Future projection of extratropical cyclone simulated by a 14 km mesh global atmospheric model

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Changes in the extratropical cyclones due to global warming were investigated using 14 km mesh global non-hydrostatic atmospheric model. Present and future climate runs were performed for 30 years each with cloud microphysics scheme instead of convection scheme. Detection and tracking algorithms were applied to the model output as well as reanalysis data to obtain statistics of the extratropical cyclones. Structural changes of the extratropical cyclones were analyzed by compositing each variable at the cyclone center.

The model simulates statistics and mean structure of the extratropical cyclones including histograms of mean sea level pressure (MSLP), wind speed and precipitation and dynamical structure. Geographical distribution of storm-track is captured, though significant positional bias exists, especially over the north Pacific.

The model projects poleward shift of the storm-track and slight reduction of the number of extratropical cyclones. Though MSLP does not change significantly, precipitation and Southern Hemispheric low-level wind speed around the extratropical cyclone are enhanced due to global warming. The magnitudes of changes in precipitation and low-level wind speed tend to be greater for the cyclones with lower synoptic-filtered MSLP. Both liquid and ice water paths are increased, and it seems to be linked to the increased temperature and the enhanced upward motion around the extratropical cyclones. Such thermodynamical and dynamical factors will be discussed in our talk.

Keywords: extratropical cyclone, future projection, high-resolution global atmospheric model

