

## El Niño Modoki Impacts on Austral Summer Extremely Low Discharges Events of the Paranaíba River in Brazil

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The impact of El Niño Modoki has been found in the rainy season extremely low discharges events during the DJF or Austral summer at the Fazenda Santa Maria gauge station of the Paranaíba River basin. The climatology of streamflow at the Fazenda Santa Maria gauge station of the Paranaíba River in Brazil shows significant flow during November to May and very less flow during June-October. Extreme events are identified based on their persistent flow for one week ahead. During DJF seasons when the seasonal mean streamflows are in the peak, 90% of the extremely low discharge events are occurred during the positive phases of the central Pacific warm pools of this season. There is also a very significant statistically correlation of 0.83 found between the El Niño Modoki Index and the seasonal streamflows of the El Niño Modoki season. However, surprisingly none of the low-stream-flow events were associated with canonical El Niño events. On the other hand extremely high streamflow events are associated with the La Niña years. 80% of the high streamflow events are occurred during La Niña phases. Although climate variations have direct relationship with the

rainfall, streamflow characteristic are considered as the surrogate to rainfall. However, apart from climate variations the human also influences streamflows or nature induced land-use changes. In this study we applied multi velocity TOPMODEL approach and residual trend analysis to examine the impact of land-use to the streamflow at the Fazenda Santa Maria gauge stations. The residual trend analysis shows the evident characteristics of change in model output. Thus implies the impact of land-use change along with El Niño Modoki on the streamflows of the Paranaíba river basin.