Analyzing teleconnections in the QBOi dataset using Causal Effect Networks

Nicholas TYRRELL[1], Ivonne GARCIA[2], Haiyan LI[3], Peer NOVACK[4], Scott OSPREY[5]

[1] *Finnish Meteorological Institute, Helsinki, Finland*
[2] *University of Edinburgh, Edinburgh, Scotland*
[3] *GEOMAR Helmholtz Centre for Ocean Research, Kiel, Germany*
[4] *Imperial College London, London, United Kingdom*
[5] *University of Oxford, Oxford, United Kingdom*

Causal Effect Networks (CENs) are a recently developed method of timeseries analysis that can be used to detect causal relationships between various processes within the climate system. The multi-model QBOi dataset consists of models with a high stratospheric resolution, internally generated QBOs, and greater stratospheric variability compared to previous datasets (e.g. CMIP5). We apply CENs to the QBOi dataset to determine the most important factors affecting the Northern hemisphere wintertime circulation, and the ability of the models to simulate the various teleconnections. Processes with variability on monthly to seasonal timescales are analyzed - such as the polar vortex, the Arctic oscillation, Arctic sea ice, Siberian surface temperatures and sea level pressure, and vertical wave flux. We also investigate the ability of longer term processes - such as the QBO and the El Niño-Southern Oscillation – to modulate the monthly to seasonal teleconnections. Finally, the model results are compared with ERA Interim.

Key words: QBOi, teleconnections, Polar Vortex, Causal Effect Networks