Multitemporal Analysis of Flood Events in the Attanagalu Oya River Basin in Sri Lanka using Sar Data

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Key words: Cartography; Geoinformation/GI; Hydrography; Land management; Remote sensing; Risk management; Spatial planning; Standards; Disaster Risk Management; Flood Mapping; SAR Data; Sentinel-1

SUMMARY

Flooding is one of the most pervasive natural hazards worldwide, causing severe disruption to livelihoods, infrastructure, and ecosystems. Accurate mapping of flood extents remains a challenge, particularly in tropical regions where persistent cloud cover and limited ground observations constrain the effectiveness of conventional optical remote sensing. Sri Lanka, with its monsoon-driven climate and densely populated river basins, is highly vulnerable to recurrent flooding. Among these, the Attanagalu Oya basin on the island's western slope experiences frequent inundation, creating urgent demand for reliable flood risk assessment tools. This study aims to enhance flood mapping and risk analysis in the Attanagalu Oya basin through the use of Synthetic Aperture Radar (SAR) data from the Sentinel-1 mission. Multitemporal datasets from the flood years 2016, 2017, and 2018 were processed using the ESA SNAP platform. The methodology involved radiometric calibration, terrain correction with Digital Elevation Model (DEM) data, and a threshold-based algorithm for water detection. Change detection techniques were applied to distinguish between permanent water bodies and episodic flood events, while validation was conducted against reference inundation maps to assess accuracy. The results revealed clear spatiotemporal patterns of inundation, identifying areas that are consistently vulnerable to flooding. Integration of DEM-derived slope and elevation information refined the classification of flood-prone zones, highlighting both low-lying agricultural areas and critical infrastructure corridors at risk. The findings not only demonstrate the robustness of SAR data for flood monitoring under adverse weather conditions but also provide actionable insights for disaster preparedness, land-use planning, and climate-resilient infrastructure development.It is recommended that future studies expand the temporal scope to incorporate recent flood events and integrate advanced approaches such as machine learning and multisensor fusion to further improve detection accuracy. The methodological framework established here can be adapted to other flood-prone basins in Sri Lanka and beyond, contributing to global efforts in disaster risk reduction

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and sustainable water resource management.

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