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Flood mapping by combining the strengths of optical and Sentinel active radar remote sensing

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Flood mapping with remote sensing plays an important role in large scale disaster management procedures. For this purpose, the Dartmouth Flood Observatory (DFO) gained experience since 1993 with the production of flood maps from optical satellite imagery and has currently established, together with NASA collaborators, a fully automated, global, near real-time service. Another consortium is also presently working on an automated, near real-time, global flood mapping procedure called the 'Global Flood Observatory' (GFO), which will make use of high resolution Sentinel data. The procedure is currently tested on Envisat active radar (ASAR) imagery. Both the DFO and GFO projects provide open data output of their data and maps.

The optical and radar approaches to flood mapping each have advantages and suffer from shortcomings. Optical remote sensing via the U.S. MODIS and VIIRS sensors is constrained by cloud cover but can attain a high revisit frequency (>2 /day), whereas the Envisat ASAR is not affected by cloud cover, but uses a lower revisit frequency (generally once/3 days, depending on the location). In this contribution, we demonstrate the combination of both approaches into one flood mapping result. This results in improved flood mapping in a case study over the Chao Phraya basin (Bangkok surroundings) during the recent October-November 2011 extreme flooding. The combined map shows that during overpass, ASAR reveals flooded regions over cloud-obscured areas, which clearly follow elevated features in the landscape such as roads, embankments and railways. Meanwhile, the high frequency of delivery of the optical information ensures timely information. Also, the quite different water classification methods used for the optical and ASAR data sources show good agreement and have been successfully merged into one GIS data product. This can also be automatically generated and disseminated on a global basis.