



Resolution sensitivity of tropical cyclones in CMIP6 HighResMIP global climate simulations

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For the first time in the CMIP exercise, international modelling groups have come together under a coordinated protocol, CMIP6 HighResMIP, which is designed specifically to investigate the role of global model horizontal resolution in the simulation of climate processes. The “highresSST-present” atmosphere-only experiment prescribes simulations over 1950-2014, using a simplified anthropogenic aerosol forcing. Six European models (within the H2020 PRIMAVERA project) as well as GFDL, MPAS, NICAM and FGOALS models, have completed these simulations using at least two different resolutions, the lower typical of CMIP-type models, while the higher aims towards and beyond 25km mesh size. Most of the models (and several reanalyses) have been analysed using two feature-tracking algorithms (TRACK and TempestExtremes) with no tuning of algorithm for model or basin.

The multi-model set shows some expected improvements with resolution, which are robust across the different tracking algorithms. These include increased tropical cyclone frequency and seasonal ACE (Accumulated Cyclone Energy), an increase in the maximum intensity of simulated storms (including one model agreeing well with observations), and an improved spatial distribution of storm tracks. Assessment of interannual variability is more difficult with only one ensemble member, but using at least one model with more ensemble members (up to 13) does demonstrate a clear increase in skill at higher resolutions.

Most of these models will also be used for future simulations out to 2050 (using the SSP5-8.5 scenario), and hence this multi-algorithm-model-resolution dataset may help to systematically understand the robust drivers of future change in tropical cyclones. Additional international modelling groups are also beginning to complete the HighResMIP protocol and hence this dataset will become richer over time.