

**Assessing Linkages between Climate Teleconnections and Freshwater Inflows to Texas
Bays and Estuaries**

by

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Understanding spatiotemporal variability in freshwater inflows to the bays and estuaries along the Gulf of Mexico is critical for water resources management to maintain the health of the ecosystem and marine life. The objective of this study was to assess linkages between climate teleconnections (e.g. El Nino Southern Oscillation [ENSO], North Atlantic Oscillation [NAO], and Pacific Decadal Oscillation [PDO]), precipitation, and freshwater inflows to the Gulf of Mexico. Seasonal Trend Decomposition using LOESS (STL) analysis was used to decompose monthly precipitation and freshwater inflows (1941-2015) to each bay and estuary, isolating long-term variability, and comparing it to ENSO during warm and cool PDO phases and NAO.

Results show that there are moderately strong positive correlations between ENSO and precipitation ($R = 0.158$ to 0.538) with mostly higher precipitation during El Nino and lower precipitation during La Nina. These correlations were weakened during PDO warm phase ($R = 0.076$ to 0.473) and amplified during PDO cool phase ($R = 0.269$ to 0.779). Temporal variability in precipitation was linked to bay and estuary freshwater inflows, showing high flows during El Nino and low flows during La Nina. Additionally, there are moderately strong positive correlations between NAO and freshwater inflows to two of the 10 bays/estuaries in the northeast (Sabine-Neches and Trinity San Jacinto, $R = 0.453$ and 0.410). These correlations tend to occur within the year of the driving conditions in the Pacific and Atlantic oceans. Identifying these linkages and the corresponding response times can help predict and manage the hydrologic response to wet and dry climate cycles linked to climate teleconnections along the Texas Gulf Coast to help protect and maintain the health of the vital estuarine environments.

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