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Storm Tracks and Jet Streams in ICON: Unravelling Climate Change Responses through Aquaplanet Horizontal Grid Spacing Sensitivity Experiments

Angel Peinado Bravo[1], Tiffany Shaw[2], Daniel Klocke[1], and Bjorn Stevens[1]
[1]Max Planck Institute for Meteorology, Hamburg, Germany
[2]The University of Chicago, Chicago, IL, United States

General Circulation Models (GCMs) are widely used to understand our climate and to simulate and predict the effects of global warming, revealing the dynamical convergence of storm tracks and jet streams at horizontal grid spacing of 50 km (e.g., Lu et al. 2015). Nevertheless, they have shown persistent biases in the large-scale features of the general circulation and basic climate statistics, which are attributed mainly to the parameterization, specifically, convection parameterization. To address this, Global storm-resolving models (GSRMs) provide an alternative approach to parameterization by explicitly resolving convection and its interaction with other processes, through the refinement of the horizontal grid, thus, offering new insights into the climate system. In a prior study, we showed the physical convergence of the tropical and general circulation structure at horizontal grid spacing of 2.5 km using aquaplanets. However, questions linger: Does the response under climate change of the storm tracks and jet streams converge at similar horizontal grid spacing, and what mechanism controls this convergence?

We will present the effect of increasing horizontal grid spacing on the convergence of the storm tracks and jet stream location and intensity using the global storm-resolving model ICON. Control runs and idealised climate change experiments (increasing sea-surface temperature by 4 Kelvin) were conducted at horizontal grid spacing from 160 km to 2.5 km using an aqua-planet configuration. We adopt an aqua-planet configuration to focus on atmospheric phenomena, specifically convection and cloud feedback, meanwhile reducing the effect of complex interaction with land, topography, sea ice, and seasons. We will discuss the convergence rate of the eddy driven jet, subtropical jet, storm track, and large-scale circulation and their response to climate warming, characterised by the location, width, and intensity.