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Statistical downscaling of Global Model output to predict extreme point rainfall

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Spatial patterns of precipitation accumulation, as derived for example from radar snapshots, commonly have a form that depends on extraneous factors such as atmospheric structure. For example in strong wind dynamic rainfall situations there is often little spatial variability, in strong wind convective situations totals tend to vary greatly in one (wind-normal) direction, and in light wind convective situations great variability can be seen in all directions. It is in the latter case that extreme point totals are most likely, and it is also in this instance that grid-scale forecasts from (for example) a global model will exhibit the largest errors, when verified against observations at points.

It will be shown that the relationships between model-based parameters such as wind speed, and sub-grid variability in observed totals are extraordinarily strong, and that these relationships can be used to predict the probability of occurrence of extreme rainfall at a point. For example, one can imagine two scenarios in which a model predicts, respectively, 20 and 10mm of rain in 12h. Yet if other model parameters are favourable the chance of observing 100mm at a point within the gridbox can be considerably higher in the *second* scenario.

The above thus provides a new way by which single model and ensemble precipitation total forecasts can be downscaled, to give useful probabilistic forecasts of extreme precipitation, which in turn has practical applications in flash flood prediction. The concepts will be described, along with the statistical relationships identified to date, and future directions for this work.