

The added value of hecto and kilo meter scales for the representation of clouds and precipitation

In this talk we summarize our experiences in the German national project, high-definition clouds and precipitation for climate prediction, focusing on the added value of high resolution. Simulations using ICON over different domains are presented, the maritime continent and East-Asia, Germany, the Tropical Atlantic, and the North Atlantic, using models with grid spacings ranging from 155 m to 2.5 km and are contrasted with results from climate and NWP models running grid spacings ranging from 10 km to 100 km. The results show that, consistent with a great body of previous work, the ability to resolve precipitating systems increases their representation and statistics in manifold ways, but that most of the gains are realized already at grid spacings of 2.5 km. Few qualitative changes are evident as the resolution is reduced finer to the hectometer scale. Clouds on the other hand are more sensitive to the grid spacing across this range of scales. Many of their features change qualitatively and become more realistic as the resolution approaches hectometer scales; but even at a resolution of 155 m, deficiencies remain. The implications are that advances in computing may greatly advance our ability to represent precipitation in the climate system, as well as the circulation systems underpinning different cloud regimes, making their parameterization more straightforward.