



Does the Eastern Pacific Act Like an Autonomous Component?

Avi Gozolchiani (1), Kazuko Yamasaki (2), and Shlomo Havlin (1)

(1) Department of Physics, Bar Ilan University, Ramat Gan, Israel (avigoz@gmail.com), (2) Tokyo University of Information Sciences, Chiba, Japan

The temperature and pressure fluctuations of different locations l and r in the same atmospheric layer can be viewed as dynamical systems with interactions. It is possible that l and r have correlated behavior (sometimes with a lag time) due to common forcing mechanisms (such as solar insolation), material flow (salt, dust, water, air), direct pressure of l and r on each other, and heat flow between them. These correlations are commonly studied with the aid of eigen-techniques such as principal component analysis, yielding a few fluctuation profiles that are typical.

However these correlations can be regarded as a robust field on their own right, and the profiles of this field, which we call "the climate network" have been the topic of recent studies. We have demonstrated [K. Yamasaki et. al. PRL (2008), A. Gozolchiani et. al. EPL (2008)] that during El-Nino times large portions of this field have a reduced value, corresponding to a less correlated atmosphere. We are now able to pinpoint a peculiar and rich pattern in this effect - the unique autonomous component in the eastern pacific [A. Gozolchiani et. al. arXiv:1010.2605 (2010)]. We have elaborated a four altitude/two fields (temperature and geopotential heights)/10000 snapshots (corresponding to 10 days resolution over 30 years) survey of the climate network, which presents the behavior of this autonomous component. This includes the distribution of places that strongly correlate with this component, the distribution of its time delays with the environment, and an interesting altitude dependent profile of its interactions with the northern and southern hemispheres. We have also compiled the leading profiles of this information (main principle component), which are shown to be related to the different stages of the El-Nino Southern Oscillations (see an animation of the fields in http://physionet.ph.biu.ac.il/~gozola/PRL_ENSOPMgozyamhav).