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The influence of soil moisture conditions on the spatio-temporal variability of event rainfall-runoff coefficients in UK catchments

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Since the bias and uncertainties of the current design flood estimation methods for ungauged catchments are inevitable, estimation of the design flood in ungauged catchments still remains an unsolved problem. The derived distribution approach appears to be the one of the promising design flood estimation methods, as this method can improve the understanding on which processes contribute most to flood in ungauged catchments. Generally, the distribution of rainfall characteristics and lumped rainfall-runoff modelling was incorporated to estimate the flood magnitude in this method. However, we should note that rainfall is not the only driving factor of flood events. Soil moisture conditions are also an important driving factor affecting the rainfall-runoff transformation, and may even control rainfall-runoff coefficients to a higher degree than does rainfall. Hence, here we perform soil moisture analysis at national scale by employing GLDAS-Noah datasets, and link this to observed event runoff coefficients from a large sample of UK catchments. The relationship between soil moisture conditions and rainfall-runoff coefficient was explored to analyse the spatio-temporal variability of runoff coefficient. This study laid the foundation for further development of a practical derived distribution method, by considering the statistical distribution of rainfall-runoff coefficients and the influence of soil moisture conditions.