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A changing Arctic Ocean: How measured and modeled ^{129}I distributions indicate fundamental shifts in circulation between 1994 and 2015

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^{129}I measurements on samples collected during GEOTRACES oceanographic missions in the Arctic Ocean in 2015 have provided the first detailed, synoptic ^{129}I sections across the Eurasian, Canada and Makarov Basins. ^{129}I is discharged from European nuclear fuel reprocessing plants since several decades and is carried north into the Arctic Ocean with waters of Atlantic origin. Here the measurements of its passage can be used to identify the ocean circulation at different depth horizons. Elevated ^{129}I levels measured over the Lomonosov and Alpha-Mendeleyev Ridges in 2015 were associated with tracer labeled, Atlantic-origin water bathymetrically steered by the ridge systems through the central Arctic while lower ^{129}I levels were evident in the more poorly ventilated basin interiors. ^{129}I levels of 200-400 x 10^7 at/l measured in intermediate waters had increased by a factor of 10 compared to results from the same locations in 1994-1996 owing to the arrival of a strong increase in the discharges from La Hague, that occurred during the 1990s. Comparisons of the patterns of ^{129}I between the mid-1990s and 2015 delineate large scale circulation changes that occurred during the shift from a positive Arctic Oscillation and a cyclonic circulation regime in the mid-1990s to anticyclonic circulation in 2015. These are characterized by a broadened Beaufort Gyre in the upper ocean, a weakened boundary current and partial AW flow reversal in the southern Canada Basin at mid-depth. Tracer ^{129}I simulations using the coupled ocean-sea ice model NAOSIM agree with both, the historical ^{129}I results and recent GEOTRACES data sets, thereby lending context and credibility to the interpretation of large-scale changes in Arctic circulation and their relationship to shifts in climate indices revealed by the tracer ^{129}I distributions. We will present measurements and simulation results of ^{129}I for the 1990s and 2015 and put them into the context of ocean circulation responses to changing atmospheric forcing regimes.