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Cyclone activity as revealed from climate experiments with coupled GCMs

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Since cyclone activity is one of the most effective characteristics of the observed climate variability the ability of climate models to represent proper cyclone characteristics is crucial for the quality of the climate models. In the present study characteristics of the cyclones in the two GCMs, developed at the MPI in Hamburg (ECHAM4/OPYC and ECHAM5/OM) are compared with reanalysis data. Additionally, greenhousegas experiments with both models are analyzed. Beside cyclone number and frequencies the characteristics of cyclone life cycles are included as well. The focus is on the summer and winter season and the Northern Hemisphere.

The higher resolved further development ECHAM5/OM shows clear improvements in comparison with ECHAM4/OPYC. In large parts of the Northern Hemisphere cyclone number and frequency are in surprisingly high agreement with reanalysis data. The same holds for the derived cyclone characteristics. Thus, especially ECHAM5/OM seems to provide a good basis for further climate experiments. In this assessment, we compared the first 20 years of the control integration under past climate conditions (1860) with the periods 1978-1999 and both 2070-90 and 2170-2190. Regional changes of cyclone numbers are in the order of 10-15% while hemisphere-wide changes in the cyclone characteristics are rather small. Thus, with our analysis we can not support the hypothesis of enhanced storminess under greenhousegas forcing.