

Chapter 8

Comparative Flood Inundation Mapping Utilizing Multi-Temporal Optical and SAR Satellite Data Over North Bihar Region: A Case Study of 2019 Flooding Event Over North Bihar

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ABSTRACT

Floods are investigated to be the utmost frequent and destructive phenomena among all other types of natural calamities worldwide. Thus, flood events need to be mapped to understand their impact on the affected region. The present case study is intended to examine and analyze the flood events occurred in July-August 2019 over the Northern Bihar region situated in Kosi and Gandak river basins. Furthermore, a comparative study was carried out to map the satellite based near real time flood inundation using multi-temporal Sentinel-1A (SAR) and MODIS NRT Flood data (optical and 3-day composite). Optical (MODIS) and Sentinel-1 SAR data were acquired to compare their flood inundation extent and the result shows overestimation in MODIS flood data due to varying spatial resolutions.

1. INTRODUCTION

Floods are the utmost destructive, pervasive, recurring meteorological, and hydrological hazard occurred due to natural and anthropogenic reasons. Notably, in the South Asian region, floods are the most vulnerable natural calamity with regard to human and economic losses because of the very dense population in the region. It was indicated (EM-DAT, 2016) that by the year 2016, Asia has experienced 46.7% natural disaster followed by America, Africa, Europe, and Oceania which experienced 24.3%, 16.9%, 8.2%, and 3.9% respectively. Among all natural disasters, flash floods, rain, and landslides were the most significant fatalities caused by higher run-off and higher rainfall in a concise period (Modrick and Georgakakos 2015). So, various mitigation practices were taken into consideration to restrict flooding. Improper planning in the roads construction, barrages, bunds across the river as well as the public efficacies inside the floodplain has led to a severe effect over the normal flow of the river or drainage system. Consequently, hasty siltation in the riverbed tends to the overflow of flooding water (Kumar et al. 2014). Inundations are frequent and a serious concern to human society that consequently leads to power quantification and flood occurrence. Over the decades, flood events were rising (Freer et al. 2013), so the advancement of flood mapping and applying flood inundation models using remotely sensed satellite data has become an essential application in monitoring and assessing the impact of floods. The inadequate resources in heavily populated countries led to the effective supervision in forecasting of floods (Wu et al. 2014). Over large areas, remote sensing (RS) data works as a substitute to provide useful information on progression of floods because the collection of information through in situ observation is impractical. Remote sensing data provides a classical solution for assessing a spatio-temporal flood evolution. The flood mapping based on RS

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