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Spatial Disaggregation of Satellite Rainfall using High Resolution Topographic and Environmental Data

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Landslides and associated debris flows are usually triggered by heavy rainfall. In the absence of in situ rainfall, the closest gauge measurements are usually used for debris flow analysis. Hence there is a need to estimate rainfall at the local scale for ungauged basins. We developed a spatial interpolation technique for estimating rainfall fields at the spatial scale of available topographic data based on rain gauge and satellite rainfall data. A hybrid spatial interpolation (HSI) scheme is first developed. It consists of point gauge measurements interpolated to the resolution of the topographic data using an adaptive inverse distance technique constrained by satellite rainfall measurements for the area. The HSI interpolated rain measurements, topographic data and surface meteorological conditions (aspect and exposure) are used as input to an Artificial Neural Network (ANN) to produce an interpolated rain field. Rain data collected by forty-seven rain gauges maintained by the Taiwan Central Weather Bureau in central Taiwan were analyzed during the passage of Typhoon Tori-Ji around July 29, 2001. Coincident satellite rainfall data collected by the Tropical Rainfall Measuring Mission (TRMM) Precipitation Radar is sued. The inclusion of satellite data reduces the error from about 23% to 17%. The inclusion of topographic information further reduces the error to 15%.