



The Giovanni News

GODDARD EARTH SCIENCES DATA & INFORMATION SERVICES CENTER (GES DISC)

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Editor's Note:

Well, it's finally autumn 2011 in the Northern Hemisphere, after a particularly eventful (in the geophysical sense) summer. We've seen droughts, floods, hurricanes, heat waves, and even an anomalous East Coast earthquake. Our NASA Giovanni system doesn't provide data on earthquakes, even though that shook us up a bit, but it does provide data on just about everything else on that list of disasters. Giovanni makes it simple to use NASA remote-sensing data, applicable to research on both the causes and effects of climate and weather phenomena.

On a brighter note, we'll be introducing a new Giovanni home page very soon, and it will feature the first version of our Giovanni parameter list, showing in one place the impressive list of all the data currently in the system. So please read, enjoy, feel free to provide feedback, and let's all hope that any blizzards wait until 2012.

The new look to The Giovanni News is brought to you by Wainie Youn, ably assisting your editor, James Acker.

Feedback?

Email me at jim.acker@nasa.gov!

Just released: New Giovanni home page!

The Goddard Earth Sciences DISC has just rolled out a new Giovanni home page. One of the main differences from our current page is an improved presentation of the existing Giovanni data portals*, using an "accordion" table where the portals are grouped by research area. The most notable new feature on the page is the first version of the Giovanni Parameter List, an application that lists all of the data parameters in the Giovanni database. The Parameter List allows filtering by parameter, data product, sensor, or data portal. This application is intended to allow users a complete overview of the wide variety of data products available in Giovanni.

Shown to the right is a screen capture of the new Giovanni home page. The News bar on the right can be minimized, allowing the Parameter List display to expand.

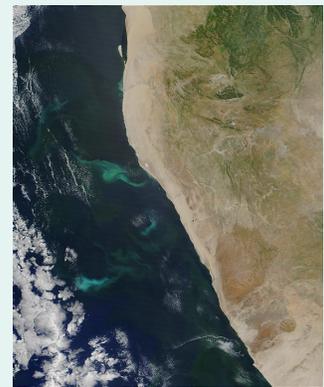
*Giovanni data portals used to be termed "instances". The term portals better reflects the availability of different data types in Giovanni.



Screen shot of the new Giovanni home page

Revisiting sulfurous plumes on the Namibian coast

Several years ago on one of the GES DISC's ocean color *Science Focus!* pages discussed one of the more unique phenomena in the oceans – the eruptions of toxic hydrogen sulphide (H₂S) that occur off the coast of Namibia. (“[A bloom by any other name... might never be a bloom at all](#)”) The eruptions are due to a buildup of H₂S in the sediments underlying the highly productive Benguela Upwelling Zone; in those sediments, oxygen gets used up by bacteria digesting the planktonic organic matter that rains down from the surface, and sulphur-loving bacteria take over, producing H₂S in large quantities. At certain times, this gas erupts to the surface, killing fish and chasing crustaceans onto the shore, and also transforms to particulate clouds of elemental sulphur that can be seen from space. The picture shows one such event captured by MODIS on April 24, 2002.



In a recent paper, Thomas Ohde and Volker Mohrholz of the Department of Remote Sensing, Leibniz Institute for Baltic Sea Research, examined the occurrence of the sulfur plumes. (“Interannual variability of sulfur plumes off the Namibian Coast,” *International Journal of Remote Sensing*, DOI:10.1080/01431161.2011.554455) They concluded that the main season for the sulphur plumes was between January and June (summer and fall in the Southern Hemisphere), and that the Walvis Bay region of the coast was partially decoupled from the rest of the coastal region in terms of the timing of the sulphur plumes. They also determined that one of the contributing factors to the formation of the plumes was the amount of low-oxygen South Atlantic Central Water that circulates onto the coastal shelf. In 2008, despite a lower occurrence rate of the plumes, the most intense events were observed, causing the death of numerous juvenile hake and several lobster walk-outs.

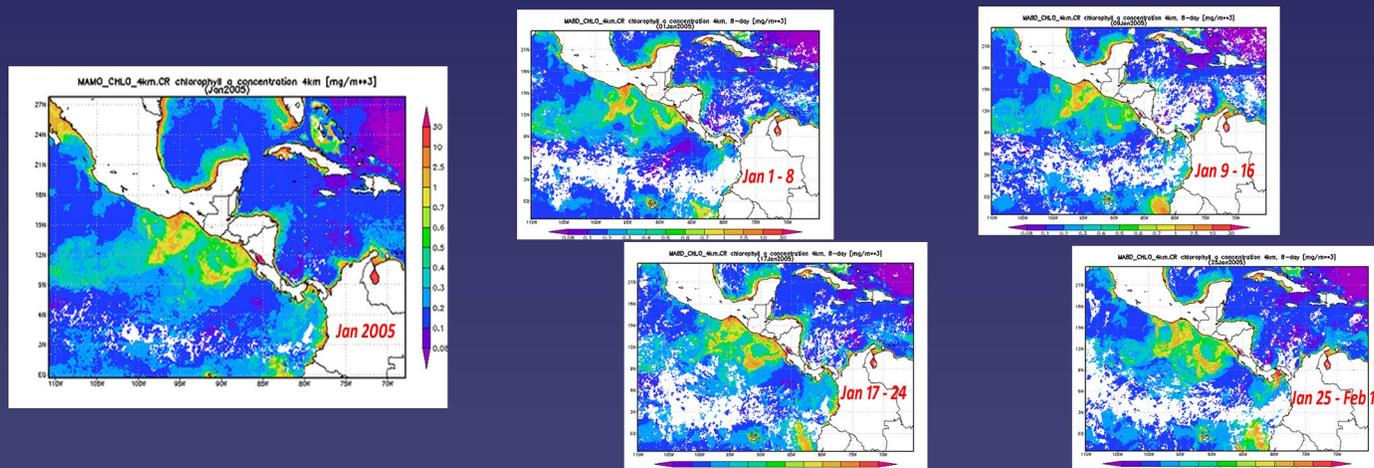
In this study, Ohde and Mohrholz utilized ocean remote sensing data from the European Medium Resolution Imaging Spectrometer (MERIS) and the NASA Moderate Resolution Imaging Spectroradiometer (MODIS). Cloud fraction data from MODIS in the NASA Giovanni system was used to estimate how much cloud cover could contribute to undersampling of plume observations. They concluded that the plumes have a sufficiently long persistence (about six days) that cloud cover only has a minimal effect on the detection of the plumes.

What a Difference 8-day Makes...

It may be cliché, but it's true, that the ocean is always in motion. Using monthly averages of data for the oceans blurs the interaction of winds and currents in the ocean that cause its multifarious patterns of motion. For this reason, one of the best temporal resolutions to view ocean color radiometric data products is products generated at 8-day intervals. (Someone might think to ask if daily data is better, but for visible wavelength remote sensing of the oceans, clouds obscure much of the oceans. Averaging the data over eight days provides much more data from the ocean surface, because clouds have the courtesy to move fairly quickly and reveal different parts of the ocean each day.)

The earlier incarnation of Giovanni provided SeaWiFS 8-day data products, but was "turned off" to allow for the new data format used by the Ocean Biology Processing Group, which provides SeaWiFS and MODIS ocean data products. It has taken a little time, but Giovanni has now brought back 8-day temporal resolution data products for SeaWiFS, and now also has 8-day data products from MODIS – including 8-day data products at 4km spatial resolution. An additional feature is that Giovanni now provides new – and exciting, if you're an ocean remote sensing biologist – products at this spatial and temporal resolution, such as normalized fluorescence line height (NFLH), offering more insight into the health and growth of phytoplankton populations.

The images below show the difference between a monthly image and the corresponding 8-day images for the same time interval. The region shown is the dynamic Pacific coast of Central America, where fierce directional wind jets form in the winter due to pressure differences along the cordillera. This causes wind mixing that brings cold water and nutrients to the ocean surface, fostering episodic phytoplankton blooms. Even though the monthly image captures the location and general direction of the blooms, the four 8-day images provide much better context of the generation and movement of the successive blooms.



Giovanni publication count just keeps going and growing

The most recent compilation of new Giovanni research papers (research publications published in peer-reviewed journals) found 35 new contributions to the scientific literature. Topics in these papers included the following:

- dust and aerosols over South Asia, East Asia and India
- hurricanes in the Caribbean Sea
- the diet of deep-water shrimp
- changes in woody biomass in central Africa
- how an "exceptional" flood event in Italy's Po River affected the adjacent waters of the Adriatic Sea.



Hurricane Omar in the western Caribbean Sea, October 2008. Image courtesy of NOAA.

Several new publications were discussed in the recent news article on the GES DISC Web site, "[Giovanni adds 35 new journal publications to 2011 list](#)". Of the papers listed above, the paper by Mark Jury of the University of Puerto Rico, published in *Theoretical and Applied Climatology* and entitled "Caribbean hurricanes: case study of interacting easterly and westerly waves", is of particular interest during this hurricane season. Jury determined that most flood damage in the Caribbean occurs from slow-moving tropical cyclones. In his case study of Hurricane Omar (October 13-21, 2008), Jury observed that the initial moisture content and instability resulted from African easterly waves. A westerly wave accelerating around the northern Andes was drawn into the circulation of Omar, enhancing cyclogenesis.

Portrait of a Heat Wave

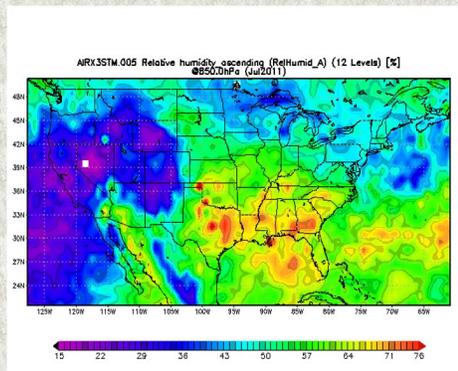
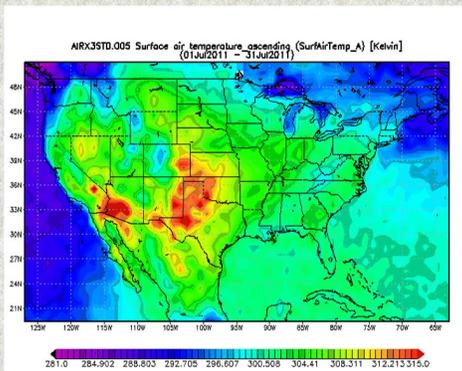
The oppressive heat wave that enveloped much of the central and eastern United States in a steamy haze of high temperatures and humidity generated numerous headlines around the country, and quite a bit of human discomfort too, of course. The feature article published by the GES DISC on the heat wave, "NASA data reveals anomalously hot summer", generated more hits from interested readers than any other single article published on the GES DISC home page.

The article, authored by Andrey Savtchenko, used Atmospheric Infrared Sounder (AIRS) data directly, in combination with output from the Goddard Earth Observing System Model Version 5 (GEOS-5). Yet it's possible to take a look at the July heat wave in a simple fashion using AIRS data in Giovanni.

The two images below show AIRS surface temperature and AIRS relative humidity, the latter for the 850 hectoPascal (hPa) atmospheric pressure layer. It is easy to see where the heat wave was at its worst, in northern Texas and Oklahoma. Oklahoma, in fact, set an all-time temperature record in July for the highest average temperature in the historical record for any state. The effect of high humidity maintained high temperatures at night, contributing to this record, which the citizens of Oklahoma had the dubious honor to experience firsthand.

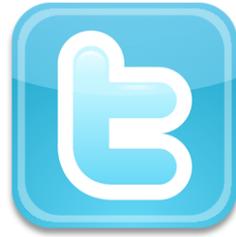
To generate these portraits of the heat wave, AIRS daily data for surface temperature was averaged over the month of July for the continental United States region. The relative humidity portrait utilized AIRS monthly average data.

The alternate color palette used for these images is called "Purple+Red+Stripes", and it provides a pseudo-contouring effect that helps to emphasize data features of interest. In the AIRS temperature image, it is easy to find the location of Death Valley in California, which is famed for its high temperatures.



Selected @nasa_giovanni Tweets!

Readers of *The Giovanni News* may remember that we have inaugurated a Twitter feed about Giovanni, entitled @nasa_giovanni. If you aren't a regular Twitter user, you may not know that you don't have to have a Twitter account and "follow" @nasa_giovanni to be able to read the tweets; you can just read the tweets on the @nasa_giovanni Twitter page, http://twitter.com/#!/NASA_Giovanni/.



As a sampling of the content of @nasa_giovanni, listed below are five recent tweets. The "#" symbol is a hash tag, allowing searches on that phrase for any related tweets. Links to online articles were shortened with "bit.ly".

Two #NASA Giovanni #rain images of #Irene, full track and rain over Maryland: <http://1.usa.gov/oBnGiq> - deck rain gauge shows good agreement

#NASA Giovanni provides OMI data images of NO2 from #Arizona fire (& Denver & power plants): <http://1.usa.gov/ldhox1> #smoke #pollution

MODIS "Deep Blue" aerosol Giovanni image shows March #dust storm that stopped #oil exports; more storms in April: <http://1.usa.gov/eCmaM3>

An idea, Giovannauts! Observe for Great Backyard Bird Count, <http://www.birdsource.org/gbbc/> #GBBC; use #Giovanni to analyze conditions

NEW! 8-day, 1km MODIS land surface #temperature data in #Giovanni for Asia #monsoon region studies: <http://bit.ly/emWcTO> #climate #weather

Before you can know,
you must find.

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

Giovanni in Puerto Rico: iguanas, robots, mosquitoes, dust, bioluminescence, and mofongo

By Jim Acker



Every now and then you get an invitation too good to pass up. That's what I thought about the invitation from Dianne Robinson of Hampton University to be an instructor at the [African Dust Workshop 2011](#) for Mexican and Puerto Rican science teachers, held in La Parguera, Puerto Rico. This workshop is one of an ongoing series developed by Robinson and Principal Investigator Olga Kalashnikova of the NASA Jet Propulsion Laboratory.

After a direct flight to San Juan from Baltimore-Washington Thurgood Marshall International Airport, I stayed the first night at the Verdanza Hotel, just a few blocks off the beach. I had found out the day before that a proposal for teacher education with Robinson as the PI (and myself as a collaborator) had just been funded by NASA, and I was eager to tell her, because I knew that she'd been vacationing on Vieques Island and might not have heard the news. It turned out she had – she had received several congratulatory messages and then she checked her email to find out why.

The next day our group traveled by bus to La Parguera, crossing Puerto Rico's central mountain range from the wet side to the dry side. It was about a three-hour ride, because San Juan is on the northeast coast of the island, and La Parguera is on the southwest corner. La Parguera is a small seaside village, almost "off the grid" compared to the Washington-Baltimore metro area. At dinner, we immediately became acquainted with the summertime mosquitoes that get extraordinarily vicious at twilight; it's permissible to wear mosquito repellent when dining outdoors, and the restaurant even supplied it for us.

The workshop began the next day, at the University of Puerto Rico – Mayaguez (UPRM) oceanography laboratory on Isla Magueyes. We "commuted" with a half-mile walk through town, and then a ferry ride across the channel to the island. Disembarking passengers are immediately greeted by several of the island's population of feral Cuban iguanas, a colony that began with escapees from a failed zoo.



Each workshop had a full day of instruction, with Paul Adams of Fort Hays State University providing many diverse demonstrations illustrating the basics of climate, clouds, and dust. Olga Kalashnikova provided an overview of the science of dust remote sensing from space. The teachers also heard from UPRM's Dr. Roy Armstrong about the effects of African dust on the marine realm. In March 2004, Dr. Armstrong had been doing at-sea research when a massive dust storm from the Sahara passed overhead.

Serendipitously, the dust storm that I chose for my first demonstration of Giovanni for the teachers was the same massive dust storm that Dr. Armstrong had experienced firsthand. I showed the teachers how to "troll" for dust storms using time-series of aerosol optical depth, then used Giovanni's mapping capabilities to display it in various eye-catching ways. Relative humidity profiles were used to show the altitude of the Saharan dust layer in the atmosphere over the Atlantic Ocean.

During subsequent demonstrations of Giovanni, I showed how to track the dust across the Atlantic by adjusting the maximum and minimum values for the color palette; how to generate and interpret a Hovmöller plot; how to use ocean color radiometry data to evaluate the impact on the Caribbean Sea biology; and how to put the plots into Google Earth. While I was giving these presentations, teachers in the audience followed along on their laptops; some even tried it on an iPad or a smartphone!

Each night after the workshop, we could experience the night life of La Parguera. The town square and market featured music every night (even until 2 AM – glad I brought my earplugs, because our hotel was right next to the town square). For dinner I tried (and enjoyed) the Puerto Rican specialty *mofongo* – mashed plantains with garlic topped with chicken, shrimp, or seafood. We had home-cooked lunches of rice and beans and chicken or pork – I made sure to save a little for the iguanas, so that I could watch their dinosaurian battles over my leftovers.



We also participated in two field trips; a snorkeling trip on the local reefs, which are in fairly good shape – a highlight was a small school of color-changing large squid. And one evening we went to the main local tourist attraction, the bioluminescent bay. While there are reports that the brightness of the bay is fading (and there is more light on the horizon from shopping centers), the bay still lights up with myriad dinoflagellate stars when you swim in it. My swimming background prompted me to do a short bio-illuminated underwater stroke analysis. One other night we held a star party, using a large Cassegrain telescope to see Jupiter and its moons, and also looked for satellites – we glimpsed the reflection of the now-defunct Japanese remote sensing satellite Midori.

On the last day of the workshop, Dr. Armstrong and his colleague, Dr. Yasmín Detrés, took us to the roof of the laboratory to see their instrumentation in action. We watched the AERONET robot perform two observations of the atmosphere, and also saw the other light sensors deployed on the roof. The laboratory even has a live Webcam to show weather conditions; later in the summer we watched the Webcam as Hurricane Irene swept by Puerto Rico. (<http://bio-optics.uprm.edu/>)



View of Isla Magueyes from La Parguera: the large building on the island is the oceanography laboratory.

One final note; because we were in Puerto Rico on June 24th, we celebrated Saint John's Day in the traditional way by jumping into the hotel pool a dozen times at midnight. (It's a good way for instructors and students to get to know each other better, of course.)

As we continue to develop Giovanni as an educational resource – including the new Data-enhanced Investigations for Climate Change Education (DICCE) portals – we plan to continue providing instruction to teachers at workshops such as this, and at meetings, including the upcoming Fall and Ocean Sciences meetings of the American Geophysical Union.

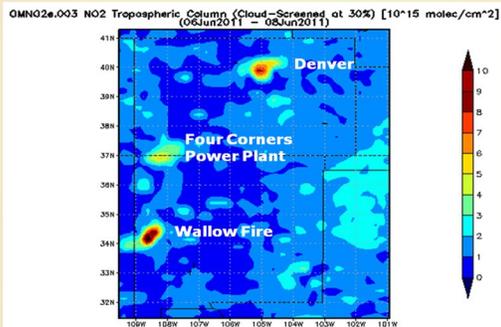
Where there's NO₂, there's fire (or a big city)

One of the very useful data products in Giovanni is the NO₂ (nitrogen dioxide) data product from the Ozone Measuring Instrument (OMI) on the Aura satellite. NO₂ is useful because it is a product of combustion, either natural (usually meaning wildfires) or anthropogenic (usually meaning the burning of fossil fuels for energy). Recently, several Giovanni NO₂ images were used by NASA to show the influence of wildfires in various regions of the world.

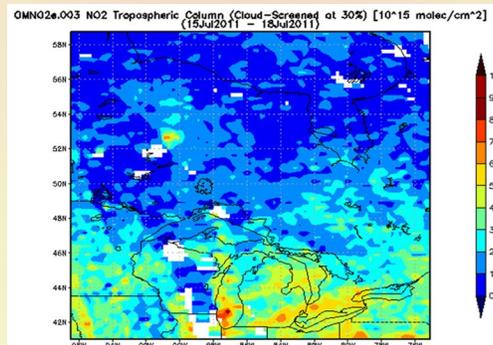
Arizona was the site of the raging Wallow fire in June 2011; smoke from the Wallow fire blew hundreds of miles into New Mexico, affecting air quality and even briefly causing flight cancellations in Albuquerque. A Giovanni image of the Four Corners region (annotated with Powerpoint) showed three distinct sources of NO₂; the Wallow fire, the city of Denver (most urban areas generate an observable NO₂ signal), and emissions from the large Four Corners power plant in northwest New Mexico. This power plant is the largest single source of NO₂ in the country, and only recently was a plan to substantially reduced emissions from this plant adopted. The emissions from the plant affected air quality and visibility in nearby national park and forest areas in Colorado.

A smoky fire in western Ontario generated a long smoke plume that flowed eastward, eventually flowing over the Niagara Falls region. This fire did not generate a large amount of NO₂; it seems likely that the fire mostly involved green vegetation, which produced a lot of smoke while it burned. A MODIS aerosol optical depth image shows the extent of the smoke.

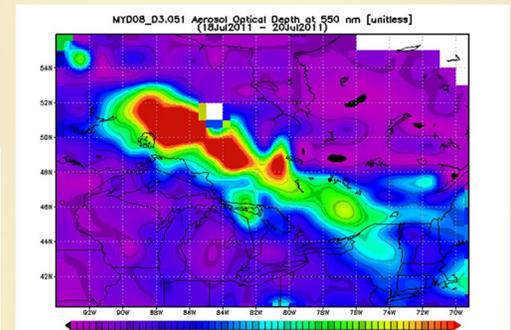
In contrast, bush fires in South Africa produced much more NO₂ and much less smoke. This contrast may be due to the hotter fires in the South African veld, burning dry bush and grasses. The NO₂ signal from the fires was large, covering a large area of eastern South Africa and Namibia.



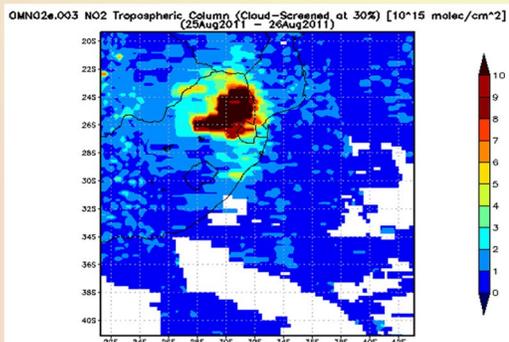
OMI NO₂ image of Arizona, New Mexico, and Colorado, showing NO₂ sources from the Wallow Fire, the city of Denver, and the Four Corners Power Plant.



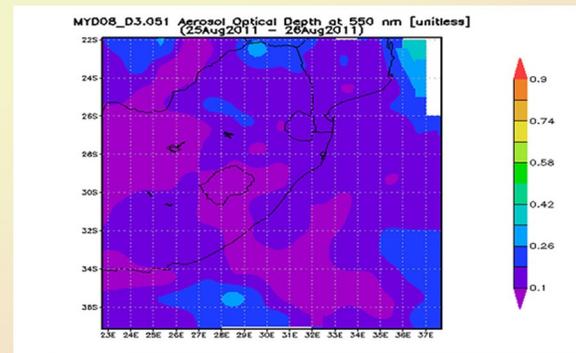
OMI NO₂ image of Ontario, showing the small source from western Ontario fires at upper left.



MODIS Aerosol Optical Depth Image of smoke plume from the Ontario fires. This image was visualized with the Purple+Red+Stripes palette.



OMI NO₂ image of South Africa, showing a large region of elevated NO₂ in eastern South Africa, August 25-26, 2011.



MODIS AOD image of South Africa, August 25-26, 2011. Very little smoke corresponding to the large area of NO₂ is evident in this image. Ground-level winds may have limited the rise of smoke into the atmosphere where it is more detectable by MODIS.