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Validation of MODIS aerosol optical depth over a Mediterranean and coastal urban environment (Valencia, Spain)

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Atmospheric aerosols, as small solid or liquid particles suspended in the atmosphere, are considered one of the largest uncertainties in climate modeling. They play an important role in the energy balance of the Earth scattering and absorbing solar radiation, and they also have an impact in precipitation, modifying clouds, or affecting air quality. In order to get a better knowledge of them, a great number of measurements all over the world have been done with different ground-based instruments and, in the last years, also with satellites.

One of the biggest efforts of characterizing atmospheric aerosols comes from AERONET (Aerosol Robotic Network). AERONET is an international operative network of Cimel CE318 sky-sunphotometers that provides the most extensive aerosol data base globally available of ground-based measurements. The ground sunphotometric technique is considered the most accurate for the retrieval of radiative properties of aerosols in the atmospheric column.

On the other hand, MODIS (Moderate Resolution Imaging Spectroradiometer) is a sensor located aboard both Earth Observing Systems (EOS) Terra and Aqua satellites, which provide almost complete global coverage every day. These satellites have been acquiring data since early 2000 the (Terra) and middle 2002 (Aqua). Among all the different products they offer, the atmospheric aerosols products are of upmost importance. These are presented as level 2 products with a pixel size of 10 x 10 Km in nadir.

In this study we present a validation of MODIS aerosol optical depth (AOD) employing AERONET measurements obtained from 2007 to 2011, over an area of 50 x 50 km centered in Valencia. Valencia is a medium size Spanish city ($\sim$1,800,000 inhabitants in the metropolitan area) located in the Western coast of the Mediterranean Sea. AOD from MODIS is obtained by employing different algorithms in function of the pixel surface type, differing whether it is land or ocean. Therefore, the fact that our region of study is in the coast, makes us possible to validate MODIS' AOD retrieved both over ocean and over land for each satellite. This validation is done comparing spatial statistics from MODIS with corresponding temporal statistics from sunphotometers, as proposed by Ichoku et al. (2002).

As Valencia is located in the coast it often suffers the meteorological phenomena known as sea breeze. Therefore and improvement to the previous validation can be done by taking into account the wind speed and direction at the time of the satellites acquisitions, which usually take place in the morning between 1100 and 1300 UTC.

References:

- C. Ichoku et al. "A spatio-temporal approach for global validation and analysis of MODIS aerosol products", Geophysical Research Letters, 219, 12, 10.1029/2001GL013206, 2002.