Geophysical Research Abstracts
Vol. 18, EGU2016-3191, 2016
EGU General Assembly 2016

Estimating the limit of decadal-scale climate predictability using observational data

Ruiqiang Ding (1) and Jianping Li (2)

(1) Institute of Atmospheric Physics, Chinese Academy of Sciences, (2) 2. College of Global Change and Earth System Sciences (GCESS), Beijing Normal University

Current coupled atmosphere–ocean general circulation models (CGCMs) can not simulate decadal variability well, and model errors would have a significant impact on the estimation of decadal predictability. In this study, the nonlinear local Lyapunov exponent (NLLE) method is adopted to estimate the limit of decadal predictability based on 9-yr low-pass filtered sea surface temperature (SST) and sea level pressure (SLP) observations. The results show that the limit of decadal predictability of the SST field is relatively large in the North Atlantic, North Pacific, Southern Ocean, tropical Indian Ocean, and western North Pacific, exceeding 7 years at most locations in these regions. In contrast, the limit of the SST field is relatively small in the tropical central–eastern Pacific (4–6 years). Similar to the SST field, the SLP field has a relatively large limit of decadal predictability over the Antarctic, North Pacific, and tropical Indian Ocean (>6 years). In addition, a relatively large limit of decadal predictability of the SLP field also occurs over the land regions of Africa, India, and South America. Distributions of the limit of decadal predictability of both the SST and SLP fields are almost consistent with those of their intensity and persistence on decadal timescales. By examining the limit of decadal predictability of several major climate modes, we found that the limit of decadal predictability of the Pacific Decadal Oscillation (PDO) is about 9 years, slightly lower than that of the Atlantic Multidecadal Oscillation (AMO) (about 11 years). In contrast, the Northern and Southern Annular Modes (NAM and SAM) have limits of decadal predictability of about 4 and 9 years, respectively. However, the above limits estimated using time-filtered data may overestimate the predictability of decadal variability due to the use of time filtering. Filtered noise with the same spectral characteristics as the PDO and AMO, has a predictability of about 3 years. Future work is required with a longer period of observations or using a more realistic model of decadal variability to assess the real-time decadal predictability.