

Retrieving and broadcasting near-real time biophysical parameters from MODIS and SEVIRI receiving stations at the Global Change Unit of the University of Valencia



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ABSTRACT

We present here the automatic processing chains implemented at the Global Change Unit of the University of Valencia. These allow for a near-real time retrieval of various biophysical parameters from sun-synchronous TERRA/AQUA MODIS (Moderate Resolution Imaging Spectroradiometer), and from geostationary MSG SEVIRI (Spinning Enhanced Visible and Infrared Imager) sensors. Retrieved parameters are similar for both sensors, and specific approaches have been developed and implemented for near-real time parameter retrievals: < 2 hours for MODIS, and < 5 minutes for MSG-SEVIRI. A BRDF (Bidirectional Reflectance Distribution Function) correction has still to be implemented in both processing chains, while more advanced parameters are already retrieved (hotspot detection, MSG-SEVIRI phenology), in good agreement with independent ground observations.

INTRODUCTION

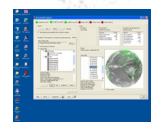
Within the framework of the Spanish CEOS-SPAIN project, a processing and broadcasting scheme has been developed and implemented at the Global Change Unit of the University of Valencia, taking advantage of the received MODIS and MSG-SEVIRI data. The processing scheme has been designed with the goal of a near-real time processing of the data, estimating biophysical parameters (see list in Table below) as straightforwardly as possible. The selected parameters to estimate are the following: sea (SST) and land surface temperatures (LST), for which the total amount of water vapor (WV) and emissivities are needed, NDVI (Normalized Difference Vegetation Index), Vegetation Condition Index (VCI). However, different corrections are needed to retrieve accurately these parameters, such as an atmospheric correction and a BRDF (Bidirectional Reflectance Distribution Function) correction for visible bands. This poster presents briefly the data received by the MODIS and MSG-SEVIRI stations located at the Global Change Unit, the processing chain for both streams of data, and a few applications of these data.

DATA

Two different streams of data are received at the Global Change Unit: MSG-SEVIRI (left) and MODIS (right). MSG-SEVIRI data are from a geostationary platform, at 3 km resolution at nadir, with an image every 15 minutes, amounting to 21 GB/day before processing. MODIS data are sun-synchronous, at 250m to 1km spatial resolution, with around three overpasses during the day, and 3 during the night, amounting to 4GB/day before processing. Each data stream is received on a dedicated computer, then processed by another dedicated computer, to be finally uploaded to a server.



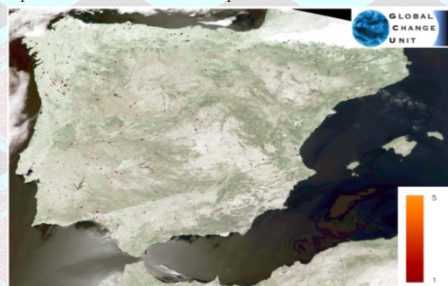
MSG-SEVIRI reception system.



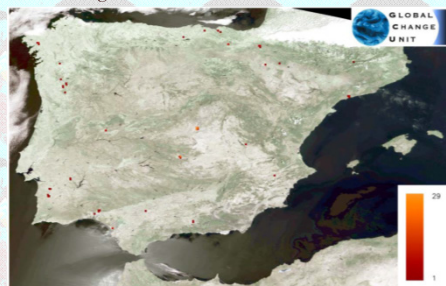
MODIS reception system.

APPLICATIONS

Hotspot detection: forest fires present a temperature in the MIR and TIR higher than their surroundings, which allow for their detection from MODIS and/or MSG-SEVIRI (Calle et al. 2006). Here we present the hotspots detected in Spain during May 2016, 229 and 50 hotspots by MODIS and MSG/SEVIRI, respectively. In yellow are depicted the greatest fires, both in extension or duration. Red fires are the ones with less extension or duration. Discrepancies between both maps are due to the different spatial resolution or the different time coverage.

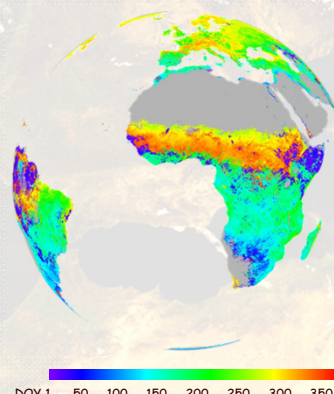


MODIS TERRA/AQUA (1km, 6 img/day)



MSG SEVIRI (4km, 1 img/15 min)

Phenology estimation: monitoring NDVI throughout a complete year allow for the estimation of phenological phases, such as the dates corresponding to the start and end of season (resp. SOS and EOS). Here we present an example of EOS dates for year 2013 for the whole MSG-SEVIRI disk. Comparison with PEP725 ground station data show an error below 1 week for EOS in Europe (Sobrino et al. 2013)



PROCESSING

Both streams of data are processed linearly following a similar scheme (see Table). The selected algorithms have been chosen from a literature review, and are based on standard procedures (contextual fire detection – MOD14, MOD35 cloud screening, SMAC atmospheric correction), completed with specific methods (threshold method for emissivities, band ratio for MODIS WV, SST, Split-window LST). A specific algorithm for instantaneous estimation of MSG-SEVIRI WV has been developed to allow for a near-real time processing of MSG-SEVIRI data stream. This algorithm makes use of the 6.2, 10.8 and 12 μ m bands.

Processing steps	MODIS	MSG-SEVIRI
Data unpacking and calibrating	YES	YES
Geolocation	YES	NO
Hotspot Detection	YES	YES
Cloud Detection	YES	NO
Water Vapor	YES	YES
Atmospheric Correction	YES	YES
Sea Surface Temperature	YES	YES
NDVI	YES	YES
Vegetation Condition Index	YES	YES
Land Surface Emissivity	YES	YES
Land Surface Temperature	YES	YES
Quicklooks	YES	YES
Upload to webpage and server	YES	YES
Compression	YES	YES



ALL DATA ARE AVAILABLE FOR DOWNLOAD: ceospain.lpi.uv.es

CONCLUSION

The MODIS and MSG-SEVIRI receiving stations at the Global Change Unit of the University of Valencia have been operational since mid-2007. All these data have been processed as described above, allowing for specific applications such as fire hotspot detection, phenology monitoring, or temperature spatial homogeneity studies (not shown). These data are available for download to the scientific community from the geoport located within the CEOS-SPAIN webpage: ceospain.lpi.uv.es. Additional products (BRDF correction) will be added in a near future.

REFERENCES

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