Geophysical Research Abstracts
Vol. 12, EGU2010-2167-1, 2010
EGU General Assembly 2010

Predictability and Metastable Regime Behavior of the North Atlantic Jet Stream

Christian Franzke (1) and Tim Woollings (2)

(1) British Antarctic Survey, Science Programmes, Cambridge, United Kingdom (chan1@bas.ac.uk), (2) Walker Institute for Climate System Research, Department of Meteorology, University of Reading

The metastable regime behavior and the predictability characteristics of the eddy-driven jet stream over the North Atlantic ocean are investigated. The North Atlantic jet stream variability is characterised by the jet latitude index which is defined as the latitude of the maximum wind speed of the ERA-40 reanalysis data for the period 1 December 1957 through 28 February 2002. We utilise nonlinear time series analysis tools to investigate its time scale, memory depth, regime and predictability characteristics.

A nonlinear decomposition of the index with the Empirical Mode Decomposition (EMD) into intraseasonal and interannual components reveals that most of the variability is in the intraseasonal band. The EMD analysis also reveals a statistically significant nonlinear trend corresponding to a poleward shift of the jet stream. The jet latitude index shows an increased autocorrelation time scale when interannual variability is included compared to when only intraseasonal variability is contained. In previous studies it has been claimed that this increased autocorrelation time scale indicates increased predictive skill. We show by performing predictability experiments that this increased autocorrelation time scale does not lead to an enhanced predictive skill.

A Hidden Markov Model (HMM) analysis shows that the jet stream exhibits 3 significant metastable regimes which correspond to northern and southern jet states and a blocking state. A simple Markov model for predicting the regimes has a prediction horizon of about 6 days which is comparable with the predictability of blockings in the ECMWF ensemble forecasting system and we find prefered transition routes between the regimes. The dynamical causes of the regime behavior will be discussed.