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Evaluation of clouds in the Met Office global forecast model using CloudSat data

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Clouds and their radiative properties are still not sufficiently well represented in numerical weather prediction (NWP) and climate models. Improving their representation is a key priority, as clouds play a main role in the Earth's radiation budget and are a key uncertainty in predictions of climate change. CloudSat is the first spaceborne millimetre wavelength radar (94 GHz) that provides estimates of cloud condensate and precipitation globally. We have developed a system to simulate CloudSat data in the Met Office Unified Model (MetUM) that is consistent with the observations. We apply this simulator to evaluate the MetUM global forecast model, as previous studies have shown that the global forecast model is a useful framework in which to analyse cloud representation errors that are relevant for both numerical weather prediction and climate time scales. These comparisons are presented from two different points of view. Firstly, we analyse the direct comparisons of CloudSat passes over a mid-latitude system and tropical convection. Secondly, a more statistically-based approach is followed by computing two dimensional height-reflectivity histograms integrated over time. This second approach allows us to study how well the vertical distribution of clouds is represented in the MetUM.