



## Concurrency and climate change signal in Scottish flooding

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The Scottish Environmental Protection Agency maintains a database of river gauging stations and intensity rain-gauges with a 3-hourly resolution that covers the majority of Scotland. Both SEPA and a number of other Scottish agencies are invested in climate change attribution in this data set. SEPA's main interest lies in trend detection and changes in river level ('stage') data throughout Scotland, while Emergency response teams are more concerned with the concurrency of multiple flood events that might stretch their ability to respond effectively. Unfortunately, much of the rainfall signal within SEPA's river-gauge data is altered by land use changes, modified by artificial interventions such as reservoirs, compromised by tidal flow, or obscured by measurement issues. Data reduction techniques, indices of extreme rainfall, and robustness-driven discrimination have been employed to produce a reduced set of flooding-relevant information for 24-hour 'flashy' events. Links between this set and North Atlantic circulation have been explored, as have patterns of mutual occurrence across Scotland and location- and seasonally- dependent trends through time. Both frontal systems and summer convective storms have been characterised in terms of subsequent flood-inducing flow regime, their changing behaviour over the last fifty years, and their spatial extent.

This is the first stage of an ongoing project that will intelligently expand to take less robust river and rain-gauge stations into account. It is also the first study of its type to analyse a nation-scale dataset of both rainfall and flow from multiple catchments for concurrency of flood event. As intense rainfall is expected to become more frequent across much of Europe, this kind of research is likely to have an increasing degree of relevance for policy-makers. This project demonstrates that productive, policy-relevant and mutually-rewarding partnerships are already underway.