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Flooding from Intense Rainfall: an overview of project SINATRA

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Project SINATRA (Susceptibility of catchments to INTense RAinfall and flooding) is part of the UK NERC's Flooding From Intense Rainfall (FFIR) research programme which aims to reduce the risks of damage and loss of life caused by surface water and flash floods through improved identification, characterisation and prediction of interacting meteorological, hydrological and hydro-morphological processes that contribute to flooding associated with high-intensity rainfall events.

Extreme rainfall events may only last for a few hours at most, but can generate terrifying and destructive floods. Their impact can be affected by a wide range factors (or processes) such as the location and intensity of the rainfall, the shape and steepness of the catchment it falls on, how much sediment is moved by the water and the vulnerability of the communities in the flood's path. Furthermore, FFIR are by their nature rapid, making it very difficult for researchers to 'capture' measurements during events. The complexity, speed and lack of field measurements on FFIR make it difficult to create computer models to predict flooding and often we are uncertain as to their accuracy. In addition there is no consensus on how to identify how particular catchments may be vulnerable to FFIR, due to factors such as catchment area, shape, geology and soil type as well as land-use. Additionally, the catchments most susceptible to FFIR are often small and un-gauged.

Project SINATRA will:
(1) Increase our understanding of what factors cause FFIR and gathering new, high resolution measurements of FFIR by: assembling an archive of past FFIR events in Britain and their impacts, as a prerequisite for improving our ability to predict future occurrences of FFIR; making real time observations of flooding during flood events as well as post-event surveys and historical event reconstruction, using fieldwork and crowd-sourcing methods; and characterizing the physical drivers for UK summer flooding events by identifying the large-scale atmospheric conditions associated with FFIR events, and linking them to catchment type.

(2) Use this new understanding and data to improve models of FFIR so we can predict where they may happen nationwide by: employing an integrated catchment/urban scale modelling approach to FFIR at high spatial and temporal scales, modelling rapid catchment response to flash floods and their impacts in urban areas; scaling up to larger catchments by improving the representation of fast riverine and surface water flooding and hydromorphic change (including debris flow) in regional scale models of FFIR; improving the representation of FFIR in the JULES land surface model by integrating river routing and fast runoff processes, and performing assimilation of soil moisture and river discharge into the model run

(3) Use these new findings and predictions to provide the Environment Agency and other professionals with information and software they can use to manage FFIR, reducing their damage and impact to communities by: developing tools to enable prediction of future FFIR impacts to support the Flood Forecasting Centre in issuing new 'impacts-based' warnings about their occurrence; developing a FFIR analysis tool to assess risks associated with rare events in complex situations involving incomplete knowledge, analogous to those developed for safety assessment in radioactive waste management.