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# Role of equatorial basin modes for equatorial Atlantic productivity

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The eastern equatorial Atlantic hosts a productive marine ecosystem that relies on upward supply of nitrate, the main limiting nutrient in this region. The annual peak in surface chlorophyll occurs in boreal summer, roughly coincident with increased easterly winds. Enhanced turbulence is expected with increased winds. However, upward nitrate supply by mixing requires this turbulence to act on adequate nitrate gradients. Here, we show the combination of independent wind-forced processes that seasonally elevates the nitracline into the turbulent layer above the core of the Equatorial Undercurrent (EUC). Detailed measurements from two trans-Atlantic surveys plus extended time series from equatorial moorings show how the nitracline responds in quasi-equilibrium to strengthening easterly winds. The vertical migration of the EUC core is independently determined by an annual oscillation caused by the presence of a resonant equatorial basin mode. When both processes cause the nitracline to be raised above the EUC core, local and instantaneous winds force an enhanced diffusive nitrate flux. This interplay of mechanisms synchronizes to create the seasonal cycle of nutrient supply and productivity unique to the equatorial Atlantic but not present in the mainly iron-limited equatorial Pacific, highlighting fundamental biogeochemical and dynamical distinctions between the two basins.

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