Jiří Navrátil

ENSO teleconnections – Analysis of time lag between tropical Pacific sea surface temperature and climate and vegetation anomalies

El Niño-Southern Oscillation (ENSO) affects weather and climate in regions spread all around the Earth via teleconnections. While quite a lot of research has been done on recognizing what regions are affected by these and what is the sign of the associated temperature, rainfall and vegetation anomalies, not that much attention has been paid to the timing of the impacts with respect to the ENSO state.

This project found that the ENSO-caused anomalies were never at their peak simultaneously with an ENSO event culmination for any of the three examined variables – precipitation, temperature and normalized difference vegetation index (NDVI) – in any of the eight study areas. It was also found that there is no seasonally uniform time lag between sea surface temperature (SST) anomalies in tropical Pacific and the associated anomalies in a specific region. Instead, the time lag of the strongest anomalies varies with season: it is most often 10 months of delay for teleconnections caused by ENSO forcing in northern hemisphere summer, 7 months for northern hemisphere autumn and 4 months for northern hemisphere winter. For northern hemisphere spring, the prevailing delay was 11 months, the longest tested. As a result, the anomalies were generally strongest in late northern hemisphere spring to early northern hemisphere summer for all the variables in all the regions. They were mainly caused by the ENSO state in the preceding northern hemisphere summer and northern hemisphere winter because that is when the correlations were found the strongest.

Delays longer than one season were not always expected by authors of some studies already published. While results for southern Borneo and north-eastern Brazil agreed with findings of others and partial agreement was found for Colombia, Florida, Gulf of Mexico and central India, there was disparity for results observed for southern Africa and south-eastern Australia. Hence, it seems necessary to test the time lag between tropical Pacific SST and impacts of ENSO teleconnections in more studies with possibly diverse methodologies before drawing conclusions that would revise the so far published knowledge about the timing of ENSO teleconnections impacts as suggested by the results of this study for the regions mentioned.

Keywords: Physical Geography and Ecosystem Analysis, ENSO, teleconnections, climate, NDVI

Advisors: **Thomas Holst, Lars Eklundh**
Master degree project 30 credits in Physical Geography and Ecosystem Analysis, 2020
Department of Physical Geography and Ecosystem Science, Lund University. Student thesis series INES nr 500