Baseflow Response to Climate Variability Induced Droughts in the Apalachicola-Chattahoochee-Flint River Basin

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Abstract. Climate variability induced droughts have been the source of the Tri-State Water Wars in the Southeastern United States. One of the major issues related to the conflict is the reduction in baseflow levels in the Flint River during droughts. This study was conducted to understand and quantify the impacts of climate variability cycles on baseflow levels in the Flint River. The individual and coupled impacts of the El Niño-Southern Oscillation (ENSO), Pacific Decadal Oscillation (PDO), Atlantic Multidecadal Oscillation (AMO), and North Atlantic Oscillation (NAO) on baseflow were studied and quantified. A non-parametric Joint Rank Fit (JRFit) procedure was used to test the interaction between ENSO phase baseflows with PDO, AMO, and NAO phase baseflows. Further, simple-main effect comparisons were also performed using the JRFit model to estimate significant difference between the positive and negative phase baseflows of PDO, AMO and NAO associated with El Niño or La Niña phases. The results indicate that the phases of ENSO, AMO and NAO significantly affect baseflows in the Flint River. Interaction tests showed that the PDO and AMO phases modulate ENSO phase baseflows. La Niña associated with positive phase of PDO and AMO resulted in greater decrease in baseflow levels of approximately 30% and 35% respectively. However, La Niña associated with negative phase of AMO showed above normal baseflows. Results obtained from this study can be used by water managers in issuing severity-based water restrictions in the region.