A seamless approach to assessing monsoon simulations in the Met Office Unified Model

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We present an assessment of monsoons as simulated by the latest configurations of the Met Office Unified Model. These consist of models of varying complexity that are used for Numerical Weather Prediction (NWP), climate, and seasonal prediction. A comparison is made between the model biases in different monsoon regions for the different configurations, giving an insight into the nature of the main systematic errors, and also of the time-scales involved in their development. Both the mean state and the variability are assessed using a metric-based approach. The main model bias in the Indian monsoon region is the relatively low precipitation over Indian land. This has been significantly improved in the latest atmospheric component of the climate model, mainly due to changes in the CAPE closure in the convection scheme, which are aimed at reducing the tendency for strong intermittent deep convection. A more detailed comparison of the model with ERA re-analysis data is made for the onset and the pre-monsoon period of the Indian summer monsoon, giving an insight into the impact of various changes to the model. The emphasis is placed on the impacts of the timing of convection, the development of the monsoon jet, the impact of cyclonic vortices, and the moistening rates over India. The interannual variability is further examined through analysis of the ENSO-monsoon teleconnection, the link between El Nino/La Nina events and below/above average rainfall over India, which is assessed using a metric-based approach.