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Early results from combined historic chlorofluorocarbon and first sulphur hexafluoride measurements in the Weddell Sea - variability of ventilation rates and anthropogenic carbon

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The Weddell Sea is a key area for the formation of deep and bottom water and, hence, a major driver of the deep part of the global ocean's conveyor belt. Furthermore, it provides an important sink for atmospheric gases like anthropogenic carbon. Its sensitivity to changing atmospheric conditions is under discussion.

During the last three decades time series of anthropogenic transient tracer measurements (chlorofluorocarbons, CFCs) were obtained on a section crossing the Weddell Basin from the northern tip of the Antarctic Peninsula to Cape Norwegia and along the Prime Meridian from the Antarctic Continent to the Mid Atlantic Ridge (1984-2008). On our most recent RV POLARSTERN expedition from November 2010 to February 2011 we obtained for the first time sulphur hexafluoride (SF6) measurements in addition to CFCs in that area. The onset of the atmospheric SF6 history starts some decades after the CFCs, and the increase of SF6 in the atmosphere is steeper. The combination of CFC and SF6 may, hence, provide a better constraint for the quantification of very recently ventilated deep and bottom water and for the estimate of transport time scales or transit time distributions (TTDs).

We discuss that new CFC and SF6 data set in comparison to the historic CFC data and show early results from our analysis. We use the extended CFC time series combined with the additional tracer SF6 to determine TTDs, from which we assess the ventilation rates of deep and bottom water and estimate the related content of anthropogenic carbon and their temporal variability in the Weddell Sea during the last three decades.