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Observational confirmation of the thermohaline feedback between the Arctic and the AMOC

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The flow of warm saline Atlantic water across the Greenland-Scotland Ridge (Atlantic inflow) is critical for conditions in the Nordic Seas and Arctic Ocean by importing heat and salt. After cooling, most of it returns to the Atlantic as dense overflow water that feeds the deep branch of the North Atlantic thermohaline circulation (THC). A feedback mechanism between these flows has been suggested to cause rapid climate shifts in paleodata and is implicit in suggestions for or against anthropogenic weakening of the THC. An integral part of the feedback mechanism is forcing of the Atlantic inflow by overflow, but this conflicts with claims that the Atlantic inflow is forced by wind stress over the Northeastern Atlantic. Here, we present a decade-long series of measurements from the Iceland-Faroe inflow branch (IF-inflow), which carries almost half the total Atlantic inflow. The observations show no significant trend in volume transport, but temperature and salinity increased during the period. Combining transport time-series with satellite altimetry reveals that the IF-inflow is mainly forced by suppressed sea level in the southern Nordic Seas, generated by outflow from the area. Since the outflow is dominated by overflow, the analysis confirms the thermohaline feedback mechanism.