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Extending RST-FLOOD to thermal infrared data: a possible operational strategy for flooded areas detection in near real time

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In the recent years the use of remote sensing data has been growing rapidly in the flood risk context, because they can offer the possibility to support hydrological and hydraulic analyses aimed at both improving flood inundation models and better understanding hydrodynamic processes for managing flood emergency.
Optical sensors aboard meteorological satellites may provide a useful contribution for a rapid detection and mapping of areas interested by a flood. Such sensors, being able to guarantee a steady and frequent stream of images (with a temporal resolution variable from hours to minutes), have in fact a great potential for near real time monitoring of flood evolution. Actually, to be effectively used for supporting flood risk management and assessment, such kind of data must be analyzed using reliable earth observation (EO) techniques in order to guarantee consistent results regardless of the used data/sensor.
The methodology used and shown in this paper has been moving in this direction. Such a methodology, known as RST (Robust Satellite Techniques) approach (in the paper named RST-FLOOD to indicate its specific application to flood risk) and based entirely on satellite remote sensing data, is a multi-temporal scheme of data analysis which identifies statistically significant anomalies of the investigated signal on the basis of a preliminary characterization of the signal in normal (i.e. unperturbed) conditions. Its implementation on visible and near infrared bands of AVHRR (Advanced Very High Resolution Radiometer) and MODIS (Moderate Resolution Imaging Spectroradiometer) sensors, for studying different flooding events occurred worldwide, already showed its potential in correctly detecting flooded zones furnishing reliable flood maps. The main issue of this approach is its limited application during daylight.
In this paper, the proposed approach has been extended to satellite thermal data in order to assess its potential in identifying flooded pixel also during night-time conditions. Specifically, RST-FLOOD has been implemented on night-time thermal data acquired by AVHRR and MODIS (channel 4 and channel 31, respectively), defining a possible operational strategy for a reliable mapping of flooded areas, which will be presented and discussed in this work. The extreme flood occurred in Germany during the August 2002 was selected as test case.