



Influence of El Niño-Southern Oscillation (ENSO) on the behavior of floods in the Itajaí River basin in Southern Brazil

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The Itajaí River basin is located in the Southeastern South America (SESA) region, where the influence of El Niño-Southern Oscillation (ENSO) on hydrometeorological extremes has been reported. The lower reaches of the river are prone to calamitous floods as the basin is frequently subjected to extreme rainfall events. The history of devastating floods motivated the construction of detention dams in the upper reaches of the river during the 1970s-1990s.

This work presents a study on the nonstationarity of floods in the Itajaí River, using a peaks-over-threshold (POT) approach applied to flood data from 3 gauging stations located in the Basin. Exploratory data analysis methods and nonstationary Poisson-Generalized Pareto models are used to study the joint influence of ENSO and upstream flood control dams on the flood regime of the river. Bayesian model estimation techniques are used with prior belief about the Generalized Pareto shape parameter elicited from regional information.

The analysis revealed that occurrence rate and over-threshold peak magnitudes exhibit statistically significant and complex relationships with ENSO. Results also show evidence that, while upstream flood detention dams play a perceptible, though small, role in reducing flood hazard, the influence of the climate covariate on the flood regime is dominant. Furthermore, increased ENSO activity in recent decades, possibly related to a reported climate regime shift in the mid-1970s, has increased flood hazard and led to the occurrence of very large annual floods.