

# ARSET

Applied Remote Sensing Training

<http://arset.gsfc.nasa.gov>

 @NASAARSET

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## Remote Sensing of Drought

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July 19, 2017

Week 2

Speakers: Amber McCullum

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Cynthia Schmidt

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# Homework and Certificates

- Homework
  - Answers must be submitted via Google Form
- Certificate of Completion:
  - Attend both webinars
  - Complete the homework assignment by the deadline (access from ARSET website)
    - HW Deadline: August 2<sup>nd</sup>
  - You will receive certificates approx. two months after the completion of the course from:  
[marines.martins@ssaihq.com](mailto:marines.martins@ssaihq.com)

Advanced Webinar: Remote Sensing of Drought

To be eligible for a certificate, this homework must be submitted by: date  
Once you click submit, you will receive an email confirming your submission. You may click "View Your Score" to see how you did.

\* Required

Email address \*

Your email

Name \*

Your answer

1. What bands are used to calculate NDVI? \*

Red and Green

Red and Near-Infrared

Infrared and Shortwave Infrared

Green and Blue

National Aeronautics and Space Administration

NASA's Applied Remote Sensing Training Program (ARSET) presents a certificate of completion to «First\_Name» «Last\_Name» for completing:

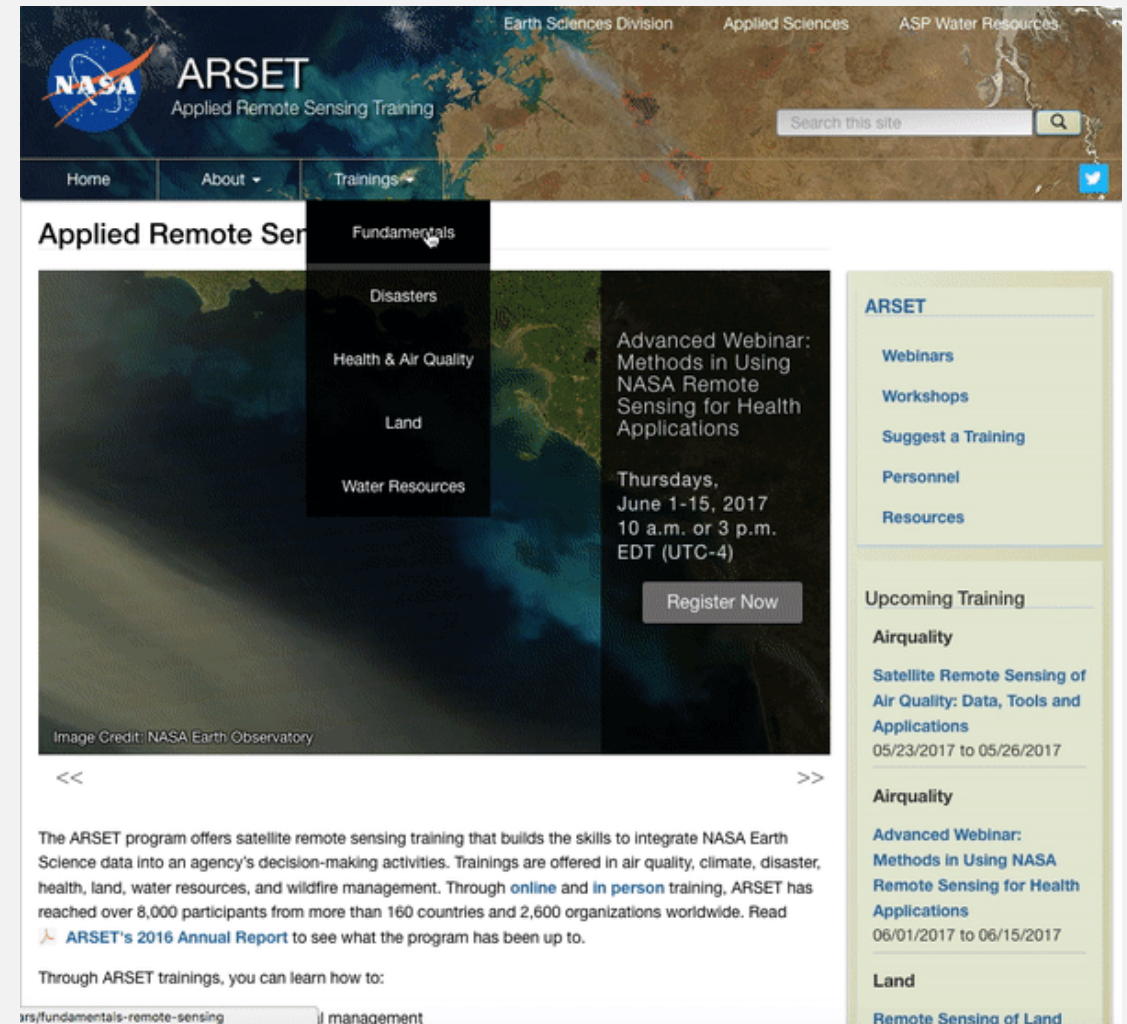
**Advanced Webinar: Remote Sensing of Drought**

July 12 – July 19, 2017

Trainers: Amber McCullum, Amita Mehta, and Cynthia Schmidt

# Prerequisites

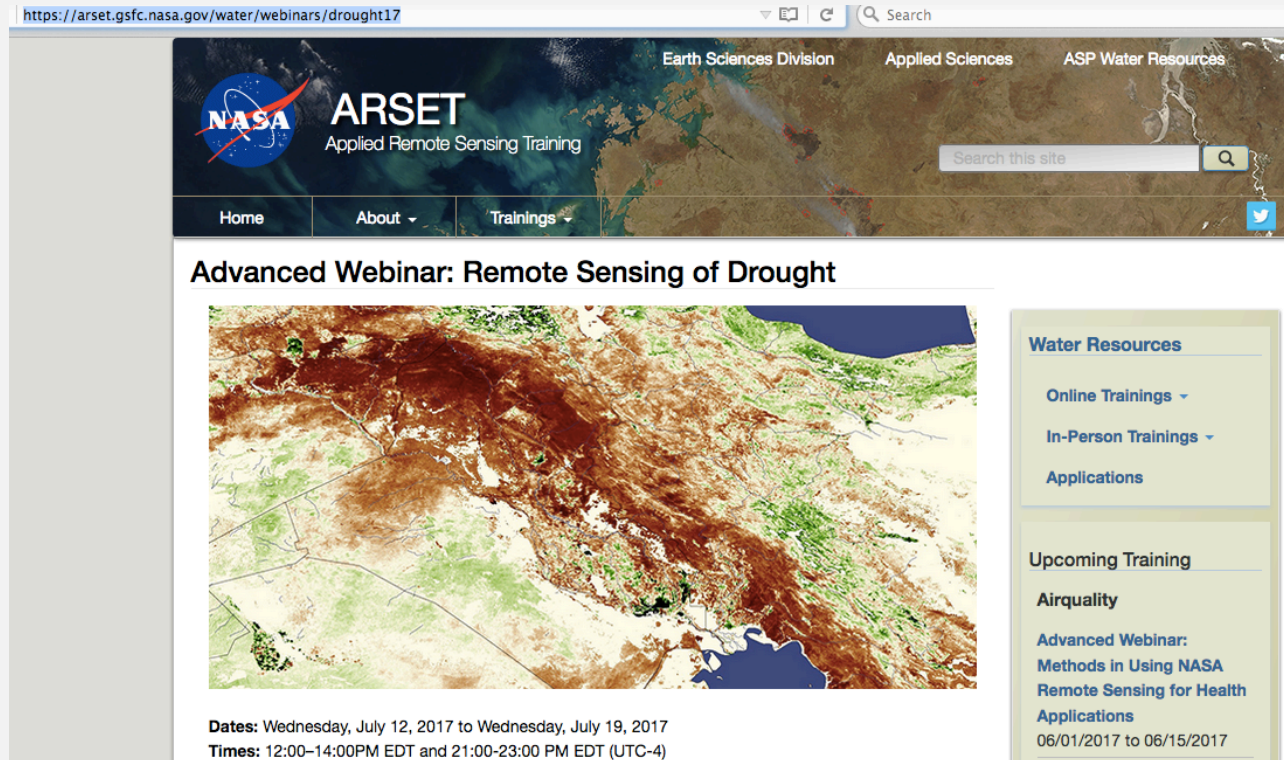
- Fundamentals of Remote Sensing
  - Sessions 1, 2A, and 2B
  - On demand webinar, available anytime
  - <http://arset.gsfc.nasa.gov/webinars/fundamentals-remote-sensing>
- Download and install QGIS
  - <https://www.qgis.org/en/site/forusers/download.html>
  - Open software to ensure it is working properly



The screenshot shows the ARSET (Applied Remote Sensing Training) website. The header includes the NASA logo, the text 'ARSET Applied Remote Sensing Training', and navigation links for 'Earth Sciences Division', 'Applied Sciences', and 'ASP Water Resources'. A search bar is located in the top right. Below the header is a navigation menu with 'Home', 'About', and 'Trainings'. The 'Trainings' menu is open, showing options for 'Fundamentals', 'Disasters', 'Health & Air Quality', 'Land', and 'Water Resources'. The 'Fundamentals' option is selected, leading to a page for an 'Advanced Webinar: Methods in Using NASA Remote Sensing for Health Applications'. The webinar is scheduled for Thursdays, June 1-15, 2017, from 10 a.m. to 3 p.m. EDT (UTC-4). A 'Register Now' button is visible. The page also features a sidebar with 'ARSET' links for 'Webinars', 'Workshops', 'Suggest a Training', 'Personnel', and 'Resources'. Below the sidebar, there is a section for 'Upcoming Training' with details for 'Air Quality' and 'Land' trainings. The main content area includes a paragraph about the ARSET program and a link to 'ARSET's 2016 Annual Report'.

# Course Material

Webinar recordings, presentations, in class exercises, and homework are available at: <http://arset.gsfc.nasa.gov/water/webinars/drought17/>



https://arset.gsfc.nasa.gov/water/webinars/drought17

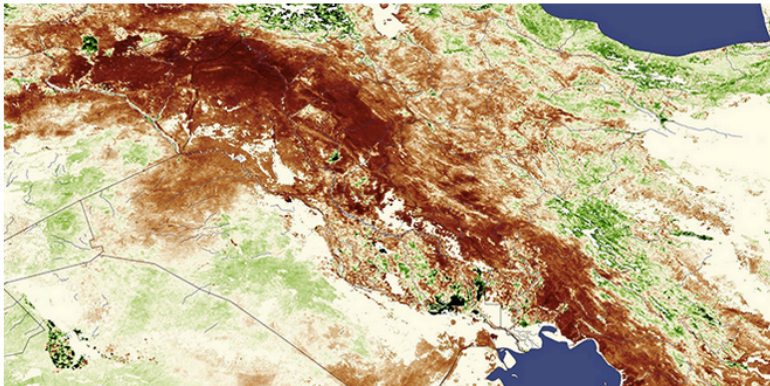
Earth Sciences Division Applied Sciences ASP Water Resources

**NASA ARSET**  
Applied Remote Sensing Training

Search this site

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## Advanced Webinar: Remote Sensing of Drought



**Dates:** Wednesday, July 12, 2017 to Wednesday, July 19, 2017  
**Times:** 12:00–14:00PM EDT and 21:00–23:00 PM EDT (UTC-4)

**Water Resources**

- Online Trainings ▾
- In-Person Trainings ▾
- Applications

**Upcoming Training**

**Airquality**

**Advanced Webinar:**  
Methods in Using NASA Remote Sensing for Health Applications  
06/01/2017 to 06/15/2017

## Course Agenda:

[Agenda.pdf](#)

### Remote Sensing-Based Drought Monitoring

July 12, 2017

This session will include an overview of drought classification, an introduction to web-based drought monitoring tools, a demonstration of drought data visualization tools, and end with an exercise for attendees to practice downloading data.

- [View the Recording](#) »
- [Presentation Slides \(English\)](#) »

### Drought Monitoring Analysis and Application

July 19, 2017

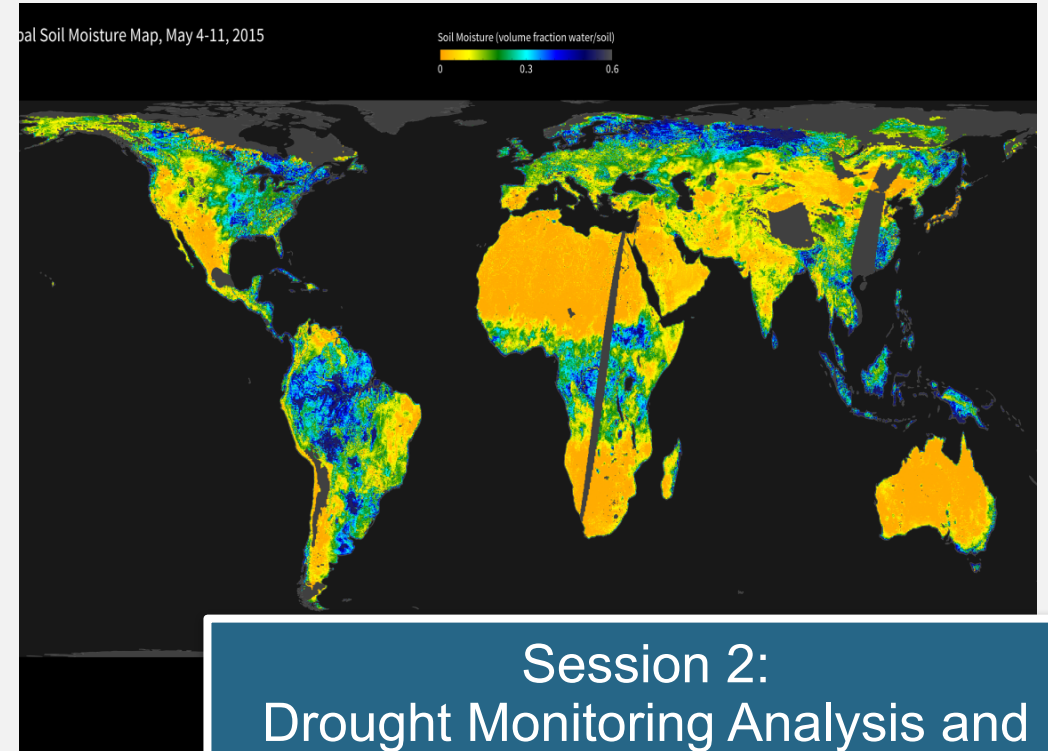
This session will include a demonstration of soil moisture, groundwater, NDVI, and evapotranspiration (ET) data access and visualization, and will use a case study (California) exercise to demonstrate how participants can analyze drought conditions. Background will also be provided for a case study (northern Africa) to be used by participants to independently conduct their own analysis.

- [View the Recording](#) »
- [Presentation Slides \(English\)](#) »
- [Homework Assignment](#) »

# Course Outline



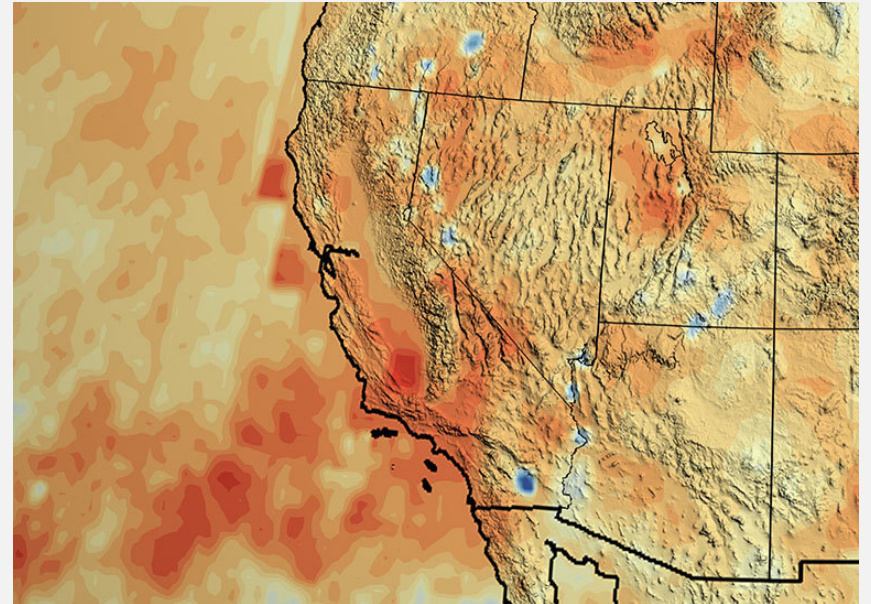
Session 1:  
Remote Sensing for Drought  
Monitoring



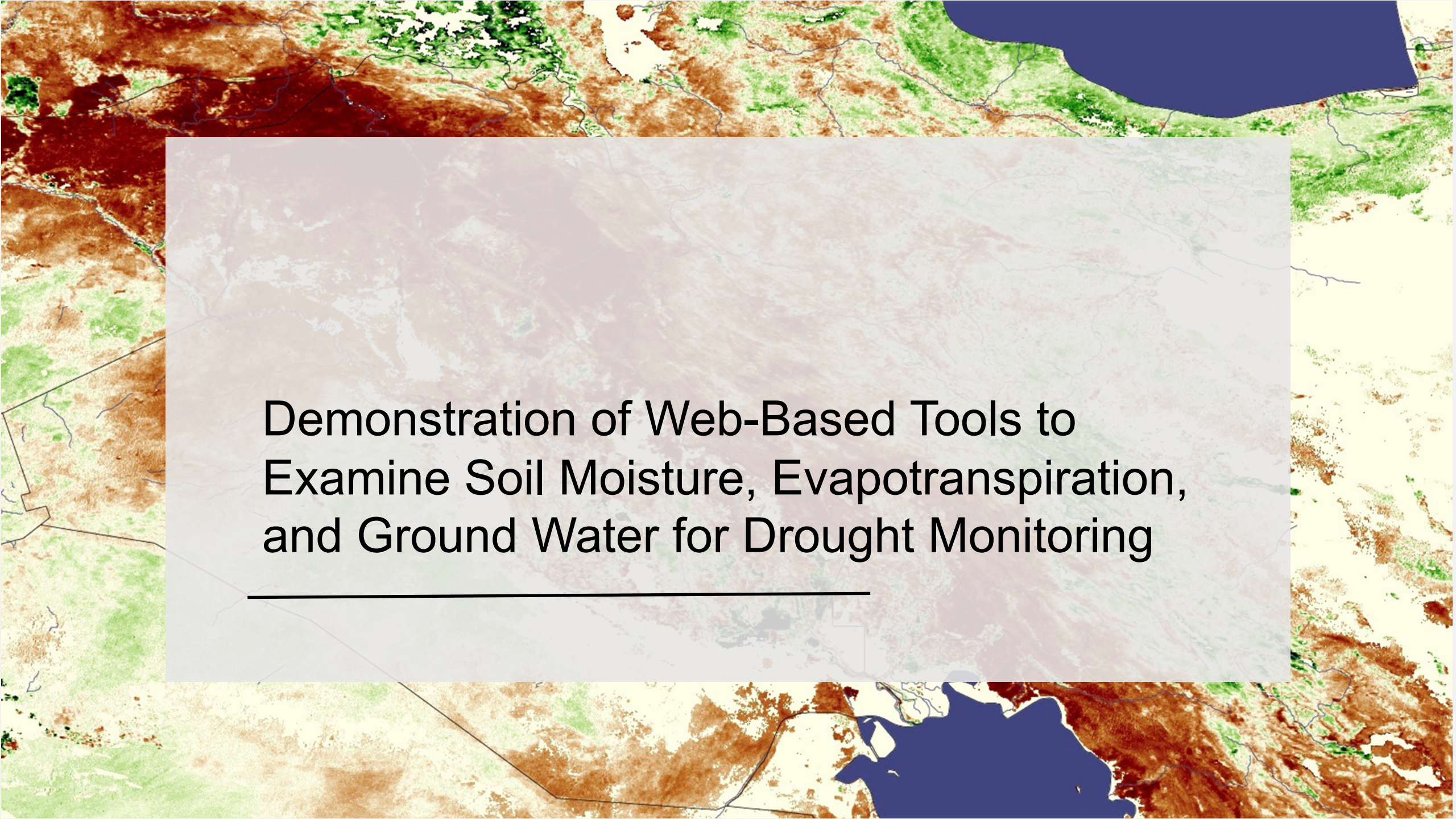
Session 2:  
Drought Monitoring Analysis and  
Application

## Session 2 Agenda

- Demonstration of Web-Based Tools to Monitor Soil Moisture, Evapotranspiration, and Ground Water Storage for Drought Monitoring
- Exercise: Analysis of Precipitation and NDVI Anomalies for Drought Monitoring
- Summary
- Q and A



California's precipitation deficit from 2012-2014 via TRMM (NASA Global Climate Change)

The background is an aerial photograph of a landscape, likely a coastal or riverine area. It shows a mix of green vegetation, brownish soil or low-lying vegetation, and blue water bodies. A semi-transparent white rectangular box is centered over the image, containing the title text. Below the text, a thin black horizontal line is drawn across the width of the text area.

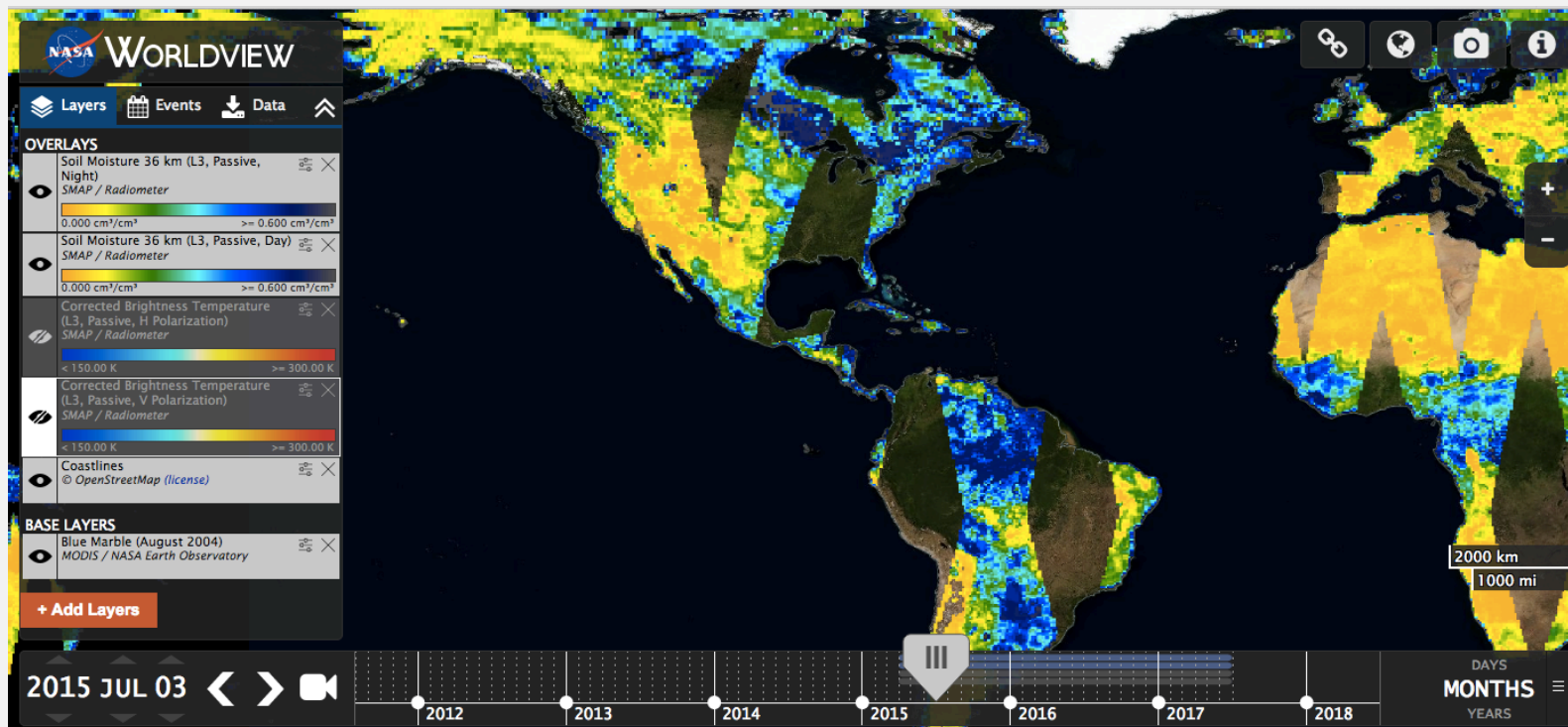
# Demonstration of Web-Based Tools to Examine Soil Moisture, Evapotranspiration, and Ground Water for Drought Monitoring

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# Monitoring Soil Moisture

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

- Since early 2015, the SMAP mission provides global soil moisture observations that can be used to monitor soil moisture variability from day-to-day and month-to-month
- Daily and monthly soil moisture data can be visualized using NASA Worldview

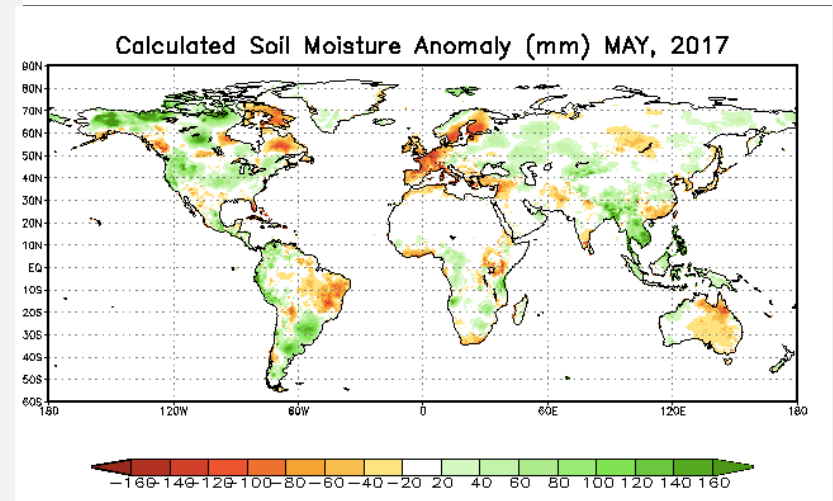
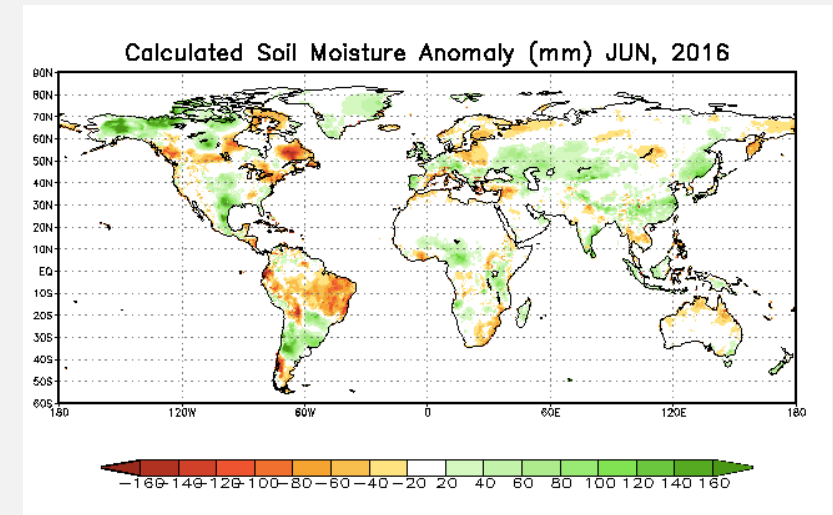




# Soil Moisture Anomalies for Drought Monitoring

[http://www.cpc.ncep.noaa.gov/products/Soilmst\\_Monitoring/gl\\_Soil-Moisture-Monthly.php](http://www.cpc.ncep.noaa.gov/products/Soilmst_Monitoring/gl_Soil-Moisture-Monthly.php)

- NOAA Climate Prediction Center provides calculated monthly soil moisture climatology (19701-2000) and anomalies for present-day and the past 12 months
- These maps visually provide indications of soil moisture deficit and drought conditions

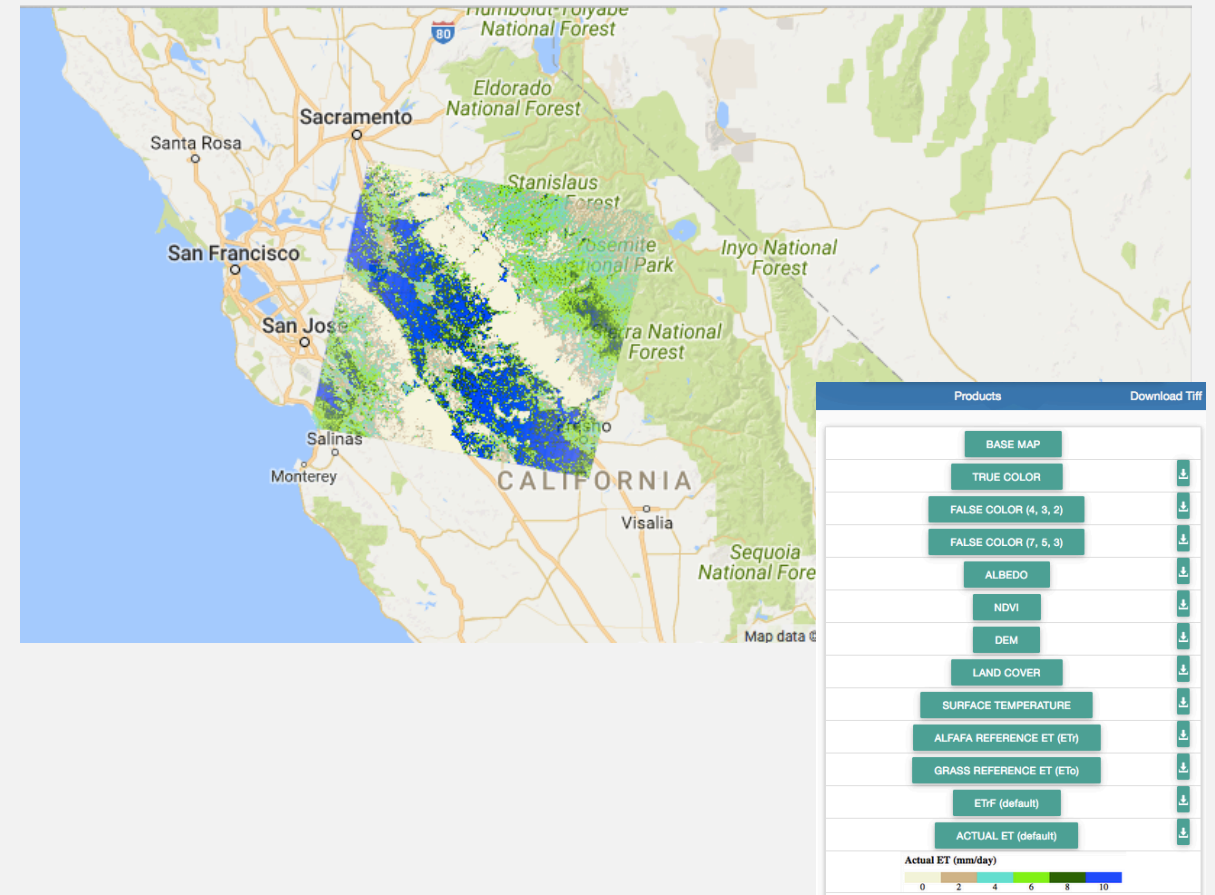


# ET for Drought Monitoring

<http://eeflux-level1.appspot.com/>

- Landsat-based evapotranspiration images are available online at 30m resolution (see <https://arset.gsfc.nasa.gov/sites/default/files/water/ET-SMAP/week4.pdf> for details)
- These maps provide information about changing ET, indicative of agricultural and hydrological drought conditions

## Landsat-Based ET for July 17, 2015



Reference: [https://c3.nasa.gov/water/static/media/other/Day1\\_S1-3\\_Allen.pdf](https://c3.nasa.gov/water/static/media/other/Day1_S1-3_Allen.pdf)

# GRACE-Based Water Storage Anomalies for Drought Monitoring

<http://geoid.colorado.edu/grace/dataportal.html>

## Time Selection

YYYY:DY

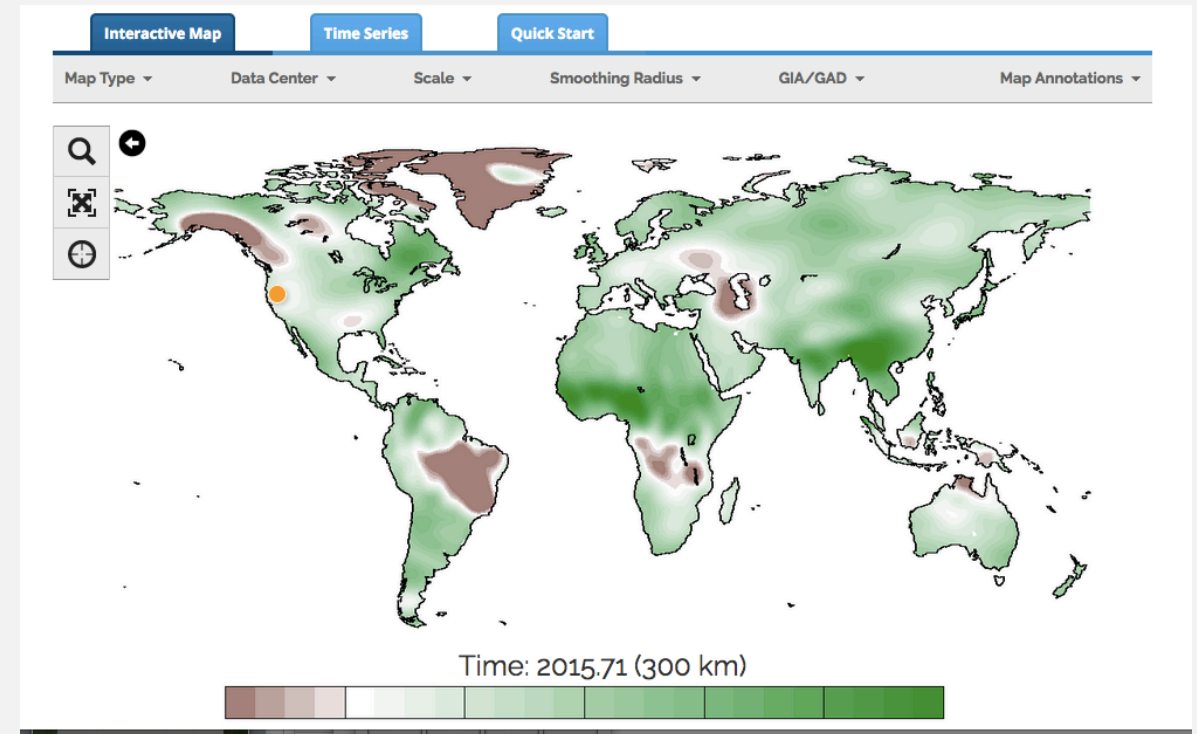
DY=Decimal Year

Day of Year/365

DY=0.79

Represents  $0.71 \times 365 = 259$ th Day of the Year = 15 September

2015.71 selects data for September 2015



A satellite-style map of a region, likely the Mediterranean basin, showing terrain, vegetation, and water bodies. A semi-transparent grey rectangular box is overlaid on the map, containing the title text. The map uses a color palette where greens and browns represent land, and dark blue represents water. The text is centered within the box.

# Exercise: Analysis of Precipitation and NDVI Anomalies for Drought Monitoring

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# Summary

- Multiple historical and near real-time remote sensing-based data provide consistent and large-scale coverage to assess past and monitor current meteorological, hydrological, and agricultural droughts
  - Data Include: precipitation, NDVI, soil moisture, ET, & ground water estimates
- These data
  - have different spatial and temporal resolutions and coverage
  - require appropriate analysis and synthesis for drought monitoring
- Precipitation anomalies, their magnitudes, spatial extent, and duration provide indications of short to long term drought conditions, and the potential for agricultural and hydrological droughts
- NDVI can be used to assess vegetation health
- Negative NDVI anomalies may indicate drought conditions and/or fallowed land

# Thank you!

- The Homework Assignment is Due August 2, 2017
  - Available at: <http://arset.gsfc.nasa.gov/water/webinars/drought17>
- To keep up-to-date on available ARSET training, join the ARSET listserv:
  - <https://lists.nasa.gov/mailman/listinfo/arset>