

EGU22-6329

<https://doi.org/10.5194/egusphere-egu22-6329>

EGU General Assembly 2022

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



## El Niño forecasting by climate networks: comparison of the forecasting performance in observational data and in historical and controls runs of CMIP5 and CMIP6

Josef Ludescher<sup>1</sup>, Armin Bunde<sup>2</sup>, and Hans Joachim Schellnhuber<sup>1</sup>

<sup>1</sup>Potsdam Institute for Climate Impact Research, Potsdam, Germany

<sup>2</sup>Institute for Theoretical Physics, Justus-Liebig-Universität Gießen, Gießen, Germany

The El Niño Southern Oscillation (ENSO) is the most important driver of interannual global climate variability and affects weather and climate in large parts of the world. Recently, we have developed a dynamical network approach for predicting the onset of El Niño events well before the spring predictability barrier. In the regarded climate network, the nodes are grid points in the Pacific, and the strengths of the links (teleconnections) between them are characterized by the cross-correlations of the atmospheric surface temperatures at the grid points. In the year before an El Niño event, the links between the eastern equatorial Pacific and the rest of the Pacific tend to strengthen such that the average link strength exceeds a certain threshold. This feature can be used to predict the onset of an El Niño with 73% probability and its absence with 90% probability. The p-value of the hindcasting and forecasting phase (1981-2021) for this performance based on random guessing with the climatological average is  $4.6 \cdot 10^{-5}$ .

To assess whether this predictive feature is also present in coupled general circulation models, we apply our algorithm to historical and control runs of CMIP5 and CMIP6. We find that the predictive performance present in observational data is absent or very low in GCMs. The lack of this feature may explain the difficulties of GCMs to overcome the spring barrier.