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Temporal variability of Antarctic Bottom Water flows in the Atlantic

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Antarctic Bottom Water (AABW) fills the abyssal layer of the major part of the Atlantic basins. The classical definition of its upper boundary is the isotherm of potential temperature 2ºC. The inclination of this isotherm determines the horizontal pressure gradient which forces Antarctic water motion to the north. Velocities of this flow reach 50 cm/s in narrow channels between separate ocean basins. Long-term velocity and temperature measurements in such channels show strong variability of the flows at different temporal scales. Physical mechanism of this variability is not clear yet.

We use our velocity, temperature, and salinity measurements of bottom currents performed at different locations over the Atlantic in the last few years. The major part of the measurements was concentrated in the Vema Channel in the Southwestern Atlantic and in the numerous fracture zones of the Mid-Atlantic Ridge. We measured the same currents a few times using CTD and LADCP profilers and analyzed changes of their lateral structure. Measurements of thermohaline properties of the strongest flow in the Vema Channel show decadal warming of AABW. We also used mooring observations of the velocity time series measured at the key points of the sections across the channels. Velocities in the bottom layer were simulated by the Institute of Numerical Mathematics Ocean Model (INMOM). Three-dimensional velocity fields calculated for different seasons significantly differ from each other and allow us to study dynamics of bottom currents and the causes of their variability.

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