



CMIP6 HighResMIP - Global High Resolution Climate Modelling

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CMIP6 HighResMIP defines an experimental protocol designed to elucidate improved understanding of the robust role of increasing horizontal resolution in global climate modelling. Seven European models (all part of H2020 PRIMAVERA) together with an increasing number of other international groups have either started or completed atmosphere-only or coupled model simulations using this protocol, with resolutions ranging from 250km to 25km in the atmosphere, and 1° to 1/12° in the ocean, and a time period of 1950-2050.

We find robust changes to some long-standing climate biases in both precipitation and coupled sea surface temperatures when we compare multi-model ensembles of higher and lower resolution models. Representation of orography and bathymetry seem to play an important role in some of these changes. There are also consistent differences in surface fluxes, together with enhanced ocean heat transports at higher coupled model resolutions.

Simulations into the future under the SSP58.5 scenario will enable us to assess whether these changes in mean bias have any impact on the future evolution of the climate. Although global mean temperature changes have little sensitivity to resolution, there are differences in the regional spatial patterns that could be significant for climate impacts.

One of the main challenges in analysing datasets such as these are the data volumes – the PRIMAVERA project alone expects to locally store at least 3 PB of data. However, using only one ensemble member is not enough to assess some aspects of climate variability and change (such as temperature trends and tropical cyclone variability), and hence additional ensemble members are being produced to assess the required ensemble size to improve the signal-to-noise ratio.