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Forecasting the weather
- ensemble techniques
in probabilistic weather prediction

Dynamics of the sea surface temperature extrema on a global scale using satellite measurements

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According to different estimates from the mid-nineteenth century the average surface temperature has increased by 0.3-0.6º C. In different parts of the Earth this warming is manifested in varying degrees, but almost anywhere the temperature increase by itself did not have catastrophic effects on ecosystems and human activity. Extreme climatic events have a much greater influence on the environment. The Global Ocean is the largest part of the climatic system of the Earth, and, thus, investigation of its dynamics is extremely important for studying of global changing. In this paper we propose a generalised approach to the study of dynamics of the “ocean-atmosphere” system using the methods of statistical evaluation of long-term series of satellite (AVHRR, SeaWiFS and MODIS) and ground-true data, based on the theory of stochastic dynamic systems. To study the dynamics of the ocean for the period from 1985 through 2009 we used data on the temperature of the surface layer of the ocean and chlorophyll concentration because it is a good indicator of both atmospheric and oceanic processes.

As it is known a priori that extremely high and extremely low chlorophyll concentrations or sea surface temperature are associated with different physical processes, when mean or total values in the ocean are calculated, the processes induced by different physical reasons superpose. Thus, no correlation can be reached between the calculated total dynamics and some physical process. In this paper we applied the method of statistical distribution analysis of data to every pixel. With this approach, extreme values are investigated in greater detail. We divided the range of values for every pixel into 5 parts; seasonal variations were taken into account.

The spatiotemporal distribution of the dynamics of extreme and average values was investigated. This approach made possible discovering the commonality of processes in the different oceans and defining a problem of revealing global processes responsible for this commonality and different types of El Niño events were revealed. Also it was found that the instability of the oceanic processes that was increased after the El Niño event began to decrease during the last two years.