

Preliminary results from numerical modeling of chlorofluorocarbons (CFCs) and sulfur hexafluoride (SF₆) in the Southern Ocean

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Antarctic Bottom Water (AABW) forms in the Southern Ocean and spreads throughout the global ocean. The time scale of AABW spreading has not been understood in detail. To quantitatively understand its time scale, it is effective to use transient tracers such as chlorofluorocarbons (CFCs) and sulfur hexafluoride (SF₆). We carry out numerical experiments of CFCs and SF₆ in the Southern Ocean using a coupled ocean-sea ice-ice shelf model and investigate the relationship between partial pressure of CFC-12 (pCFC-12) and partial pressure of SF₆ (pSF₆) in AABW. The concentrations of pCFCs in the model are significantly high near formation regions of the AABW (Ross Sea, Weddell Sea, off the Cape Darnley, and off the Adelie Land). This horizontal distribution is consistent with observational results. The linear relationship between pCFC-12 and pSF₆ are found near formation regions of the AABW, indicating that a strong mixing of waters with different ages. The transit time distribution (TTD) method using pCFC-12 and pSF₆ provides information about mean age and age distribution of a water parcel. In the presentation, we will reveal the TTD in the model and estimate the water mass age using the TTD and observed multi-transient tracers.

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