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Disentangling different types of El Niño episodes by evolving climate network analysis

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Complex network theory provides a powerful toolbox for studying the backbone of statistical interrelationships between multiple time series in various scientific disciplines. In this work, we apply the recently proposed climate network approach for characterizing the evolving correlation structure of the Earth's climate system based on reanalysis data of surface air temperatures. We provide a detailed study on the temporal variability of several global climate network characteristics, which allows deriving results that go significantly beyond recent findings. Based on a simple conceptual view on climate networks, we are able to give a thorough interpretation of our evolving climate network characteristics, which allows a functional discrimination between recently recognized different types of El Niño episodes (so-called cold-tongue and warm pool events). In this respect, our analysis provides deep insights into the Earth's climate system, particularly its response to strong volcanic eruptions and large-scale impacts of different types of El Niño episodes, and thus contributes to the understanding of the global signatures of distinct phases of the El Niño Southern Oscillation (ENSO).