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Satellite based estimation of Aerosols from forest fire

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During the last decades, the repeated occurrence of severe wildfires affecting various parts of the world has heightened the significant damage caused by fires in different types of vegetations and ecosystems. Fires lead to permanent changes in the composition of vegetation community, cause decrease in forests, loss of biodiversity, soil degradation, alteration of landscape patterns and cause greenhouse emission into the atmosphere. In particular, forest fire has been recognized as a significant contribution to the atmospheric pollutants being comparable to that from the fossil fuel combustion. Forest fire emissions are strongly dependent on many interdependent factors, among them the most significant are the following forest fuel and burning efficiency (i.e. fraction of biomass burned). Remote sensing can provide significant information for evaluating both forest fuel and burning efficiency (i.e. fraction of biomass burned).

Due to the limitations in the traditional approaches recent methodology has been proposed to determine burned biomass using the energy radiated measured from satellite sensors using the infrared spectral bands. in this paper, we propose an integrated use of satellite derived information based on (i) ASTER data to obtain fuel type characterization and (ii) MODIS for extracted energy radiated and aerosol distribution over the Basilicata Region (in South of Italy). In particular, concerning the assessment of aerosol from space it should be noticed that there are numerous satellite sensors with some type of aerosol detection capability: each type of satellite system and its sensors have strengths and weaknesses for aerosol detection. The NOAA Polar Operational Environmental Satellite (POES) Advanced Very High Resolution Radiometer (AVHRR), the NASA Moderate Resolution Imaging Spectroradiometer (MODIS) and the ESA Medium Resolution Imaging Spectrometer (MERIS) on board the Environmental Satellite (ENVISAT) yield high spatial resolution in the monitoring of aerosol optical thickness (AOT). which measures the total amount of light attenuated by the aerosol in an air parcel. The particulate optical thickness can be used in monitoring pollution, because the presence of particles in the atmosphere always causes a reduction in the optical thickness.

The available algorithms for the aerosol optical thickness (AOT) retrieval are generally sensor-specific due to the different characteristics of the satellite instruments. For some instruments several algorithms have been developed.

In this paper Moderate Resolution Imaging Spectroradiometer (MODIS) observations are used to determine the spatial and temporal extent of the summer 2009 forest fire aerosol episode over the Basilicata region. To this aim MODIS products free downloaded from NASA web site were analysed from January to December 2009 coupled with the fire data archive
In addition to fire affected areas, other additional locations representative of different environmental conditions and human activities were chosen to study the evolution of the aerosol properties during July and August 2009. MODIS observations reveal that relatively large aerosol optical depth are present at four out of the six locations for the summer period corresponding to the fire season in the investigated area.