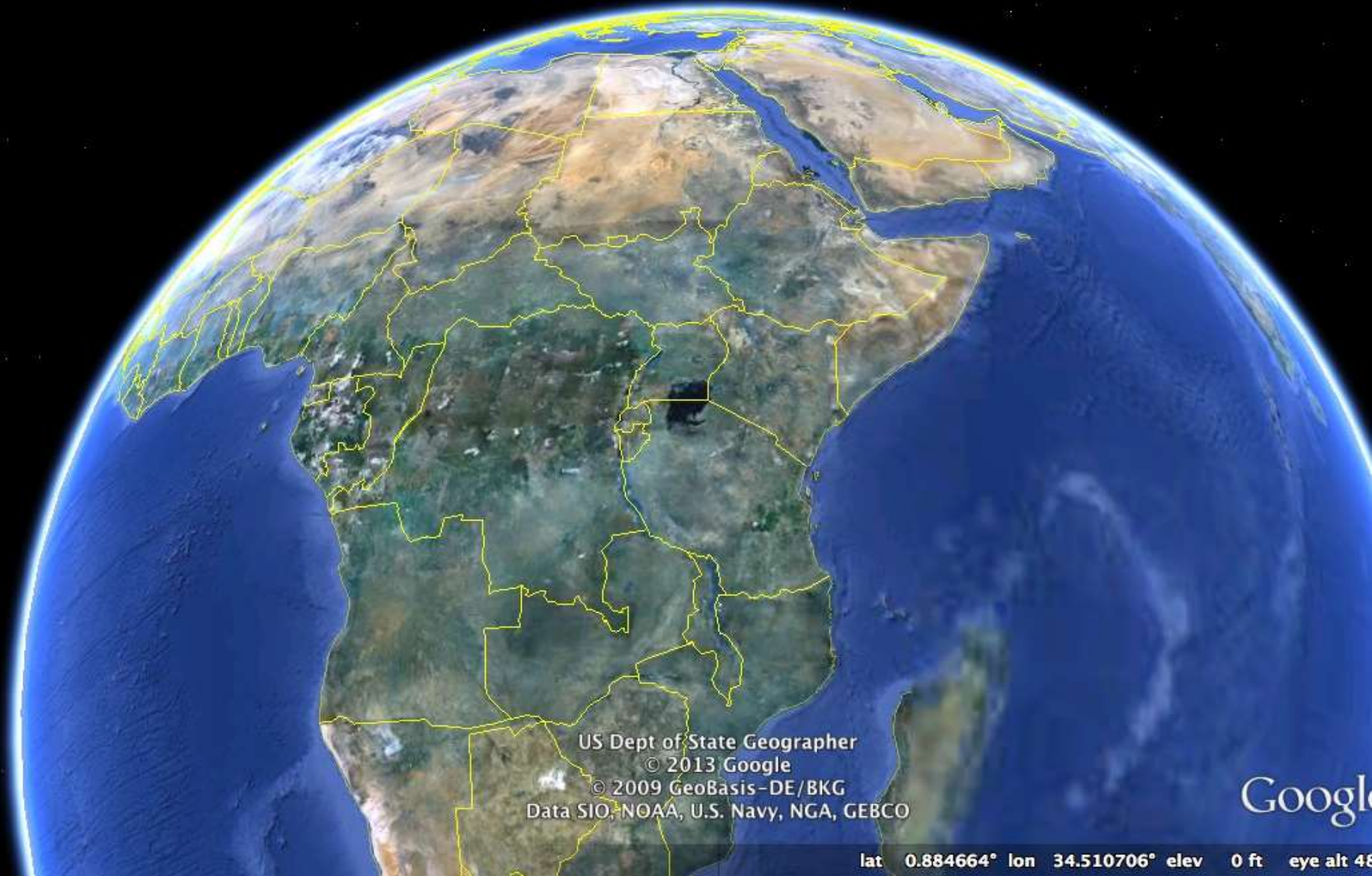


Drought Duration
(3-month period)

RHEAS - APPLICATIONS



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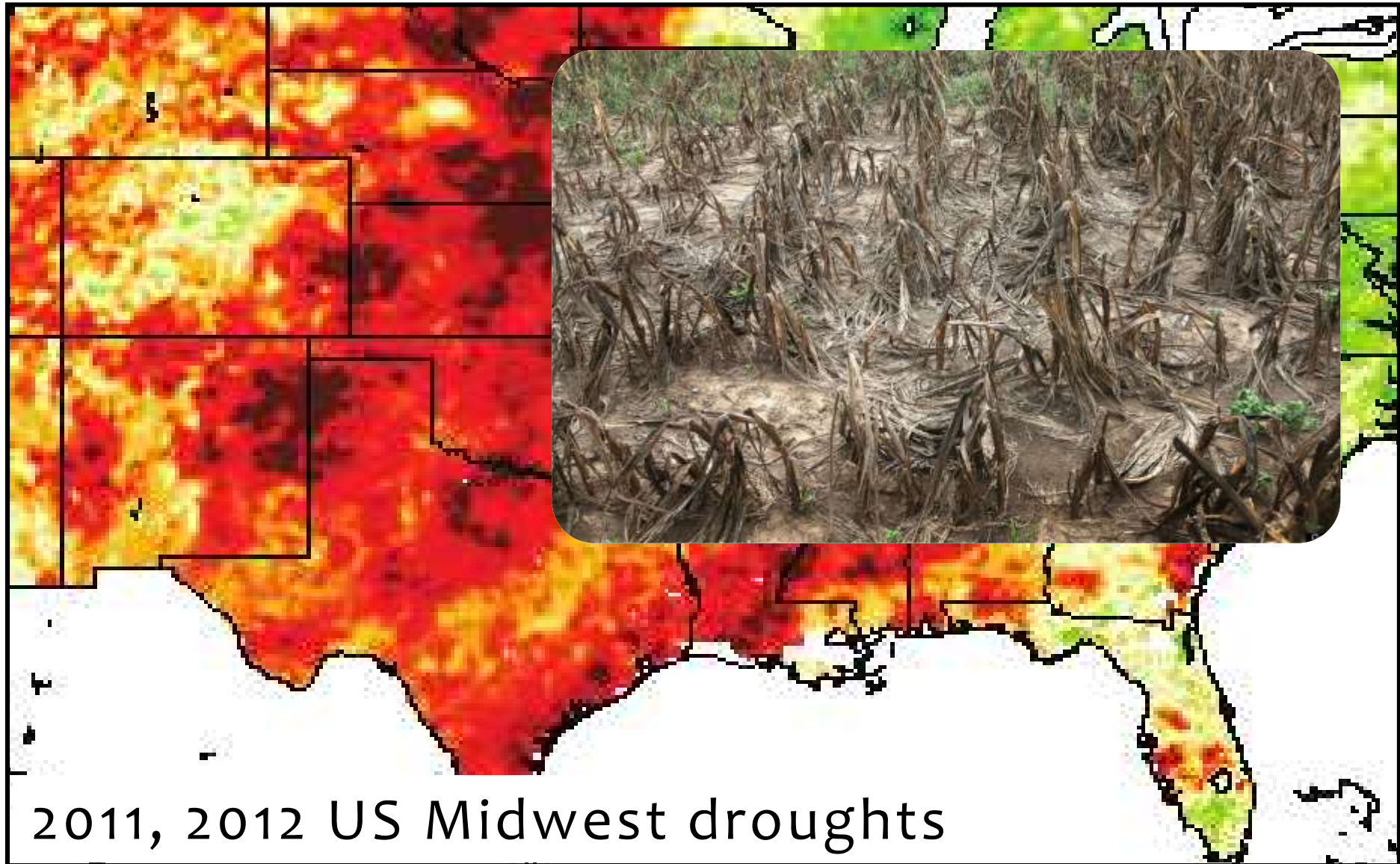


US Dept of State Geographer
© 2013 Google
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Data SIO, NOAA, U.S. Navy, NGA, GEBCO

Google

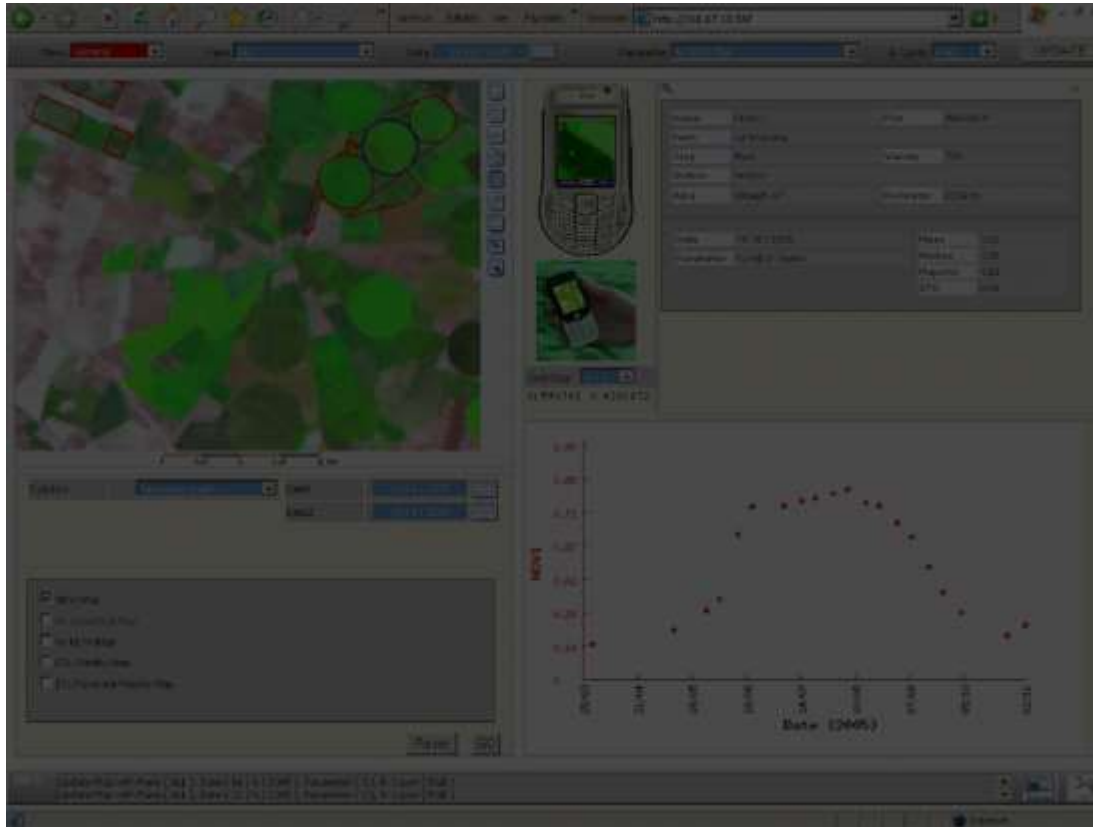
lat 0.884664° lon 34.510706° elev 0 ft eye alt 48

RHEAS - APPLICATIONS



RHEAS - APPLICATIONS

Web-GIS



Mobile phone app



WSWC & JPL

- Use our individual  engage with experts on details and nuance;
- Use our RHEAS seasonal forecasts for hydrological components (e.g., runoff, soil moisture);
- Use our RHEAS seasonal forecasts for drought;
 - Engage with us on exactly what product fits your need.
- Adapt current systems with features of RHEAS;
- Direct integration of RHEAS into operations.
- ...

