Geophysical Research Abstracts
Vol. 21, EGU2019-1018, 2019
EGU General Assembly 2019

A new perspective on studying climate teleconnections

Matyas Herein (1), Timea Haszpra (2), and Daniel Topal (3)

(1) MTA-ELTE Theoretical Physics Research Group, Budapest, Hungary (hereinm@gmail.com), (2) Institute for Theoretical Physics, Eötvös Loránd University, Budapest, Hungary, (3) Department of Meteorology, Eötvös Loránd University, Budapest, Hungary

A new perspective on studying climate teleconnections

Traditionally we think that climate is a long term average of weather. It is true but only if the climate is stationary. However, in a changing climate, where one or more relevant parameters are changing in time, there can be no stationarity by definition, whereas stationarity is crucial for the applicability of any temporal averaging techniques. To avoid this problem we redefine climate as the distribution of potential climate realizations characterized by the instantaneous statistics of an ensemble using the so called snapshot attractor view. In this view the relevant quantities of the climate system are the statistics taken over an ensemble of possible realizations evolved from various initial conditions. To illustrate the power and applicability of this method we investigate the properties and teleconnections of the Arctic Oscillation (AO) and the the El Niño–Southern Oscillation (ENSO) using the Max Planck Institute Earth System Model 100-member Grand Ensemble subjected to RCP2.6, 4.5 and 8.5 scenarios and the Community Earth System Model 40-member Large Ensemble subjected to RCP8.5 scenario. Using the whole ensemble of realizations instantaneous correlation coefficients (independent of previous or later characteristics of the teleconnection) can be objectively calculated between the climate index (AO index and SO index, respcetively) and other quantities (e.g., surface temperature). In this way, the time evolution of the strength of the teleconnections can be revealed. We found that the teleconnections „survive” the climate change but their strength is not constant, furthermore, their time evolution depends on the RCP forcing. With very high confidence, we detect an increase in the strength of the ENSO–Indian summer monsoon teleconnection system for the 20th century. In the case of AO there exists such regions (e.g., Northern Europe, the Eastern coast of Asia and western part of North America) where the correlation coefficients show also remarkable change (0.2-0.4) by the end of the 21th century.