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Predictability and spatial variability impacts in a cloud-resolving model

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Cloud-resolving models are used to improve our understanding of deep convective systems by resolving the important cloud processes missed by large scale models. Until recently, CRMs have typically been run with a horizontal grid length of 1 or 2 km, and in the study of organized deep convective systems this has been shown to be adequate. However, as the focus of experiments has moved to the development phase of convection such as the diurnal cycle, this has proved to be a problem. Here I will briefly show that transports not resolved by the 1 km grid-scale are important for modelling the development of convection and will use a shorter grid length in my further studies.

When considering the diurnal cycle of convection, CRMs have typically been initialized with a prescribed mean profile and white noise in temperature in the lowest few layers to allow the model to "spin up". It will be shown that the development of deep convection in a CRM can vary considerably simply by using a different white noise in the temperature. It will also be shown that the lack of horizontally variability of temperature and moisture on larger scales can impact the timing of convective development. A new method for initializing a CRM to study the diurnal cycle is proposed.