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Atlantic Meridional Overturning Circulation: Dynamics of Abyssal Mmixing and InteriorTtransports Experiment (DynAMITE)

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DynAMITE is an investigation of the processes by which the densest waters in the Atlantic Meridional Overturning Circulation - Antarctic Bottom Waters (AABW) and Denmark Strait Overflow Waters (DSOW) - are transformed by turbulent mixing and buoyancy gain into warmer, lighter density classes - Lower North Atlantic Deep Waters (LNADW) - and the circulation through the interior western North Atlantic basin that results. The dense waters originate as strongly stratified inflows from the south (AABW) and from the north (DSOW). It is postulated that turbulent mixing drives an entrainment of overlying warmer waters into the dense bottom waters with important consequences for the abyssal circulation: 1) it modifies the vertical density structure inducing vortex stretching and formation of beta plumes, 2) creates localized uplift of isopycnals and thermal wind, 3) inflates the volume transport of the bottom flows enhancing the northward penetration of AABW, and 4) weakens the stratification resulting in two massive reservoirs of low potential vorticity waters - an abyssal analog to water masses formed by convective processes and buoyancy loss at high latitudes (e.g. Labrador Sea Water). Most of the water mass transformation takes place between 20o - 40o N where mixing is enhanced over rugged topography along the Mid Atlantic Ridge and Bermuda Rise, and in the high eddy kinetic energy regime associated with the deep Gulf Stream. DynAMITE is designed to measure the structure and strength of this diapycnal mixing (where? how much? and why?) and the flows through the interior basin that result. The field program is comprised of two components. 1) A moored array of profilers installed down the southeast flank of Bermuda Rise in September 2010 is presently measuring interior flows at depths between 1200-6000 m. 2) A microstructure survey conducted in May/June 2011 using the High Resolution Profiler (HRP), has provided a basis for estimating and parameterizing the diapycnal mixing field and buoyancy gain that feeds the interior flows. Preliminary results from this observational program will be presented.