

ALTERNATING CLIMATE DRIVERS AFFECT ALTAMAHA RIVER, GEORGIA STREAMFLOW

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Abstract. Variability in freshwater delivery (precipitation and streamflow) to the Altamaha River estuary (GA, USA) was examined in relation to indices for several climate signals: the Bermuda High Index (BHI), the Southern Oscillation Index (SOI), the Niño4 index for El Niño Modoki, the North Atlantic Oscillation (NAO), and the Atlantic Multidecadal Oscillation (AMO). Freshwater delivery is an important factor determining estuarine character and health, and streamflow to this estuary has been linked to key ecosystem properties (e.g., salinity regime, water residence time, nutrient inputs, and marsh processes), so understanding how climate patterns affect precipitation and river discharge will help elucidate how the estuarine ecosystem may respond to climate changes. Precipitation patterns in the Altamaha River watershed were described using empirical orthogonal functions (EOFs) of the combined multi-decadal time series of precipitation at 14 stations. The first EOF mode (67% of the variance) was spatially uniform with monthly temporal variability. The second mode (11%) showed a spatial gradient along the long axis of the watershed (NW-SE) whereas the third mode (6%) showed a NE-SW pattern. We compared these EOFs, monthly standardized anomalies of Altamaha River discharge at the Doctortown, GA gauge (closest to the estuary), and the climate indices. Complex, seasonally alternating patterns emerged. The BHI was correlated with June-January discharge and precipitation EOF 1. The SOI was correlated with January-April discharge and precipitation EOF 2, and also weakly correlated with EOF 1 in November-December. The Niño4 index correlations resembled those of the SOI with some exceptions. The AMO was correlated with river discharge and precipitation EOF 3 mainly in December-February and June. There were no consistent relationships between two NAO indices and river discharge or precipitation. The occurrence of tropical storms in the region was strongly related to the BHI but not to the other climate indices, possibly representing the influence of storm tracking more than the rate of storm formation. Comparison with the literature suggests that the patterns found may be typical of southeastern USA estuaries but are likely to be different from those outside the region. This work is presented in more detail in a manuscript that has been submitted to the journal *Estuaries and Coasts*.