

Asia flood mapping using multiple satellite data

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Monsoon floods occur frequently as one of the major disasters in the Asian region, the most flood-prone region in the world. Therefore, flood mapping is an imperative process as part of flood risk management. With the development of advanced optical and SAR sensors, flood detection algorithms should be progressively developed to produce more accurate flood maps under climate change and environmental changes. However, there are many challenging issues regarding, for example, the limitations of each sensor type as well as data acquisition with revisit time.

Despite very limited satellite-based data, this study introduces good examples of snapshot flood detection and annual flood monitoring focusing on urbanized mega-deltas in international river basins in Asian countries using a new index-based flood algorithm with a synchronized floodwater index, SfWi². Multiple types of advanced satellite data, such as Landsat-8 (NASA), MODIS (MODerate resolution Imaging Spectroradiometer, NASA-USGS), AMSR2 (Advanced Microwave Scanning Radiometer 2, NASA-JAXA), Sentinel-1 (ESA), and ALOS-2 (JAXA), were employed to detect the flood extent for wide application to a global flood mapping and operational global flood risk system. As preliminary results of most vulnerable Asian countries, the pilot studies represent the dynamics of flood extent and flood propagation process over the mega deltas in Bangladesh and India (i.e., the 2015 flood in the basins of the Ganges, Brahmaputra and Magna rivers), China (i.e., the 2016 flood in the Yangtze River basin), Cambodia and Vietnam (the 2012 flood in the Mekong River basin), Pakistan (the 2010 flood in the Indus River basin), and Thailand (the 2011 flood in the Chao Phraya River basin).

The resultant maps show a methodological possibility for instant and comprehensive flood mapping at the international river-basin level. In addition, these satellite-detected flood maps will help validate hydrological model-based inundation areas to assess the accuracy of comparative flood maps. However, many ambiguities still remain to be solved in rapid flood mapping of urbanized mega-delta floodplains due to different spatio-temporal resolution, surface complexity, and sensor ability, and further effort is necessary to improve flood algorithms for satellite-derived products.

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