Effective utilization of RISAT-1A multi-mode satellite data for near real time flood mapping and monitoring: case study and implementation at the national level

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Flooding is a recurring issue in India, affecting 10–15 states annually during monsoon season and coastal regions due to cyclones. Microwave satellite data from SAR sensors like RISAT-1A, launched in February 2022, offers near real-time flood mapping crucial for relief efforts. Various acquisition modes, including medium resolution ScanSAR (MRS) mode, coarse resolution ScanSAR (CRS) mode and fine resolution Strimap (FRS) mode, provide suitable resolutions for flood mapping. Case studies demonstrate the behaviour of the backscatter coefficient in flood pixels, essential for flood map preparation. Validation against optical datasets shows a high accuracy of 91% in CRS, 94% in MRS and 94% in FRS, which is acceptable for near real-time mapping. The 67 and 91 flood maps were generated in 2022 and 2023 respectively, aiding state and central disaster management.

Keywords: Flood damage assessment, flood disaster, flood mapping, RISAT-1A, synthetic aperture radar data.

of India, resulting in storm surges, heavy rainfall and severe floods, leading to prolonged standing water in areas and causing severe floods. The flood affected area in India is estimated annually from 1998 to 2022 using multi-sensor satellite datasets, and the cumulative flood affected area is estimated to be 15.75 Mha during 1998–2022 (ref. 4).

Remote sensing has transformed our understanding of flood processes at different scales, improved the prediction and monitoring of floods, and improved disaster response, which involves understanding of various main characteristics of floods, typical types of flood information, advantages, and limitations and challenges in using synthetic aperture radar (SAR) data for flood inundation delineation. Satellite remote sensing offers synoptic coverage and the capability to monitor more extensive regions repeatedly, making it an indispensable tool for disaster management and mitigation efforts. This method helps to identify critical areas and understand flood progression, monitoring post-flood impacts like damage assessment.

Satellites use optical sensors that require sunlight