

# Estimation of Flood Water Depth using SAR Images and Digital Elevation Models

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Natural disaster assessment techniques can play an essential role in the planning of damage control and mitigation strategies. Flood disasters can affect a large population and may cause significant economic impacts on any society. The implication of remote sensing techniques is an economical, faster, and reliable way for disaster reliance policies. For the assessment of flood damage, flood water depth is a crucial parameter that can provide an accurate assessment of damage spread. Conventionally, flood depth values are estimated by applying the combination of hydraulic and rain-runoff models, which need a large number of input data that is acquired with time-consuming and generally costly. For this purpose, Floodwater Depth Estimation Tool (FwDET) can be adopted as a quicker, more convenient, and economical alternative method. In the current study, we used the FwDET with the input of DEM and flood extent area extracted from Sentinel 1 SAR images to estimate inundation depth. We applied the FwDET tool for the historic flood event in Quang Binh, Vietnam, in October 2020. The estimated flood depths were validated with 717 inventory points with an accuracy coefficient ( $R^2$ ) of 82.6% and root-mean-square error (RMSE) of 0.4m. These coefficients indicate that the FwDET can perform well for quick flood damage assessment. The results also showed the usefulness of combining remote sensing data and DEM in rapidly generating flood maps for near-real-time flood response.

**Keywords:**Flood depth, Sentinel-1, SAR data, DEM, Quang Binh