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Flooding from Intense Rainfall

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Brief periods of intense rainfall can lead to flash flooding with the potential to cause millions of pounds of damage to property, and to threaten lives. Accurate flood warnings even just a few hours ahead can allow preparations to be made to minimise damage. In order to improve the prediction of these events, more accurate forecasts of heavy rainfall are needed, and these can then be used to inform flood prediction and warning systems. The impact of a flood 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.

A broad agenda of research, funded under the UK Natural Environment Research Council (NERC) Flooding from Intense Rainfall (FFIR) programme in partnership with the UK Met Office and Environment Agency is addressing many of these issues. Improvements in numerical weather prediction of intense precipitation will be achieved by reducing initial condition errors. For example, in heavy rainfall, weather radar reflectivity measurements are strongly attenuated, leading to underestimation of the rainfall rate. Research funded under the FFIR programme has shown that radar reflectivities can be corrected using an emission technique that detects the "glow" of the storm. Further work has focussed on understanding the factors that cause FFIR, including 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. This data is being used to improve flood models from urban scale (high spatial and temporal resolution); 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.