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Extreme rainfall and flood response

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What is an extreme rainfall? What causes an extreme flood? The properties of the storm and the nature of the responding catchment are critical to answering these questions and revealing a location's vulnerability to flooding. Radar and raingauge datasets from selected extreme storms are used in combination with rainfall-runoff models to understand catchment response at times of extreme rainfall. The datasets are employed to evaluate model performance, identify deficiencies and to seek improvements. A methodology has been developed to artificially "enhance" the datasets to simulate more extreme conditions by controlling the position, movement, size, shape and orientation of storms. Together with a rainfall-runoff model, this provides a controlled environment within which to understand extreme flood genesis and to "destruction test" models. A rainfall-runoff model based framework has been devised to associate a flow of a given return period (or damage severity) with the storm needed to realise it, as a function of initial catchment state. This can be used to set flood warning levels for likely future rainfall amounts and as a controlled environment within which to "destruction test" models. Case studies investigated encompass storms of convective, orographic and frontal type.