Changes in the North Atlantic Oscillation influence CO2 uptake in the North Atlantic over the past two decades

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Observational studies report a surprisingly rapid decline of the CO2 uptake in the temperate North Atlantic Ocean during the last decade. We analyze these changes using numerical model simulations for the period 1979-2004, with interannually varying atmospheric forcing. The reorganization in ocean circulation is a major driver of these CO2 system changes. North Atlantic Oscillation (NAO) climate patterns are overlain by transient events such as the Great Salinity Anomaly. Our analysis indicates that the recent rapid shifts in CO2 flux are decadal perturbations superimposed on the secular trends and highlights the need for long-term ocean carbon observations and modeling to fully resolve interannual variability, which can obscure detection of the long-term changes associated with anthropogenic CO2 uptake and climate change.