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Water Masses Chemical Properties in the Western Tropical Atlantic Ocean

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Here we characterize the chemical properties of the water masses in the Western Tropical Atlantic Ocean according to their inorganic nutrient concentration: dissolved inorganic nitrogen (DIN), phosphate and silicate. We collected full-depth water samples from 16 oceanographic stations along the 38°W transect, from 1°S to 15°N during the PIRATA-BR XVIII cruise, in October–November 2018. In this region, the surface and subsurface circulation in the Atlantic Ocean displays complex seasonal patterns, under influence of the Intertropical Convergence Zone. The samples were collected from Niskin bottles closed in ten different depths, stored frozen, and later analysed through spectrophotometry. Besides that, the CTD-O₂ data provided continuous salinity, temperature, and dissolved oxygen measurements, used to identify the water masses according to their thermohaline indexes. Six water masses were identified in the region based on their neutral density limits: Tropical Surface Water (TSW, $\gamma^n < 24.448 \text{ kg m}^{-3}$); South and North Atlantic Central Water (SACW and NACW, $\gamma^n 24.448 - 26.815 \text{ kg m}^{-3}$); Antarctic Intermediate Water (AAIW, $\gamma^n 26.815 - 27.7153 \text{ kg m}^{-3}$); North Atlantic Deep Water (NADW, $\gamma^n 27.7153 - 28.135 \text{ kg m}^{-3}$); and Antarctic Bottom Water (AABW, $\gamma^n > 28.135 \text{ kg m}^{-3}$). The oligotrophic TSW is almost completely depleted in nutrients; Central Waters NACW and SACW have the following concentration ranges: DIN, 5 – 15 $\mu\text{mol/kg}$, phosphate, 0.5 – 1.0 $\mu\text{mol/kg}$, silicate, 5 – 20 $\mu\text{mol/kg}$; AAIW nutrient concentrations are DIN: 30 – 40 $\mu\text{mol/kg}$, phosphate: 1.5 – 2.5 $\mu\text{mol/kg}$, and silicate: 25 – 40 $\mu\text{mol/kg}$; NADW nutrient concentrations are DIN: 15 – 25 $\mu\text{mol/kg}$, phosphate: 1.0 – 1.5 $\mu\text{mol/kg}$, and silicate: 20 – 45 $\mu\text{mol/kg}$; and AABW nutrient concentration ranges are: 40 – 80 $\mu\text{mol/kg}$ silicate, 30 – 35 $\mu\text{mol/kg}$ DIN, and 1.5 – 2.5 $\mu\text{mol/kg}$ phosphate. North of 5°N up to 15°N, there is a region of lower oxygen and higher phosphate concentrations, comprising the central water and the upper AAIW layers, extending from 200 m to 800 m. This corresponds to the area under influence of the eastward flowing North Equatorial Counter Current (NECC) and North Equatorial Under Current (NEUC), which are both, in turn, influenced by the position of the Intertropical Convergence Zone (ITCZ). Further study directions include a detailed study of the multiple source waters to this central layer, associated to the regional circulation, and possible linking to the eastern tropical Atlantic oxygen minimum zone.