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Anomalous weather caused by sea temperature in tropical Pacific

Equatorial Pacific Ocean is the area of occurrence of a phenomenon called *ENSO*. ENSO is an abbreviation for El Niño-Southern Oscillation, which is a climate phenomenon arising both from the atmosphere and the ocean. This phenomenon affects the weather almost all over the world, including areas very far from the tropical Pacific. But what is the timing of these effects? Do they occur simultaneously with ENSO, or with some delay? This is what I looked at in my thesis project.

In fact, ENSO is an oscillation, meaning that it has two opposite phases: *El Niño* and *La Niña*. El Niño means that water in equatorial Pacific Ocean is warmer than usual, whereas it is colder during La Niña. Each of these phases typically lasts not longer than a year. The tricky thing with ENSO is that this oscillation is not regular. In other words, these two ENSO phases occur with irregular period of 2-7 years. As a result, a year could be an El Niño year, a La Niña year, but also a so-called ENSO neutral year, with none of the ENSO phases developed and prevailing average sea temperature in the equatorial Pacific. Both ENSO phases disrupt the climate circulation in the Pacific and because the climate circulation is connected around the globe, they disrupt weather patterns in many areas of the world.

In order to look at the weather anomalies ENSO causes, I looked at temperature and precipitation data. Moreover, I used satellite imagery data to look at how vegetation is affected by the ENSO phases and the weather anomalies it causes. The eight study areas were southern Africa, central India, southern Borneo, southeastern Australia, western Colombia, northeastern Brazil, Gulf of Mexico and Florida. The focus was to see when anomalies of these three variables reach the highest value in relation to the ENSO state.

The results were somewhat surprising, because the timing did not really differ for the different regions, although their very varying distance from the tropical Pacific. Moreover, the timing did not differ for the vegetation and the climate variables (precipitation and temperature), although one could expect that the effect would be seen on the weather and first then on the vegetation impacted by the anomalous weather. On the other hand, the delays between the observed anomalies and the ENSO state varied a lot for different seasons. Specifically, the strongest impacts were felt mainly in April, May and June, as a result of ENSO state in the preceding June, July and August and December, January and February. Interestingly, the anomalies never occurred simultaneously with the ENSO state.

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