



Comparative morphology of tropical cyclones in PRIMAVERA-HighResMIP AGCMs

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For the first time in the CMIP exercise, international modelling groups have come together under a coordinated protocol, HighResMIP, which is designed to investigate the role of model resolution in the simulation of climate processes. The atmosphere-only protocol prescribes simulations of 65 years (1950-2014) using historic forcing. Six European groups within the H2020 PRIMAVERA project have completed these simulations with at least two different resolution models, the lower typical of CMIP-type models, while the higher aims towards 20km mesh size.

All simulations have been tracked using a vorticity-based algorithm that takes into account storm structure and is able to discriminate warm core and cold core storms. A common tracking configuration is applied to all models, so as to enable meaningful comparison. Once all storms have been identified and classified in terms of intensity and region of formation, structural composites, including storm environment information, can be formed and compared. Initial analysis of these PRIMAVERA results shows that Tropical Cyclone structures are more credibly simulated at high resolution, in terms of their symmetry, core geometry, radius of maximum winds, and vertical extent of the warm core. These structural responses to high resolution are also reflected in the magnitude of the winds at 925hPa and near the surface, so that the 20km AGCMs produce a more realistic PDF of overall storm intensity. However, the majority of the models analysed can still only simulate storms up to Category 3, while Category 4 and above are significantly or entirely underestimated. These results are in fact consistent with the magnitude of the gradients that can be sustained by a model mesh at around 20km.