



Evidence of a strange nonchaotic attractor in the El Niño dynamics

Ilya Serykh and Dmitry Sonechkin

P.P.Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow, Russian Federation (iserykh@ocean.ru)

Basing on a mathematical idea about the so-called strange nonchaotic attractor in the quasi-periodically forced dynamical systems, re-analyses data are considered. It is found that the El Niño - Southern Oscillation (ENSO) is driven not only by the annual Sun-induced periodic heating, but also by two more external periodicities (incommensurate to the annual period) associated with the ~ 18.6 -year lunar-solar nutation of the Earth rotation axis, and the ~ 14 -month Chandler wobble in the Earth's pole motion. Because of the incommensurability of their periods all three forces affect the system in inappropriate time moments. As a result, the ENSO time series look to be very complex (strange in mathematical terms). The power spectra of these series reveal numerous peaks located at the periods that are multiples of the above periodicities as well as at their sub- and super-harmonic. In spite of this strangeness, a mutual order seems to be inherent to these time series and their spectra. This order reveals itself in the existence of a scaling of the power spectrum peaks and respective rhythms in the ENSO dynamics that look like the power spectrum and dynamics of the strange nonchaotic attractor.

It means there are no limits to forecast ENSO, in principle. In practice, it opens a possibility to forecast ENSO for several years ahead.