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The backbone of the climate network

J.F. Donges (1), Y. Zou (1), N. Marwan (1), J. Kurths (1,2)

(1) Potsdam Institute for Climate Impact Research, P.O. Box 60 12 03, 14412 Potsdam, Germany (donges@pik-potsdam.de), (2) Humboldt University, Newtonstr. 15, 12489 Berlin, Germany

Betweenness centrality reveals a rich internal structure in complex climate networks constructed from reanalysis and model surface air temperature data using the nonlinear mutual information. Our novel approach uncovers peculiar wave-like structures of high information flow (the backbone), that we relate to global surface ocean currents. This points to a major role of the oceanic surface circulation in coupling and stabilizing the global temperature field in the long term mean (140 years for the model run and 60 years for reanalysis data). The authors have ensured the robustness of these results by intensive significance testing on the level of time series analysis and complex network theory. It is found that using the linear Pearson correlation coefficient for climate network construction yields similar, but less pronounced backbone structures.