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A Sentinel-1 Flood map generation QGIS plugin

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Climate change derived in changing weather patterns making risks very difficult to predict and one very representative example is flood events. Flooding due to overflow from water bodies can be analyzed through change detection techniques with satellite imagery from the Synthetic Aperture Radar (SAR) sensors such as the one on board the ESA Sentinel-1. This analysis will help us have a better understanding of the floodable areas and therefore provide better support and response to these events. The presented open-source Quantum GIS (QGIS) plugin for flood mapping provides this analysis to a growing earth observation user community as described in the following abstract.

The flood mapping QGIS plugin has been developed in the context of a FP7 EU funded earth observation project named RASOR (Rapid Analysis and Spatialisation Of Risk), a multi-hazard risk analysis and assessment to support the full cycle of disaster management. The plugin available through QGIS repository enables any user to execute the processing of flood maps based on S1 data in their local work environments. Moreover, results can be uploaded to the RASOR platform in order to be shared with the community.

The RASOR Floodmap plugin takes as input two Sentinel-1 SAR images, one taken as reference and another just after the flood event. In parallel, the Area Of Interest (AOI) can be established with one or more polygons in a Shapefile format. The algorithm calibrates and co-registers both images to obtain a change detection RGB GeoTiff file. A K-Means filtering is performed in order to smooth the results and in preparation for the last classification step. Classification is performed by the plugin in which one or more classes are identified as flooded area and therefore polygonise of the extent is conducted, the user can make use of the QGIS workspace in order to supervise results and perform the necessary refinements, for instance by comparing them with different optical images or land cover information. The algorithm is run with the assistance of a Graphical User Interface (GUI) developed in PyQT for the QGIS open-source software suite. The underlying components for this algorithm are well-known open-source earth observation tools and libraries such as SNAP (Sentinel Application Platform), Orfeo toolbox and GDAL/Osgeo.

The work presented illustrates how open source software provides valuable tools to exploit Earth Observation data, by enabling the creation of new interfaces for the geoscientist community. Moreover, it contributes to the study of flood events based on S1, and the use of flood map information for the planning of emergency actions, the improvement of flood forecasts and its use in water resource management by international groups.