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A Decadal Flood Assessment Using Time-Series Satellite Data in Cambodia

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Abstract : Flood is among the most frequent and costliest natural hazards. The flood disasters especially affect the poor people in rural areas, who are heavily dependent on agriculture and have lower incomes. Cambodia is identified as one of the most climate-vulnerable countries in the world, ranked 13th out of 181 countries most affected by the impacts of climate change. Flood monitoring is thus a strategic priority at national and regional levels because policymakers need reliable spatial and temporal information on flood-prone areas to form successful monitoring programs to reduce possible impacts on the country's economy and people's likelihood. This study aims to develop methods for flood mapping and assessment from MODIS data in Cambodia. We processed the data for the period from 2000 to 2017, following three main steps: (1) data pre-processing to construct smooth time-series vegetation and water surface indices, (2) delineation of flood-prone areas, and (3) accuracy assessment. The results of flood mapping were verified with the ground reference data, indicating the overall accuracy of 88.7% and a Kappa coefficient of 0.77, respectively. These results were reaffirmed by close agreement between the flood-mapping area and ground reference data, with the correlation coefficient of determination (R^2) of 0.94. The seasonally flooded areas observed for 2010, 2015, and 2016 were remarkably smaller than other years, mainly attributed to the El Niño weather phenomenon exacerbated by impacts of climate change. Eventually, although several sources potentially lowered the mapping accuracy of flood-prone areas, including image cloud contamination, mixed-pixel issues, and low-resolution bias between the mapping results and ground reference data, our methods indicated the satisfactory results for delineating spatiotemporal evolutions of floods. The results in the form of quantitative information on spatiotemporal flood distributions could be beneficial to policymakers in evaluating their management strategies for mitigating the negative effects of floods on agriculture and people's likelihood in the country.

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