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An algorithm to detect fire activity using Meteosat: fine tuning and quality assesment

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Hot spot detection by means of sensors on-board geostationary satellites allows studying wildfire activity at hourly and even sub-hourly intervals, an advantage that cannot be met by polar orbiters. Since 1997, the Satellite Application Facility for Land Surface Analysis has been running an operational procedure that allows detecting active fires based on information from Meteosat-8/SEVIRI. This is the so-called Fire Detection and Monitoring (FD&M) product and the procedure takes advantage of the temporal resolution of SEVIRI (one image every 15 min), and relies on information from SEVIRI channels (namely 0.6, 0.8, 3.9, 10.8 and 12.0 μm) together with information on illumination angles. The method is based on heritage from contextual algorithms designed for polar, sun-synchronous instruments, namely NOAA/AVHRR and MODIS/TERRAAQUA. A potential fire pixel is compared with the neighboring ones and the decision is made based on relative thresholds as derived from the pixels in the neighborhood.
Generally speaking, the observed fire incidence compares well against hot spots extracted from the global daily active fire product developed by the MODIS Fire Team. However, values of probability of detection (POD) tend to be quite low, a result that may be partially expected by the finer resolution of MODIS.
The aim of the present study is to make a systematic assessment of the impacts on POD and False Alarm Ratio (FAR) of the several parameters that are set in the algorithms. Such parameters range from the threshold values of brightness temperature in the IR3.9 and 10.8 channels that are used to select potential fire pixels up to the extent of the background grid and thresholds used to statistically characterize the radiometric departures of a potential pixel from the respective background. The impact of different criteria to identify pixels contaminated by clouds, smoke and sun glint is also evaluated. Finally, the advantages that may be brought to the algorithm by adding contextual tests in the time domain are discussed. The study lays the grounds to the development of improved quality flags that will be integrated in the FD&M product in the nearby future.