



Historical drought variability in Southeast Florida and teleconnections to ENSO, PDO, and AMO

Anteneh Abiy and Assefa Melesse

Florida International University, Florida International University, Earth and Environment, Miami, United States
(melessea@fiu.edu)

Hydroclimate variabilities are associated with ENSO, PDO, and AMO fluctuations. The extreme case of the variabilities gives rise to flood or drought. Driven by hydroclimatic variabilities, hydrological drought affects freshwater availability, introduces challenges to water resources management and requires a review of water allocation practices. This presents a significant challenge to water users and managers, particularly in areas where freshwater is optimally allocated. In Southeast Florida, the incidence of hydrological drought is highly threatening freshwater availability for differed uses. A detailed evaluation understanding and association of local drought with ENSO, PDO, and AMO fluctuations are necessary for a sustainable water resources management strategy. The objectives of the study are to evaluate the long-term hydrological drought fluctuation in Southeast Florida and, define the teleconnectivity of local drought with ENO, AMO, and PDO. Monthly rainfall data from 1906 to 2016 were used to evaluate historical drought fluctuations by calculating the monthly residual and by using the Standardized Precipitation Index (SPI). The correspondence of total annual and dry season rainfall with ENSO, AMO, and PDO is evaluated by correspondence analysis. The SPI calculated by using total rainfall of three, six, twelve, and twenty-four months is used to analyze the association of drought with ENSO, AMO, and PDO. Historical drought in different time window indicates that there is a wet and dry cycle, where the area is in the wet phase of the fluctuation. SPI 3 and 6 indicate the seasonal fluctuations, whereas the SPI 12 and 24 indicates long-term phases. In general rainfall variability is directly proportional to ENSO and PDO, and inversely related to AMO indices. Seasonal and annual rainfall variabilities are strongly associated with ENSO. Our analysis indicates that the long-term local drought in Southeast Florida is highly associated with PDO than ENSO and AMO. Short-term drought is driven by ENSO fluctuations, whereas long-term drought is a feedback from the combined effects. A prolonged drought could result in limited freshwater available due to declined precipitation input and saltwater intrusion. Hence, recharge deficit management due to drought should be considered to enhance the sustainability of freshwater availability in the area.

Key words: Drought, teleconnection, ENSO, PDO, AMO, South Florida