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Downscaling Tropical Cyclones from global re-analysis.

Abstract.

Dynamical downscaling is a commonly used method to describe consistently regional weather detail by post-processing global re-analyses. The downscaling is mostly done by running a limited area atmospheric model (LAM), which is constrained by the large-scale state well-described by the global re-analysis ("spectral nudging").

In the present talk, first the experience with the methodology applied to extra-tropical storminess and its impacts on surges and waves is reviewed. In a second part, we examine the performance of the method in describing regionally the formation and tracks of tropical cyclones (TCs) in East Asia.

The model, using a grid with about 50 km meshsize, was run for 60 years, from 1948 to 2007, constrained by NCEP re-analysis. We demonstrate in case studies how the LAM generates storm at the right time with tracks similar to the observed ones, albeit with too high core pressures and too low maximum winds. In the 1948-2007 simulation all TCs are identified with an automated system, which makes use of spatial filters. The parameters of the automated system are set to return on average about the right numbers of TCs.

The 1948-2007 time series of the annual numbers of TCs in the simulation and in the best track (BT) data correlate favourably. The rms-difference between simulated and BT-analysed TCs is about 5 TCs per year, with 26 TCs per year in the long term average. Interestingly, the rms-error shows only a little tendency of getting smaller after the advent of satellite data. Seemingly, the availability of satellite data had a minor impact on the quality of the large-scale analysis of NCEP (used to run the LAM) and on the quality of the best track analysis of TCs in E Asia.

In both, the best track data set as well as in the downscaled data, a weak tendency towards less TCs emerges; this slight downward trend is masked by strong interannual variability, with an overall maximum of 39 TCs and a minimum of 16 storms. The interdecadal variability is relatively weak, albeit stronger in the best track data than in the downscaled data.