EGU22-7256
https://doi.org/10.5194/egusphere-egu22-7256
EGU General Assembly 2022

Identifying patterns of teleconnections, a curvature-based network analysis

Jakob Schlör, Felix M. Strnad, Christian Fröhlich, and Bedartha Goswami
Cluster of Excellence - Machine Learning for Science, Eberhard Karls Universität Tübingen, Germany

Representing spatio-temporal climate variables as complex networks allows uncovering nontrivial structure in the data. Although various tools for detecting communities in climate networks have been used to group nodes (spatial locations) with similar climatic conditions, we are often interested in identifying important links between communities. Of particular interest are methods to detect teleconnections, i.e. links over large spatial distances mitigated by atmospheric processes.

We propose to use a recently developed network measure based on Ricci-curvature to visualize teleconnections in climate networks. Ricci-curvature allows to distinguish between- and within-community links in networks. Applied to networks constructed from surface temperature anomalies we show that Ricci-curvature separates spatial scales. We use Ricci-curvature to study differences in global teleconnection patterns of different types of El Niño events, namely the Eastern Pacific (EP) and Central Pacific (CP) types. Our method reveals a global picture of teleconnection patterns, showing confinement of teleconnections to the tropics under EP conditions but showing teleconnections to the tropics, Northern and Southern Hemisphere under CP conditions. The obtained teleconnections corroborate previously reported impacts of EP and CP.
Our results suggest that Ricci-curvature is a promising visual-analytics-tool to study the topology of climate systems with potential applications across observational and model data.