Uncertainties in Future Changes in Tropical Cyclone Activity Projected by Multi-Physics and Multi-SST Ensemble Experiments

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Uncertainties in projected future changes in tropical cyclone (TC) activity are investigated using future (2075–2099) ensemble projections of global warming under the Intergovernmental Panel on Climate Change (IPCC) A1B scenario. Twelve ensemble experiments are performed using three different cumulus convection schemes and four different assumptions for prescribed future sea surface temperatures (SSTs).

All ensemble experiments consistently project significant reductions in global and hemispheric TC genesis numbers as well as reductions in TC frequency of occurrence (TCF) and TC genesis frequency (TGF) in the western North Pacific, South Indian Ocean, and South Pacific Ocean. TCF and TGF are projected to increase over the central Pacific which is consistent with the findings of Li et al. (2010).

Inter-experimental variations of projected future changes in TGF and TC genesis number are caused mainly by differences in large-scale dynamical parameters and SST anomalies. Thermodynamic parameters are of secondary importance for variations in TGF and TC genesis number. These results imply that differences in SST spatial patterns can cause substantial variations and uncertainties in projected future changes of TGF and TC numbers at ocean-basin scales.