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Climatic variability between SST and river discharge at Amazon region

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Climatic variability, related both to precipitation and river discharge, has been associated to ocean variability. Authors commonly relate Pacific sea surface temperature (SST) variation to South America (SA) precipitation. Zonal displacement of Walker cell, with intensified subsidence over northern portion of SA, Subtropical Jet strengthening/weakening over extratropical latitudes of SA are, respectively, dynamical reasons scientifically accepted for increasing and depletion of precipitation at the respective areas. Many studies point out the influence of tropical Atlantic SST anomalies in relation to precipitation/river discharge variability over northeast of Brazil. Aliseos variability at tropical Atlantic is also a physic process that contributes to explain precipitation and river flow variability over SA, mainly over the north portion. In this study, we aim to investigate the temporal correlation between SST, mainly from Pacific and Atlantic oceans, and rivers discharge at the Amazon region. Ji-Parana, Madeira and Tapajós river discharge in monthly and annual scale, between 1968 and 2008, were the time series selected to reach the purpose. Time series for river discharge were obtained from Agência Nacional de Águas (ANA, in Portuguese) and, SST data were obtained from CDC/NOAA. Before linear correlation computations between river discharge and SST have been made, seasonal cycle and linear tendency were removed from all original time series. Areas better correlated to river discharge at Amazon region show oceanic patterns apparently associated to PDO (Pacific Decadal Oscillation) and ENSO (El Niño-South Oscillation) variability, with absolute values greater than 0.3 and reaching 0.5 or 0.6. The spatial pattern observed at Pacific basin is similar to that showed by the first mode of PCA (Principal Component Analysis), such seen in many studies (the “horse shoe” pattern). In general, negative correlation values appear far more to the west of Pacific basin while positive values are appear over areas a bit more to east. Central and east areas over Equatorial Pacific show negative values to the discharge series analyzed. ENSO events are well correlated to precipitation anomalies over Amazon region. Positive/negative SST anomalies over central-east Equatorial Pacific are associated to few/more precipitation/river discharge over Amazon region. Madeira discharge is especially well and negatively correlated to SST at tropical North Atlantic areas, showing absolute values greater than 0.5. In this case, the increase/decrease of river discharge over Amazon region when SST anomaly at the tropical north Atlantic is negative/positive can be explained by the strengthened/weakened winds over the equatorial side of the subtropical high during these situations. Pacific and Atlantic areas that show good correlations to river discharge at Amazon region may be potential variables in a linear model to simulation and prediction of discharge.