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Upwelling in the Atlantic sector of the Southern Ocean inferred from helium isotope disequilibrium

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Upwelling plays an important role regarding the physical and biogeochemical characteristics of the mixed layer, and it may also counteract the uptake of atmospheric gases like CO_2. However, estimates of upwelling velocities are rare, particularly in the Southern Ocean. Since upwelling velocities are too small to be measured directly - in the order of a few meters per day - an indirect method to infer upwelling velocities from the helium isotope disequilibrium in the mixed layer is applied here instead. The main source of ^{3}He to the ocean is hydrothermal venting and thus a significant excess of ^{3}He in the mixed layer can only be maintained by vertical motion.

Helium isotope data - measured from 1986 to 2009 - in the Antarctic Circumpolar Current (ACC) and the Weddell Sea shows a significant excess of 3He in the mixed layer from which upwelling velocities will be inferred. Here, first results of upwelling estimates inferred from helium isotope disequilibria in the ACC and the Weddell Sea will be presented.