

# Delineation of small-scale landforms relative to flood inundation in the western Red River delta, northern Vietnam using remotely sensed data

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**Abstract** Flood susceptibility mapping using geomorphologic approaches is effective for delineating flood extent and various degrees of potential flood-affected areas. This approach is useful where the channel system and floodplain morphology change dynamically and in regions where detailed digital elevation models are not available. The first important step in flood zonation using this approach is detailed geomorphologic mapping, also called landform classification. This study aims to describe landform classification using the rule-based method of Ho et al. (Int J Geoinform 8(4):27–38, 2012) adapted to local characteristics in the western plain of the Red River delta, northern Vietnam. The original classification scheme is generally based on the moist condition classification, local land-surface parameters, and relative position indices derived from multi-temporal Landsat data and a shuttle radar topographic mission digital elevation model (SRTM DEM). This study uses average elevations and the standard deviation of elevations as local land-surface parameters rather than local relief, which was used in the study by Ho et al. (Int J Geoinform 8(4):27–38, 2012). Multi-temporal land cover classification was performed using an integrated method to effectively correct the SRTM DEM. The overall classification is consistent with manual mapping by visual comparison. The quantitative comparison between landform units and past flood-affected areas demonstrates a precise boundary delineation of landform objects using this method. The high agreement between

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