Geophysical Research Abstracts
Vol. 21, EGU2019-2242, 2019
EGU General Assembly 2019

A Theory for Seasonal Predictability Barrier [U+FF1A] Threshold, Timing and Intensity

Yishuai Jin
Peking University, School of Physics, Department of Atmospheric and Ocean Science, China (jinyishuai@126.com)

We develop a theory in the a seasonal stochastic climate model for understanding the general features of a seasonal persistence predictability barrier (PB), which is characterized by a band of maximum persistence decline in autocorrelation function (ACF) phase-locked to a particular season. The model is the Langevin equation with a seasonal cycle incorporated in the damping rate and the magnitude of noise forcing. The theory determines the forcing threshold, the timing and intensity of the seasonal PB as a function of the damping rate and the magnitude of seasonal forcing. It is found that a seasonal PB is an intrinsic feature of a seasonal stochastic climate system forced by either a seasonal growthrate or seasonal noise forcing. A seasonal PB emerges after the magnitude of the seasonal forcing, relative to the damping rate, exceeds a modest threshold. The timing of the seasonal PB is determined by the decline of the seasonal forcing as well as the delay associated with the damping rate. As such, for realistically weak damping, the PB season is locked close to the minimum SST variance under the growthrate forcing, butand after the minimum SST variance under the noise forcing. The intensity of the PB is determined mainly by the amplitude of the seasonal cycle of the forcing. The theory is further found to be able to explain the general features of the seasonal PB of the observed SST variability over the world ocean. Our theory provides a general framework and a null hypothesis for the understanding of the seasonal PB of climate variability in general.