N cycling in the Atlantic: Insights from nitrate $\delta^{15}N_{NO3}$ & $\delta^{18}O_{NO3}$ measurements across the UK-GEOTRACES 40°S transect

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A basin-wide transect of nitrate isotopes ($\delta^{15}N_{NO3}$, $\delta^{18}O_{NO3}$), across the 40°S (South Atlantic) South Atlantic is compared with 30°N (North Atlantic). Isotopes reveal partial utilization of nitrate by phytoplankton and distal denitrification processes, transporting into the Atlantic heavy isotope signatures through Antarctic sourced intermediate waters. On passing through the subtropical Atlantic the water masses are fortified with N due to reminerlisation of particles influenced by diazotrophy having high N:P raios (18-22:1) and light N-isotope signatures. These modifications influence the isotopic signatures of the North Atlantic Deep Water (NADW) which is subsequently exported from the Atlantic counteracting enrichment in $\delta^{15}N_{NO3}$ from water column denitrification in the Indo/Pacific basins. Using isotopic signatures, we estimate new N fixed in the Atlantic Ocean which suggests N_2 fixation can produce excess N (relative P) under favourable conditions of adequate Fe supply and/or low denitrification. The implications of this to N versus P limitation in past and present ocean will be discussed.