Geophysical Research Abstracts, Vol. 8, 00795, 2006
SRef-ID: 1607-7962/gra/EGU06-A-00795

On the nonlinear interaction between global teleconnection patterns

N.Loboda (1), A. Svinarenko (1)
(1) EU University of Odessa, Ukraine (loboda@paco.net / Fax: +380 482-637227)

In our paper the processes of non-linear interaction between teleconnection patterns are addressed. Evidence of chaotic behaviour for the relationship between the Arctic Oscillation (AO), Southern Oscillation (SO), and Antarctic Oscillation is examined by using the cross-redundancy and Granger causality. The analysis is carried out for three epochs of twenty centuries, during that the different trends of global temperature was observed. To study the influence of low frequency variations, the wavelet decomposition is applied. Presented results display many well-known features for feedbacks between climate changes and observed trends in the indices of teleconnection patterns. By using wavelet detail components, some behaviours are revealed as a particularly pure ones. At the same time, some findings require considerable further work. It is especially attributed to the revealed nonlinear interaction between the AO and AAO. Our results are encouraging for the prospects of useful model describing the climate changes at the decadal and centennial time scales.

In this study we use non-fully traditional (for the meteorology) methods to examine the nonlinear interaction between some teleconnection patterns during different epochs of the twenty century. The purpose is to reveal the chaotic behaviour in the global climate system. The main advantage of the cross-redundancy and Granger causality, in contrast to other chaotic analysis, is relatively short time series used as input parameters for these approach. Furthermore, to study the influence of low frequency variations, the wavelet decomposition is applied. By assuming that the non-decimated wavelet transform extract the "pure" low frequency variations, the interaction at the intra- and inter-decadal time scales is considered.

Our findings show that the aforementioned methods allow to display well-known mechanisms and feedbacks. Nevertheless, some our results require further elucida-

tions. This is first related to the feedbacks between the Arctic Oscillation and the Antarctic Oscillation, as well as the fact that the Arctic Oscillation can be the Granger cause of Southern Oscillation.

By using the results obtained in this paper, we can not conclude that the global warming (or cooling) affect the interaction between the teleconnecion patterns. Of course, the period of exhaustive observation is too short. Moreover, such period with regard to the indices of the Antarctic Oscillation starts in the late 1970s. Therefore, we divide the period from 1910 to 2001 to avoid, as far as possible, the superposition of different epochs that can be observed if to use whole period.

From our point of view, future investigations can be realized in two ways. First, to explain some feedbacks revealed in this paper, the runs with coupled global circulation models are needed. Second, our findings can be used to create the model of global climate variations based, for example, on the concept of synchronized chaos.

/1/ N.Loboda, A.Glushkov, V.Khokhlov, 2005 Atm.Res., in print; J. Hydrology, in print; Climat in Past, in print;