Visualization and Analysis of Multi-scale Land Surface Products via Giovanni Portals

Suhung Shen1,2, Steve Kempler1, Irina Gerasimov1,3
1 NASA Goddard Earth Sciences (GES) Data & Information Services Center (DISC), Code 610.2, NASA/GSFC, Maryland 20771, USA, 2George Mason University, 3ADNET

Abstract

Large volumes of MODIS land data products at multiple spatial resolutions have been integrated into the Giovanni online analysis system to support studies on land cover and land use changes, focused on the Northern Eurasia and Monsoon Asia regions through the LCLUC program. Giovanni (Goddard Interactive Online Visualization And eAnalysis Infrastructure) is a Web-based application developed by the NASA Goddard Earth Sciences Data and Information Services Center (GES DISC), providing a simple and intuitive way to visualize, analyze, and access Earth science remotely-sensed and modeled data.

Customized Giovanni Web portals (Giovanni-NEESPI and Giovanni-MAIRS) have been created to integrate land, atmospheric, cryospheric, and societal products, enabling researchers to do quick exploration and basic analyses of land surface changes, and their relationships to climate, at global and regional scales. This presentation shows a sample Giovanni portal page, lists selected data products in the system, and illustrates potential analyses with images and time-series at global and regional scales, focusing on climatology and anomaly analysis. More information is available at the GES DISC MAIRS data support project portal: http://disc.gsfc.nasa.gov/mairs/

Giovanni Portals to Support NEESPI and MAIRS Programs

http://disc.gsfc.nasa.gov/mairs/visualizations/

- Customizable portals
- No need to install software; no need to download and process data
- Provide visualization and basic statistical analysis functions (map, animation, time-series, scatter plot, cross-section, difference, etc.)
- Download images and data in different formats (png, KMZ, netCDF)

Land and Societal Products

Spatial coverage of data is global for 1x1 degree and 5.6km, and over Monsoon Asia region for 1km. Product name in red indicates monthly climatology and anomaly analysis available in Giovanni.

Parameter Name | Product Name | Available Since | Time Interval | Spatial Resolution
--- | --- | --- | --- | ---
Vegetation Indices | MOD09A1.005, MYD09A1.005 | 2000.03 - 2011.02 | Monthly | 1km
| MOD13C2.005, MYD13C2.005 | 2000.03 - 2011.02 | Monthly | 1km
| MOD13C1.005 | 2000.03 - 2011.02 | Monthly | 1km
| MOD13A2.005, MYD13A2.005 | 2000.03 - 2011.02 | Monthly | 1km
| Land Surface Temperature | MOD11C1.005, MYD11C1.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD11C2.005, MYD11C2.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD11C3.005, MYD11C3.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD11CM1.005, MYD11CM1.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD11A2.005, MYD11A2.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD11C3.005, MYD11C3.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD11CM1.005, MYD11CM1.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD11A2.005, MYD11A2.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| Thermal anomalies/Fire | MOD14C2.005, MYD14C2.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD14A2.005, MYD14A2.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD14CM1.005, MYD14CM1.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD14A2.005, MYD14A2.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD14CM1.005, MYD14CM1.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| MOD14A2.005, MYD14A2.005 | 2000.03 - 2011.02 | Monthly | 5.6km
| Albedo | MOD43A1.005, MOD43A2.005 | 2000.03 - 2011.02 | Monthly | 1km
| MOD43C1.005 | 2000.03 - 2011.02 | Monthly | 1km
| MOD43C2.005 | 2000.03 - 2011.02 | Monthly | 1km
| Land Cover Types | MOD12A1.005, MYD12A1.005 | 2000.03 - 2011.02 | Yearly | 1km
| Modis-1BGS1-005, 1BGS2-005 | 2000.03 - 2011.02 | Yearly | 1km
| Land Cover Dynamics | MOD12A1.005, MYD12A1.005 | 2000.03 - 2011.02 | Yearly | 1km
| Soil Moisture | MOD16A2.005, MYD16A2.005 | 2000.03 - 2011.02 | Yearly | 1km
| Snow Ice | MCD43A4.005, MCD43A5.005 | 2000.03 - 2011.02 | Yearly | 1km
| Snow/Ice Extent | MCD43A4.005, MCD43A5.005 | 2000.03 - 2011.02 | Yearly | 1km
| Snow/Ice Water Equivalent | GLDAS | 2000.01 - 2011.02 | Yearly | 1km
| Surface Snow, Soil Moisture | GLDAS | 2000.01 - 2011.02 | Yearly | 1km
| Nighttime Lights | DJF, JJA, SON, DJF, JJA, SON, DJF | 2000.01 - 2011.02 | Yearly | 1km

Access Statistics of Giovanni NEESPI and MAIRS Portals

- Monthly Unique Users
- Monthly Image Views

Regional Variations with 5km Data

EXTREMELY HOT SUMMER weather was reported in 2010 at many locations across Europe. The hot conditions caused health problems and huge economic losses. Land surface temperatures (LST) measured by MODIS reveal detailed spatial features of this abnormal event. Figure at left displays the daytime LST anomaly of July 2010 at 5.6 km resolution from MODIS-Terra generated with Giovanni. The baseline of the climatology is from 2000.03 to 2011.02 (12 years).

Local Changes over Asia with 1km Data

In terms of average surface temperature, local climate has changed due to land cover and land use changes associated with urbanization over the Yangtze River Delta, China. The urban heat island (UHI) area indicated by LST has increased significantly during the last 10 years. Figures show the 1km MODIS-QLS day/nighttime light anomalies (above and below) and 1km MODIS-Terra day/nighttime light anomalies (above and below) for 2001 and 2010.

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