A Statistical Model of Tropical Cyclone Tracks in the Western North Pacific with ENSO-Dependent Cyclogenesis

Emmi Yonekura
Columbia University Department of Earth and Environmental Science, New York, New York

Timothy M. Hall
NASA Goddard Institute for Space Studies, New York, New York

ABSTRACT: A statistical model for western North Pacific tropical cyclone genesis and tracks is developed and applied to estimate regionally-resolved tropical cyclone landfall rates along the coasts of the Asian mainland, Japan, and the Philippines. The model is constructed on IBTrACS 1945-2007 historical data for the western North Pacific. The model is evaluated in several ways, including comparing the stochastic spread in simulated landfall rates to historic landfall rates. Although certain biases have been detected, overall the model performs well on the diagnostic tests, for example, reproducing well the geographic distribution of landfall rates. Western North Pacific cyclogenesis is known to be influenced by the El Niño/Southern Oscillation (ENSO). This dependence is incorporated in the model's genesis component to project the ENSO-genesis dependence onto landfall rates. There is a pronounced shift eastward in cyclogenesis and a modest overall reduction in annual counts with increasing ENSO index value. On almost all regions of coast landfall rates are significantly higher in a negative ENSO state (La Niña).