3rd International Conference on Earth System Modelling
Vol. , 3ICESM-112, 2012
3rd International Conference on Earth System Modelling

Temporal–spatial distribution of the predictability limit of monthly sea surface temperature in the global oceans

R. Q. Ding and J. P. Li
LASG, Institute of Atmospheric Physics, Chinese Academy of Sciences (ljp@lasg.iap.ac.cn)

To study atmospheric and oceanic predictability based on nonlinear error growth dynamics, the authors introduced recently a new method using the nonlinear local Lyapunov exponent (NLLE). In the present study, the NLLE method is employed to investigate the temporal–spatial distribution of the limit of SST predictability, based on reanalysis monthly sea surface temperature (SST) data. The results show that the annual mean limit of SST predictability is the greatest in the tropical central–eastern Pacific (> 8 months). Relatively high values were also obtained for the tropical Indian and Atlantic Oceans (5–8 months). In the northern and southern mid-high latitude oceans, the limit of SST predictability is less than 6 months, with a minimum value of only 2–3 months.
The limit of SST predictability in different ocean areas shows significant seasonal variations, related to the persistence barriers that occur during particular seasons. In addition to the well-known spring persistence barrier (SPB) in the tropical central–eastern Pacific, persistence barriers also occur in other ocean areas during seasons other than spring. A winter persistence barrier (WPB) exists in the southeastern tropical Indian Ocean and the northern tropical Atlantic. In the North Pacific and North Atlantic, a persistence barrier exists around July–September. These seasonal persistence barriers cause a relatively low limit of SST predictability when predictions are made across the season in which the barriers occur. In contrast, when predictions are made initiated from the season with a persistence barrier, the SST errors show rapid initial growth but slow growth in the following seasons, resulting in a relatively high limit in predictability. Analyses also indicate that the possibility of really eliminating the effects of persistence barriers on SST errors by improving CGCMs or the data assimilation procedure is very low.