

Probabilistic Mapping of August 2018 Flood of Kerala, India, Using Space-borne Synthetic Aperture Radar

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Abstract

Synthetic Aperture Radar imaging provides an all-weather sensing technique that is suitable for near-real-time mapping of disasters such as floods and wildfires. Here, we use SAR data acquired by Sentinel-1A/B satellites to investigate a flood event that affected the Indian state of Kerala in August 2018. We apply a Bayesian approach to generate probabilistic flood maps, which contains the flood probability for each pixel rather than binary flood information. We find that the extent of the flooded area with high probability begins to increase throughout Kerala after August 8, with the highest values on August 9 and August 21. We observe no apparent correlation between distributions of the flooded area and the spatial distribution of precipitation at the district level. Instead, larger flooded areas are in districts of Alappuzha and Kottayam, located in the downstream flood plain of the Idduki dam, which released significant volume of water on August 16. Further comparison of our SAR-based flood maps with optical data and flood maps produced by Moderate Resolution Imaging Spectroradiometer (MODIS) highlights the advantages of our data and approach for rapid response purposes. Moreover, such probabilistic flood maps can be directly assimilated into hydrodynamic models and act as a significant component for future flood forecasting models, which are useful to managers, decision-makers, and insurance agencies in the era that the frequency and intensity of severe floods are increasing.

Keywords: Synthetic Aperture Radar (SAR), Probabilistic flood map, Kerala 2018 flood