Structure and circulation of water masses in the Equatorial and South Atlantic Ocean based on WOCE and "Meridian" project cruises

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Objectives of this investigation were to determine water mass boundaries below main thermocline, to compare methods of their evaluation and to obtain water mass transport in the South Atlantic, a transit region of the interoceanic circulation ("conveyor belt"). Boundaries of water masses were obtained by different methods: by maximal gradients of different tracers, by Brent-Vaisala frequency, by minimal oxygen concentration, by fixed values of potential temperature and the potential density (sigma-2). WOCE hydrographic section data in the Equatorial and the South Atlantic ocean (40°S -10° N) and the latest cruises of Russian research vessels (near WOCE sections A17 and A06) were used. Boundaries of water masses were defined more precisely. The method of maximal property gradients revealed closest correspondence practically of all water mass boundaries: the maximal gradients of different characteristics usually coincided. The results allowed to conclude that the Upper and Lower components of the North Atlantic Deep water (NADW) were mainly of the same origin. This hypothesis is in a good agreement with values of CFCs. It was also obtained that the Lower NADW, which penetrated to the Indian Ocean, was mainly the product of interaction between the Mediterranean and Antarctic origin waters. From this point of view the division of Antarctic Bottom water into Lower Circumpolar Deep water and Weddel Sea water was not correct. Water mass transport was obtained within the determined boundaries. Ekman transport was computed from satellite data (ERS-1), geostrophic component - from CTD latitudinal section data. As a result, a new scheme of the large-scale deep circulation was suggested.