



Studying the geophysical time series in a new time domain; the case of ENSO

Costas Varotsos (1), Chris Tzanis (1), and Arthur Cracknell (2)

(1) Climate Research Group, Division of Environmental Physics and Meteorology, Faculty of Physics, University of Athens, Panepistimiopolis-Zografou, Athens, 15784, Greece, (2) Division of Electronic Engineering and Physics, University of Dundee, Dundee DD1 4HN, Scotland, UK

It has been found that novel dynamical features hidden behind time series in complex systems can emerge upon analyzing them in a new time domain termed “natural time”. We analyze the Southern Oscillation Index (SOI) time series throughout the period January 1876 – November 2011 by using the entropy defined in the natural time domain in order to detect precursory signals of the major El Niño Southern Oscillation (ENSO) maxima. The calculation of the entropy change under time reversal of the SOI time series provides the strongest precursory signal with the window lengths of around two years, meaning that the entropy change of the SOI during the two previous years, approximately, allows a warning one month before the advent of an ENSO maximum.