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The impacts of teleconnection patterns on the climatic conditions of the Pannonian region

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The complex global climate system includes complicated (and often not fully understood) interactions among its components on various spatial and temporal scales. Therefore, the comprehensive examination of the web of these interactions is crucial to estimate near-future changes in the climate of the Pannonian region in Central Europe. We aim to analyse teleconnection patterns over the Northern Hemisphere (NH), which represent the low frequency variability of the atmosphere and may have significant influence on the Pannonian region. This study analyses the following large-scale teleconnection patterns: the Arctic Oscillation (AO), the North Atlantic Oscillation (NAO), the East-Atlantic/Western Russia pattern (EA/WR), the Scandinavian pattern (SCA), the North-Sea Caspian Pattern (NCP), and the Mediterranean Oscillation (MO). These oscillation phenomena have at least one action center (i.e. the most intensive region) closer than 5000 km to the Pannonian region.
(1) First, action centers are identified by (i) computing correlation coefficient fields and (ii) performing principal component analysis. To carry out the identification process of action centers, mainly the European Centre for Medium-Range Weather Forecasts' (ECMWF) ERA-20C atmospheric reanalysis dataset and the historical simulations outputs of the Coupled Model Intercomparison Project Phase 5 (CMIP5) general circulation models (GCMs) are used. Among the GCMs our first choice is HadGEM2-ES, which is developed by the UK Met Office Hadley Centre and serves as the driver of the Regional Climate Model (RegCM4) system adapted for the Pannonian region.
(2) Then, multivariate statistical methods are applied to estimate the effects of the large-scale teleconnection patterns and their changes in the regional climatic conditions of the Pannonian region for the recent periods of 1961-1990 and 1971-2000.
(3) Finally, we examine the future simulations of the selected CMIP5 models using the Representative Concentration Pathways (RCP) adopted by the Intergovernmental Panel on Climate Change (IPCC) for its Fifth Assessment Report (AR5).
Our long-term goal is (i) comparing the historical simulations of all available CMIP5 models to the ERA-20C reanalysis dataset, and (ii) assessing their abilities to reproduce the detected characteristics of the above-mentioned teleconnection systems. After the selection of the most reliable models, we aim to prepare improved predictions about the future climatic conditions of the Pannonian region for the 21st century.