Temperature Anomalies from the AIRS Product in Giovanni for the Climate Community
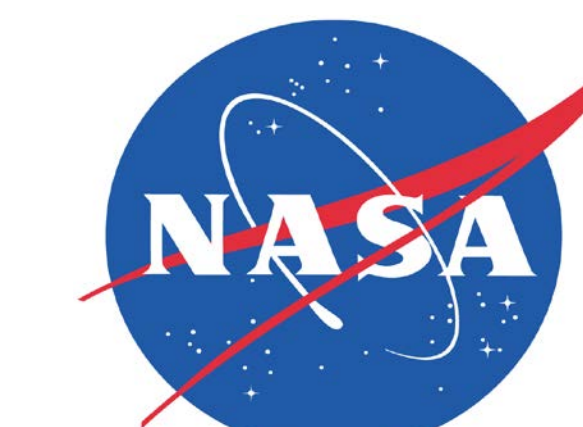
NASA/Goddard EARTH SCIENCES DATA and INFORMATION SERVICES CENTER (GES DISC)

Climate science and application communities are invited to take advantage of Giovanni to explore the 15-year long AIRS Version 6 products at GES DISC:
https://disc.gsfc.nasa.gov/ & https://giovanni.gsfc.nasa.gov/

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Abstract

The Atmospheric Infrared Sounder (AIRS) mission began with the launch of Aqua in 2002. Over 15 years of AIRS products have been used by the climate research and application communities. The NASA Goddard Earth Sciences Data and Information Services Center (GES DISC), in collaboration with NASA Sounder Team at JPL, provides processing, archiving, and distribution services for NASA sounders: the present Aqua AIRS mission and the succeeding Suomi National Polar-Orbiting Partnership (SNPP) Cross-track Infrared Sounder (CrIS) mission.

We generated a Multi-year Monthly Mean and Anomaly product using 14 years of AIRS standard monthly product. The product includes Air Temperature at the Surface and Surface Skin Temperature, both in Ascending/Daytime and Descending/Nighttime mode. The temperature variables and their anomalies are deployed to Giovanni, a Web-based application developed by the GES DISC. Giovanni provides a simple and intuitive way to visualize, analyze, and access vast amounts of Earth science remote sensing data without having to download the data. It is also a powerful tool that stakeholders can use for decision support in planning and preparing for increased climate variability. In this presentation, we demonstrate the functions in Giovanni with use cases employing AIRS Multi-year Monthly Mean and Anomaly variables.

Generation of AIRS Multi-year Monthly Mean Surface Temperature and Anomaly

- Multi-year Monthly Mean (*AIRGX3STMM*):
14-year (09/2002 to 08/2016) arithmetic mean of surface air and skin temperature from the AIRS monthly standard retrieval product (*AIRX3STM*).

- Anomaly (*AIRGX3STMMA*):
The difference between a selected month and the multi-year monthly mean of that month, generated dynamically by http service.
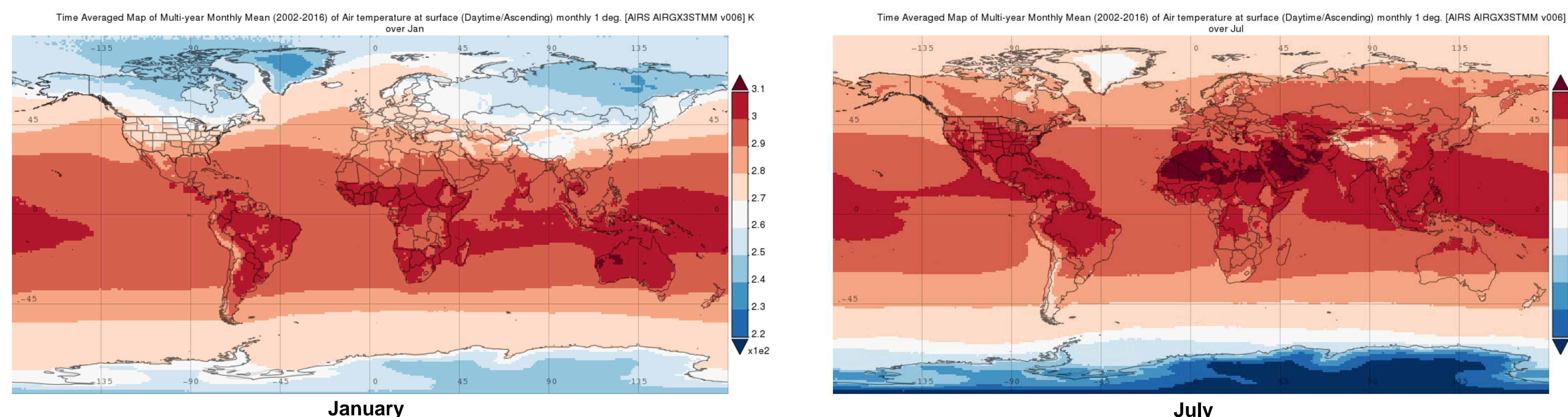
Multi-year Monthly Mean Surface Temperature and Anomaly in Giovanni User Interface


AIRGX3STMM
AIRGX3STMMA
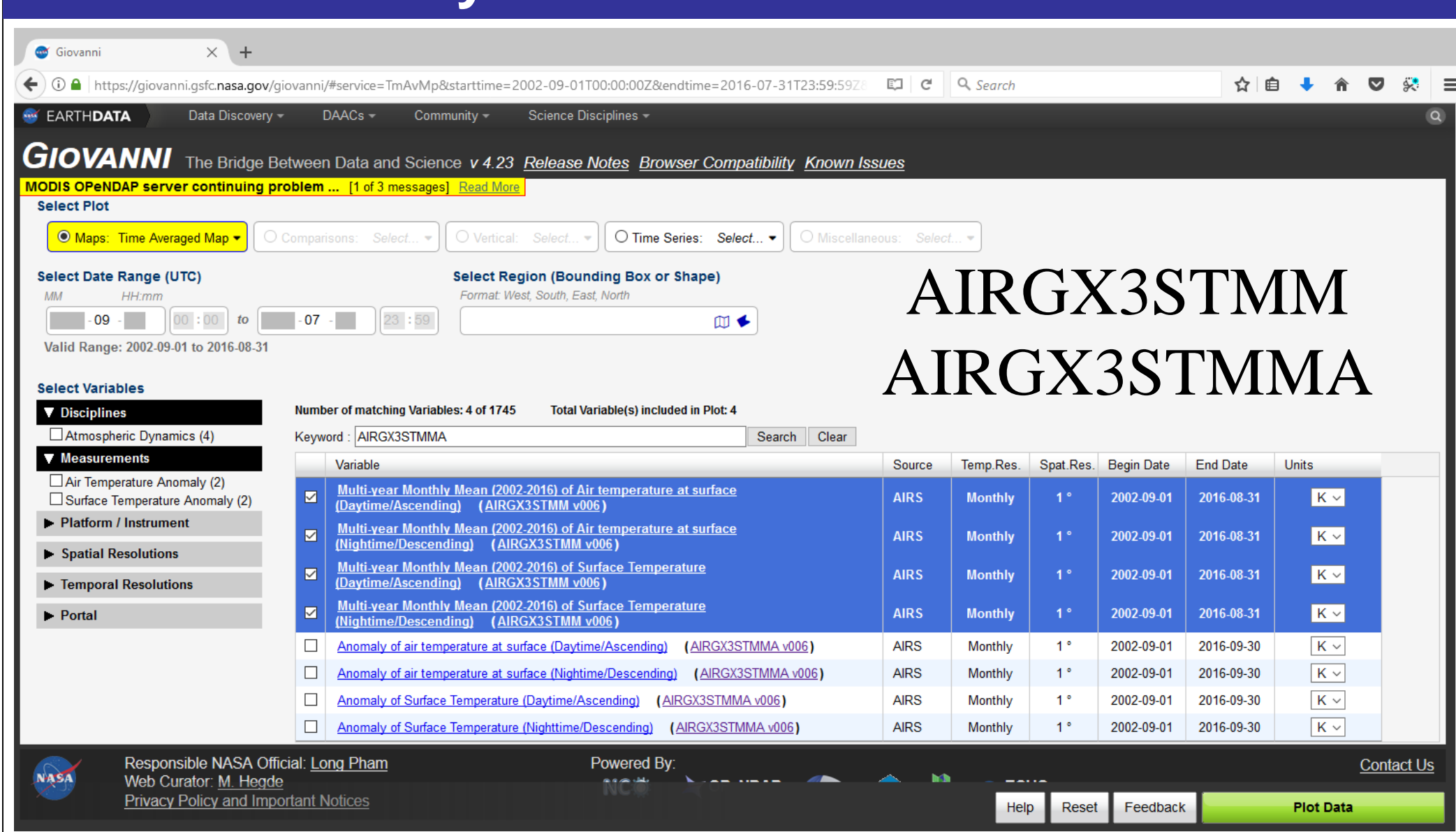
NLDAS and SeaWiFS Climatology in Giovanni

- North American Land Data Assimilation Systems (NLDAS) model: temperature, moisture, humidity, rainfall, snow, wind, runoff, radiation, heat flux, albedo, evaporation, vegetation
- SeaWiFS: Aerosol Optical Depth

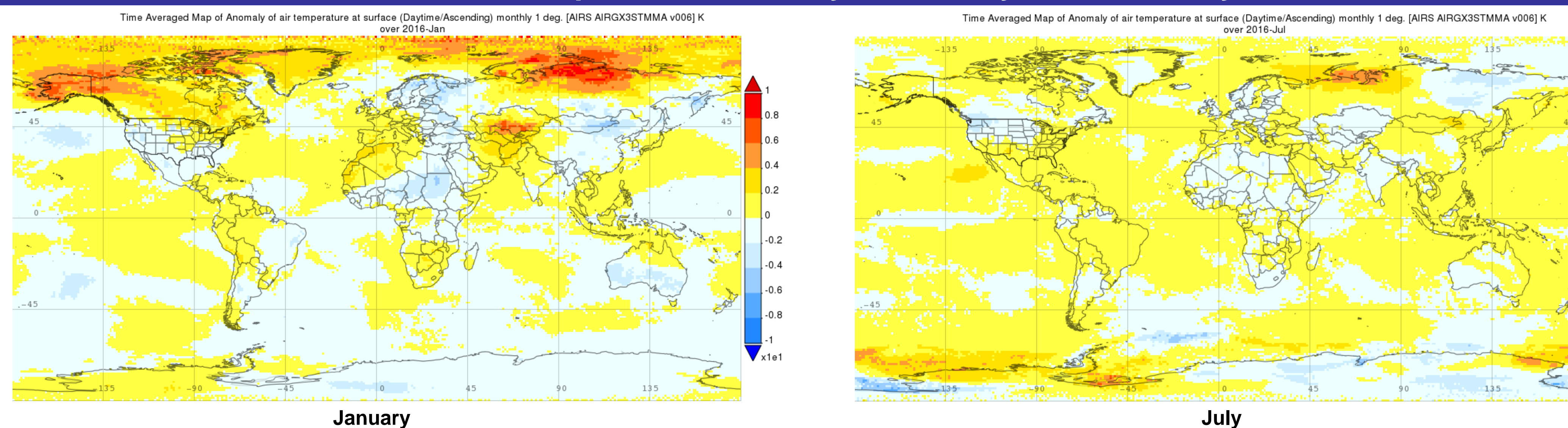## Multi-year Monthly Mean Surface Air Temperature for January and July

January

July

Multi-year Monthly Mean Surface Temperature Averaged over Global, Land, and Sea from January to December


Global

Land

Sea
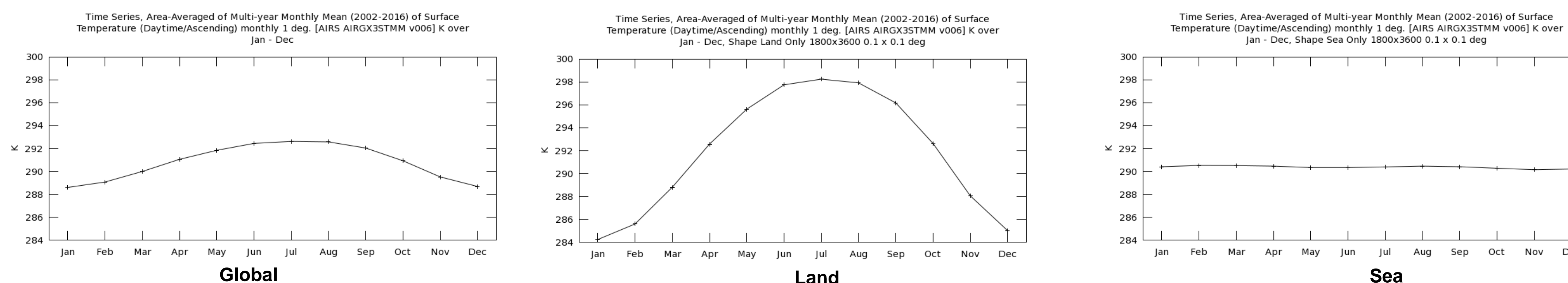
- Change of global multi-year monthly mean surface temperature is dominated by the change of surface temperature over land.

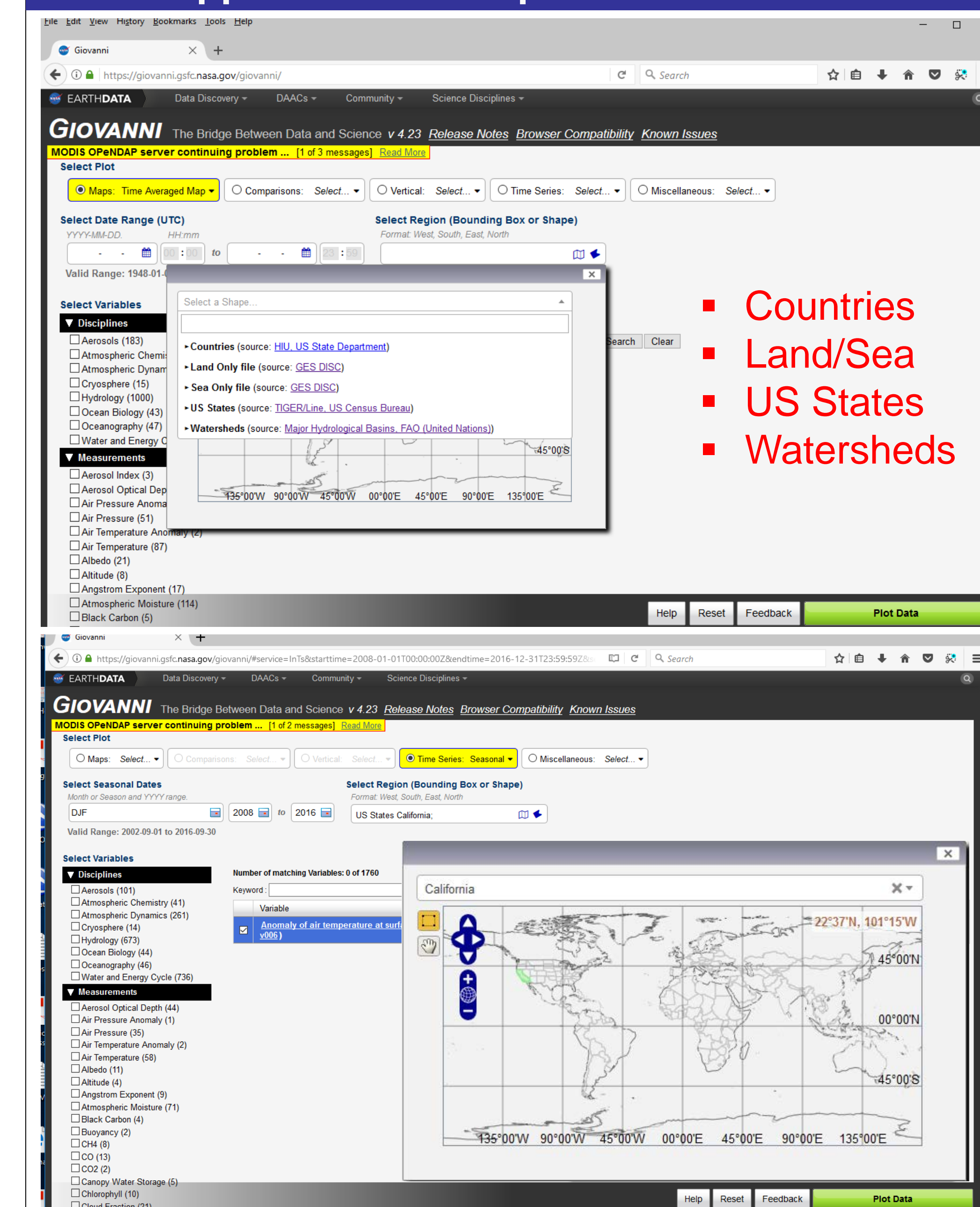## Surface Air Temperature Anomaly in January 2016 and July 2016

January

July

- Surface Air Temperature Anomaly Plots in January 2016 and July 2016 catch a glimpse of 2016, the warmest year on record globally.

Use Case of Multi-year Monthly Mean Surface Temperature and Anomaly

Daytime/Ascending

Nighttime/Descending
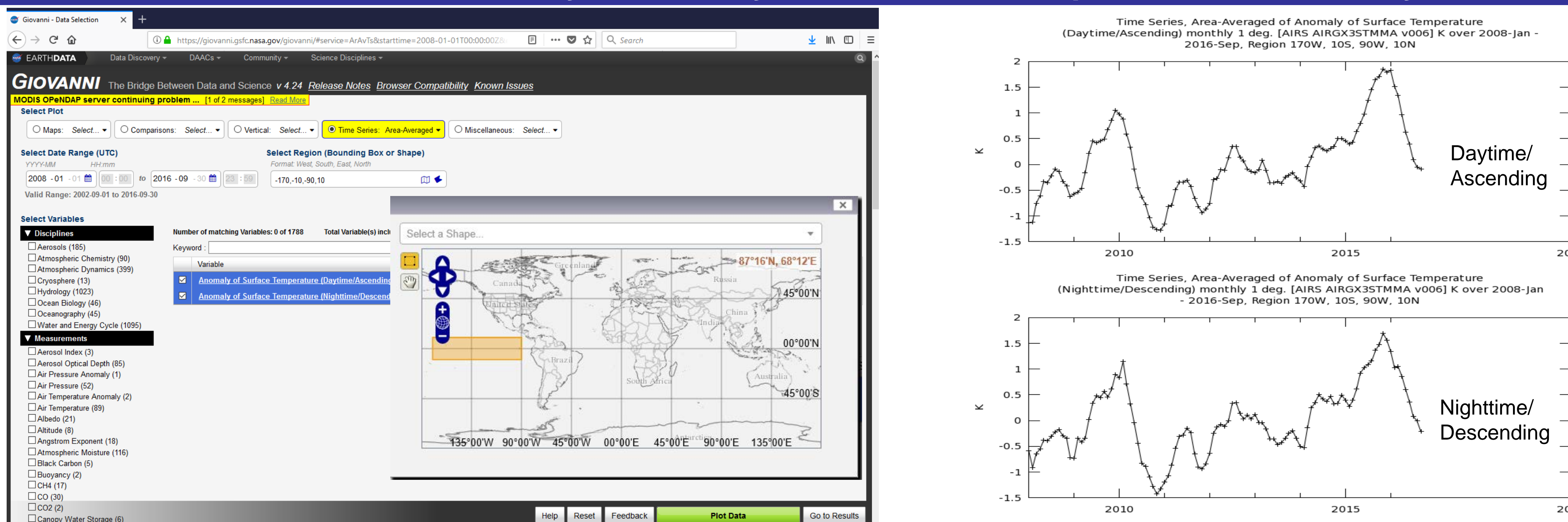
2009-2010 and 2015-2016 El Niño events: Time-series plots of the sea surface temperature anomaly over the tropical central and eastern Pacific Ocean show remarkably warmer water during these two El Niño events. The fast transition of the 2009-2010 El Niño to La Niña is also illustrated by the time-series plots of the anomaly, with a rapid shift from positive to negative.

Application of Shapefiles in Giovanni

- Countries
- Land/Sea
- US States
- Watersheds
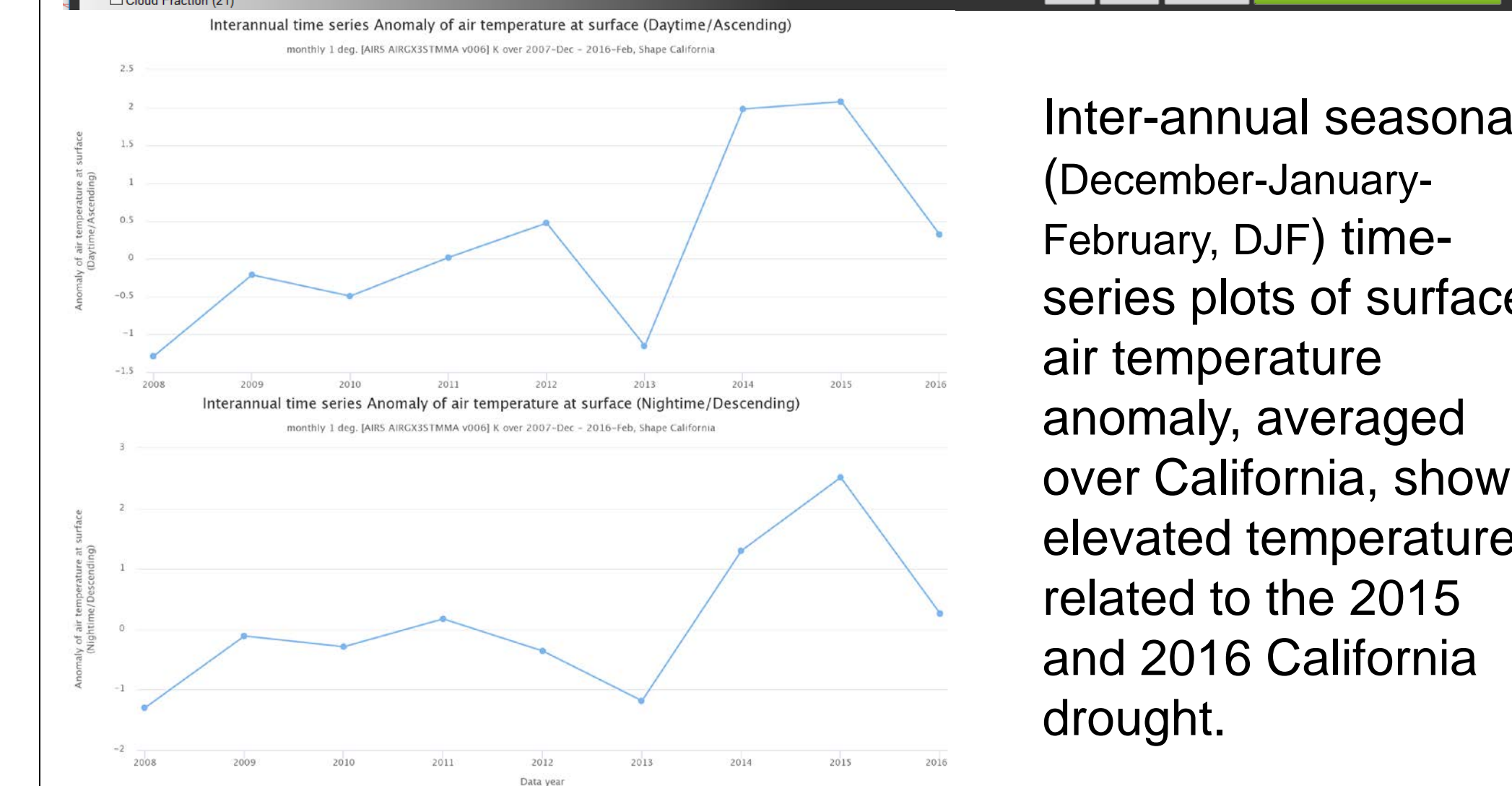
Inter-annual seasonal (December-January-February, DJF) time-series plots of surface air temperature anomaly, averaged over California, show elevated temperature related to the 2015 and 2016 California drought.

Summary

- AIRS 14-year mean surface temperature and anomaly have been created and are available in Giovanni.
- Use cases with these variables demonstrate the potential for regional and global climate variation studies and El Niño event analysis.
- Stakeholders can use Giovanni for decision support in planning and preparing for climate change variability.

Contact Information

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GES DISC

Giovanni