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Evaluation of last extreme drought events in Amazon basin using remotely sensing data

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Amazon basin has experienced several intense droughts among which were highlighted last recent ones in 2005 and 2010. Climate models suggest these events will be even more frequent due to higher concentration of greenhouse gases that are also driven forward by alteration in forest dynamics. Environmental and social impacts demand to identify these intense droughts and the behavior of climate parameters that affect vegetation. This present study also identifies a recent intense drought in Amazon basin during 2015. Meteorological parameters and vegetation indices suggest this event was the most severe already registered in the region. We have used land surface temperature (LST), vegetation indices, rainfall and shortwave radiation from 2000 to 2015 to analyze and compare droughts of 2005, 2010 and 2015. Our results show singularities among the three climate extreme events. The austral winter was the most affected season in 2005 and 2010, but not in 2015 when austral summer presented extreme conditions. Precipitation indicates epicenter of 2005 in west Amazon corroborating with previous studies. In 2010, the west region was strongly affected again together with the northwest and the southeast areas. However, 2015 epicenters were concentrated in the east of the basin. In 2015, shortwave radiation has exceeded the maximum values of 2005 and temperature the maximum value of 2010. Vegetation indices have shown positive and negative anomalies. Despite of heterogenous response of Amazon forest to drought, hybrid vegetation indices using NDVI (Normalized Difference Vegetation Index) and LST highlights the exceptionality of 2015 drought episode that exhibits higher vegetation water stress than the cases of 2010 and 2005. Finally, this work has shown how meteorological parameters influence droughts and the effects on vegetation in Amazon basin. Complexity of climate, ecosystem heterogeneity and high diversity of Amazon forest are response by idiosyncrasies of each drought. All these information improve the predictability of future climate scenarios and their effects in the environment.

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