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Differential imprints of different ENSO flavors in global patterns of seasonal precipitation extremes

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The El Nino Southern Oscillation (ENSO) with its positive (El Nino) and negative (La Nina) phases is known to trigger climatic responses in various parts of the Earth, an effect commonly attributed to teleconnectivity. A series of studies has demonstrated that El Nino periods exhibits a relatively broad variety of spatial patterns, which can be classified into two main flavors termed East Pacific (EP, canonical) and Central Pacific (CP, Modoki) El Nino, and that both subtypes can trigger distinct climatic responses like droughts vs. precipitation increases at the regional level. More recently, a similar discrimination of La Nina periods into two different flavors has been reported, and it is reasonable to assume that these different expressions are equally accompanied by differential responses of regional climate variability in particularly affected regions.

In this work, we study in great detail the imprints of both types of El Nino and La Nina periods in extremal seasonal precipitation sums during fall (SON), winter (DJF) and spring (MAM) around the peak time of the corresponding ENSO phase. For this purpose, we employ a recently developed objective classification of El Nino and La Nina periods into their two respective flavors based on global teleconnectivity patterns in daily surface air temperature anomalies as captured by the associated climate network representations (Wiedermann et al., 2016). In order to study the statistical relevance of the timing of different El Nino and La Nina types on that of seasonal precipitation extremes around the globe (according to the GPCC data set as a reference), we utilize event coincidence analysis (Donges et al., 2016), a new powerful yet conceptually simple and intuitive statistical tool that allows quantifying the degree of simultaneity of distinct events in pairs of time series.

Our results provide a comprehensive overview on ENSO related imprints in regional seasonal precipitation extremes. We demonstrate that key interlinkages between ENSO phases and droughts as well as extremely wet seasons depend crucially on the specific type of El Nino and La Nina event, highlighting the importance of correctly attributing the corresponding flavors when aiming to anticipate the likelihood of precipitation extremes. Straightforward upcoming extensions of the present work will address the imprints of ENSO types and flavors on extremes at different time scales that can be found in other relevant climate variables such as air temperature or more complex drought indices, as well as an assessment of the representation of the empirically found statistical relationships in contemporary climate models operated in hindcast as well as RCP scenario modes.

M. Wiedermann, A. Radebach, J.F. Donges, J. Kurths, R.V. Donner: A climate network-based index to discriminate different types of El Nino and La Nina. Geophysical Research Letters, 43, 069119 (2016)

J.F. Donges, C.-F. Schleussner, J.F. Siegmund, R.V. Donner: Event coincidence analysis for quantifying statistical interrelationships between event time series - On the role of extreme flood events as possible drivers of epidemics. European Physical Journal - Special Topics, 225(3), 471-487 (2016)