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Natural climate variability and the floods in Veracruz, Mexico in 2010

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The hydroclimatic events that occurred in the state of Veracruz, Mexico during the period 1999-2010 make impossible to stop thinking about floods as a hazard for its inhabitants. Climate records of the 20th century indicate that both the north and south of the state, which boarder the western side of the Gulf of Mexico, have large precipitation variability which has the potential of inducing droughts and floods. Intrinsic phenomena to the natural climate variability have the potential of generating intense rainfall episodes, and eventually, floods in Veracruz. In spite of the increased frequency of these events, and their possible connection with natural climate variability, this relationship has not been properly studied. This is the first work that directly analyzes precipitation variability in the state of Veracruz and its relationship with phenomena inherent to the natural climate variability. The observed anomalous rainfall in the summer and fall of 2010 is analyzed within this context. The concurrence of the anomalous rainfall in the northern and southern portions of Veracruz and the global sea surface temperatures in the summer and fall of 2010, suggests that climate phenomena of global scale such as La Niña and the Atlantic Multidecadal Oscillation (AMO) in its positive phase, may have induced the extreme rainfall. The AMO, a low-frequency phenomenon operating at decadal scales, works in the background inducing anomalous rainfall in the southern portion of the state in its positive phase, mainly during summer and fall. El Niño-Southern Oscillation, a high-frequency phenomenon operating at interannual scales, can magnify/reduce the effect of the AMO through its La Niña/El Niño phase in both northern and southern portions of the state. However, these phenomena do not explain entirely the observed anomalies in 2010, mainly over the northern portion seen in fall, which opens the door to other phenomena of atmospheric, oceanic or even man-made origin to explain them. This uncertainty exemplifies the work that still is needed in order to gain knowledge on the nature of the forcing of anomalous regional rainfall.