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Sensitivity and dependence of mesoscale downscaled prediction results on different parameterizations of convection and cloud microphysics

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These days as operational real-time flood forecasting and warning systems rely more on high resolution mesoscale models employed with coupling system of hydrological models. So it is inevitable to assess prediction sensitivity or disparity in collection with selection of different cumulus and microphysical parameterization schemes, to assess the possible uncertainties associated with mesoscale downscaling. This study investigates the role of physical parameterization in mesoscale model simulations on simulation of unprecedented heavy rainfall over Yorkshire-Humberside in United Kingdom during 1-14th March, 1999. The study has used a popular mesoscale numerical weather prediction model named Advanced Research Weather Research Forecast model (version 3.3) which was developed at the National Center for Atmospheric Research (NCAR) in the USA. This study has performed a comprehensive evaluation of four cumulus parameterization schemes (CPSs) [Kian-Fritsch (KF), Betts–Miller–Janjic (BMJ) and Grell–Devenyi ensemble (GD)] and five microphysical schemes Lin et al scheme, older Thompson scheme, new Thompson scheme, WRF Single Moment – 6 class scheme, and WRF Single Moment – 5 class scheme] to identify how their inclusion influences the mesoscale model's meteorological parameter estimation capabilities and related uncertainties in prediction. The case study was carried out at the Upper River Derwent catchment in Northern Yorkshire, England using both the ERA-40 reanalysis data and the land based observation data.