



Understanding the impact of ENSO-related droughts over South American vegetation health

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Regional droughts over South America are known to be strongly associated with ENSO. The warm phase of ENSO, El Niño, is related with the drying of the northern part of the continent (including the Amazon forest) and the cold phase, La Niña, with the drying of some regions in the southern part of the continent (south Brazil, Uruguay, eastern Argentina and central Chile). These drought episodes have drastic impacts on society, affecting water resources, crops and energy supplies, among others. With the aim of mitigating drought impacts, a better monitoring and understanding of the phenomenon, coupled with new policies, must be pursued. Satellite-based information is being increasingly used to study and monitor drought events. Indeed, several satellite-derived drought and vegetation indices have been developed in the last decades, the Vegetation Condition Index (VCI) and Thermal Condition Index (TCI) ranking among the most used ones. The former uses the Normalised Difference Vegetation Index (NDVI) derived from the red and near-infrared spectral regions and measures the condition of the vegetation due to the lack or galore of moisture whereas the latter relies on Land Surface Temperature (LST), as obtained from information in thermal infrared window and measures the condition of the soil due to lower or higher than normal temperature. Here, for the period 1982-2009, both indices are first correlated with the Standardised Precipitation-Evapotranspiration Index (SPEI), a multi-scalar drought index. Results show that the importance of VCI and TCI to drought (as measured with SPEI) in the South American region is not the same, with VCI appearing as more important in drier regions and TCI dominating the relation with drought over moister ones (e.g., the Amazon forest). Results further confirm that the use of the Vegetation Health Index (VHI) where VCI and TCI are combined assuming equal weights is not an optimal choice over certain areas. Then, VCI and TCI are correlated with El Niño 3.4 time-series. TCI shows a strong negative correlation with El Niño over the northern part of South America, indicating that the occurrence of such an event degrades vegetation health mainly due to abnormally high temperatures (moisture over the Amazon forest is not a limiting factor), whereas VCI tends to dominate over the southern part of the continent. Results obtained are a first step towards obtaining an optimal combination of VCI and TCI over the different biomes and pave the way to a better understanding of the impact of ENSO on drought events in South America.

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