



The 2012-2015 Brazilian drought estimated from GPS-based vertical crustal deformations

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Hydrological hazard events such as droughts have serious impact on humanity which includes loss of life, crop failures and food shortages, health issues, mass migration, and outbreaks of vector-borne (e.g. *Aedes aegypti*) diseases (e.g. Zika fever). Thus, monitoring hydrological extremes is of fundamental importance. Recently, drought monitoring has incorporated observations of the land water-storage inverted from satellite gravimetry (i.e. GRACE mission). However, many other geodetic sensors could be used to estimate land water-storage variations in near real time. For example, the vertical crustal deformations (VCDs) observed from global positioning system (GPS), due to the elastic response of the Earth to changes in hydrologic loading, could be used to quantify the water excess and deficits. Here, it is considered how GPS-based VCDs can be used to characterize the 2012-2015 drought that plagued many regions of Brazil. Overall, the GPS-based drought index (DIGPS) reflects the water depletion over many regions of Brazil and this agrees with GRACE-based DITWS in terms of correlation coefficient (0.4-0.9) in the river basins of the Amazon, Tocantins, Paraná, and São Francisco. However, for few GPS sites, daily positioning errors could impose limitations on the use of those stations for drought characterization.