Geophysical Research Abstracts
Vol. 15, EGU2013-5966-1, 2013
EGU General Assembly 2013

Empirical modeling of climate dynamics

Alexander Feigin, Dmitry Mukhin, Anna Mukhina, Andrey Gavrilov, and Evgeny Loskutov
Institute of Applied Physics of RAS, Atmosphere Physics Department, Nizhny Novgorod, Russia (feigin@appl.sci-nnov.ru)

The new method for modeling of climate system is discussed. The method is based on deriving from data of empirical low-dimensional stochastic (random dynamical) models of evolution operator of separate climate modes. The approach to both construction of low-dimensional stochastic models of complex (high-dimensional) systems by scalar time-series, and long-term prognosis by these models of critical transitions in the system evolution was described recently in [1,2].
In the report we extend this approach to construction of dynamical models of interacting climate sub-systems. The models reproduce the evolution characterized by examined time scales, and range of traceable scales is determined by the available data. The key new feature arising is vector nature of the data (i.e. time series of spatial fields), that force us to apply other methods of searching for minimal set of independent phase variable of the model. By dint of both really measured and generated numerically vector time series of climatic observables we show: (i) algorithm of construction of empirical low-dimensional stochastic model that reproduces separate climate mode evolution, and (ii) adequacy of this model for correct prognosis of future evolution of the system of interest.

1. Y.I. Molkov, D.N. Mukhin, E.M. Loskutov, R.I.Timushev, and A.M. Feigin. Prognosis of qualitative system behavior by noisy, nonstationary, chaotic time series, Physical Review E, 84, 036215, 2011
2. Y.I. Molkov, E.M. Loskutov, D.N. Mukhin, and A.M. Feigin. Random dynamical models from time series, Phys. Rev. E, 85, 036216, 2012