EGU21-13694, updated on 13 Jun 2021
https://doi.org/10.5194/egusphere-egu21-13694
EGU General Assembly 2021

Quantifying Teleconnection pathways leading to Low Rainfall anomalies during Boreal Summer in Indonesian Borneo

Timothy Lam[1], Marlene Kretschmer[2], Samantha Adams[3], Alberto Arribas[3,4], Rachel Prudden[3], Elena Saggioro[5], Jennifer Catto[4], and Rosa Barciela[6]
[1]University of Exeter, Centre for Doctoral Training in Environmental Intelligence, Exeter, United Kingdom of Great Britain – England, Scotland, Wales (tl493@exeter.ac.uk)
[2]Department of Meteorology, University of Reading, Reading, UK
[3]Informatics Lab, Met Office, Exeter, UK
[4]College of Engineering, Mathematics and Physical Sciences, University of Exeter, Exeter, UK
[5]Department of Mathematics and Statistics, University of Reading, Reading, UK
[6]Met Office, Exeter, UK

Teleconnections are sources of predictability for regional weather and climate, which can be represented by causal relationships between climate features in physically separated regions. In this study, teleconnections of low rainfall anomalies in Indonesian Borneo are analysed and quantified using causal inference theory and causal networks. Causal hypotheses are first developed based on climate model experiments in literature and then justified by means of partial regression analysis between NCEP reanalysis sea surface temperatures and climate indices (drivers) and rainfall data in Indonesian Borneo from various sources (target variable). We find that, as previous studies have highlighted, El Niño Southern Oscillation (ENSO) has a profound effect on rainfall in Indonesia Borneo, with positive Niño 3.4 index serving as a direct driver of low rainfall, also partially through reduced sea surface temperatures (SSTs) over Indonesian waters. On the other hand, while Indian Ocean Dipole (IOD) influences Indonesian Borneo rainfall through SSTs over the same area as a thermodynamic effect, its remaining effect has shifted at multidecadal timescale, opening the rooms for further research. This work informs the potential of a systematic causal approach to statistical inference as a powerful tool to verify and explore atmospheric teleconnections and enables seasonal forecasting to strengthen prevention and control of drought and fire multihazards over peatlands in the study region.

Keywords: Tropical teleconnections, Causal inference, Climate variability, Drought, Indonesia