Daily water levels from July 2017 to July 2020 **(Figure 3A)** show synchronous fluctuations between the Upper Floridan Aquifer wells at Waycross (27G003) and Jones Island (27E004), with nearly overlapping patterns in both amplitude and phase. By contrast, the Jones Island swamp surface water exhibits damped variability and smoother transitions, consistent with differing short-term hydrologic responses.

The linear correlations and temporal alignments among the three monitoring sites (summarized in **Figure 3B**) show strong covariation, indicating coherent hydraulic responses across the swamp and aquifer. The Pearson correlation between the two groundwater wells is 0.980, indicating near-perfect linear covariation. Comparisons involving the swamp yield lower correlation values ($r = 0.539$ and $r = 0.509$). Dynamic time warping (DTW) distances show a similar pattern: the Waycross–Jones well pair has a much smaller DTW value (69.0) than either aquifer–swamp pair (>400), reflecting greater dissimilarity in temporal patterns involving the swamp.

To quantify the system's hydraulic responsiveness, we estimated the impulse response function between swamp surface water (input) and aquifer levels at Jones Island (output). As shown in **Figure 3C**, the deconvoluted response function increases monotonically and asymptotes over a ~100-day lag time. Fitting these values to a one-dimensional vertical flow model through a leaky aquitard yields a best-fit diffusivity of 291 m^2/d. The match point used for the fit occurs at a lag time of ~30 days, corresponding to the inflection point in the observed response.

These results **(Figure 3C)** quantify the strength and timing of hydrologic signal transmission between the swamp and underlying aquifer, and serve as the basis for the discussion of vertical connectivity and aquitard properties in Section 4.

Together, the results from Figure 3A–C—spanning time series behavior, statistical dependencies, and hydraulic modeling—converge on a coherent interpretation: the Okefenokee Swamp is hydraulically connected to the underlying Floridan Aquifer. This vertical exchange, while temporally damped, is physically significant and occurs through a leaky confining system. These findings reinforce and extend the isotopic evidence in Section 3.1, and underscore that swamp–aquifer connectivity must be reconsidered in regional water budget and groundwater resource assessments.

The residual water budget estimates (see Section 4.1) – 130 to 220 mm/yr – is consistent with the vertical leakage required to explain the enriched isotope signatures observed in the Floridan Aquifer beneath the swamp. This downward flux aligns with