Examples of DAFNE application to multi-temporal and multi-frequency remote sensed images and geomorphic data for accurate flood mapping.

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DAFNE (Data Fusion by Bayesian Network) is a Matlab-based open source toolbox, conceived to produce flood maps from remotely sensed and other ancillary information, through a data fusion approach [1]. It is based on Bayesian Networks and it is composed of five modules, which can be easily modified or upgraded to meet different user needs. DAFNE provides, as output products, probabilistic flood maps, i.e., for each pixel in a given output map, the probability value that the corresponding area has been reached from the inundation is reported. Moreover, if remote sensed images have been acquired in different days during a flood event, DAFNE allows to follow the inundation temporal evolution.

It is well known that flood scenarios are typical examples of complex situations in which different factors have to be considered to provide accurate and robust interpretation of the situation on the ground [2]. In particular, the combined analysis of multi-temporal and multi-frequency SAR intensity and coherence trends, together with optical data and other ancillary information, can be particularly useful to map flooded area, characterized by different land cover and land use [3]. Here a recent upgrade is presented that allows to consider as input data multi-frequency SAR intensity images, such as X-band, C-band and L-band images.

Three different inundation events have been considered as applicative examples: for each one, multi-temporal probabilistic flood maps have been produced by combining multi-temporal and multi-frequency SAR intensity images images (such as COSMO-SkyMed , Sentinel-1 images and ALOS 2 images), InSAR coherence and optical data (such as Landsat 5 images or High Resolution images), together with geomorphic and other ground information. Experimental results show good capabilities of producing accurate flood maps with computational times compatible with a near real time application.

