



The impact of drought on the spatiotemporal distribution of consumptive water use in the Jaguaribe basin, Brazil

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In order to better manage drought in semi-arid regions, we urgently need to better understand and evaluate its human drivers. In river basins water scarcity and drought have led to changes and variations in the spatial distributions of water availability and water use. In this study we used a Surface Energy Balance (SEB) model to estimate the spatiotemporal variations in actual evapotranspiration (ET_a) in the Jaguaribe basin in Northeast Brazil for a period in which multiple drought events occurred. The analysis was done for the period 2000-2016. We made use of the METRIC algorithm and a data-set of Landsat and MODIS images. This allowed us to analyse data with a spatial resolution of 30m and a temporal resolution of 8 days. To evaluate the relationship between drought events and the changes and variations in ET_a, our estimates were analysed using the 'downstreamness' concept. The downstreamness of a location is the ratio of its upstream catchment area to the entire river basin area. The downstreamness concept can be used to depict the spatiotemporal changes and variations of quantities or volumes in a river basin. Here we used it to compare the spatiotemporal distributions of ET_a to data on the distribution of water availability and precipitation. Our case study shows that periods of drought and recovery lead to a spatially skewed distribution of ET_a towards upstream locations. This then also increased the duration and magnitude of the hydrological drought in downstream parts of the basin. The downstreamness concept appears to be useful to evaluate the spatiotemporal variations in ET_a that are affected by periods of drought.