An analysis of the potential for extreme temperature change based on observations and model simulations

B.H. Lynn, R. Healy, and L. M. Druyan

Hebrew University of Jerusalem, Israel (Barry-Lynn@weather-it-is.com)

Observational climate data for June-August 1977-2004 and simulations of current and future climate scenarios from a nested GCM/regional climate model system were used to assess the potential for extreme temperature change over the eastern United States. The results show how inter-annual changes in the characteristics of precipitation are associated with the development of extreme summer time temperatures. For instance, observational evidence indicates that anomalously warm summers in the eastern United States coincide with anomalously cool eastern Pacific sea-surface temperatures, conditions that are conducive to geo-potential ridging over the east, less frequent precipitation and lower accumulated rainfall. The study also found that days following nighttime rain are warmer on average than daytime rain events, emphasizing the importance of the timing of precipitation on the radiation balance. Model simulation results show the sensitivity of maximum surface air temperature to the moist convection parameterization that is employed, since different schemes produce different diurnal cycles and frequencies of precipitation. The study suggests that, in order to accurately project scenarios of extreme temperature change, models need to realistically simulate changes in the surface energy balance caused by the inter-annual variation of these precipitation characteristics. In this regard, GCMs most likely underestimate the potential for extreme temperature change.