Hydrologic Connectivity Between the Everglades and the Florida Bay Through Coastal Mangroves and Freshwater Sloughs

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Coastal mangroves are important to the southern Everglades' natural drainage systems that provide a hydrologic link between the upland freshwater wetlands and the downstream estuaries and coastal ocean. Both Shark River and Taylor Sloughs are vulnerable portions of the Florida Coastal Everglades due to the combined presses of accelerated sea level rise and pulses of severe weather like tropical cyclones. Furthermore, both Sloughs undergoing intensive hydrological rehydration through the Comprehensive Everglades Restoration Program to restore freshwater flow. Therefore, having a detailed understanding of the hydrologic connectivity between the Shark River and Taylor River Slough with the downstream coastal zones, including Florida Bay, is important. In this study, we conduct rigorous numerical modeling with an advanced three-dimensional hydrodynamic model to simulate the inundation depth and inundated areas, water level, flows, and particle trajectories of the land-to-ocean continuum of Florida coastal Everglades with a focused areas along Shark and Taylor Sloughs, Florida Bay and the Gulf of Mexico. The well-validated model results provide qualitative and quantitative analysis of the hydrologic connectivity between landscapes with heterogeneity across multiple scales along the creek-to-ocean gradient. The model's results calibrated to stage gauges located throughout south Florida and surrounding coastal areas are used to examine the seasonal variation of the hydrologic connectivity between the watershed and the coastal ocean through the freshwater sloughs with anthropogenic modification by canal water management and restoration plans. The results of this work shed light on the impact of environmental and anthropogenic stressors on the hydrologic changes and material exchanges across the land-to-ocean continuum.