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Diapycnal flux of nitrous oxide across the thermocline

Tim Fischer, Annette Kock, Hermann W. Bange, Peter Brandt, and Marcus Dengler
IfM-GEOMAR Kiel, Duesternbrooker Weg 20, 24105 Kiel, Germany (tfischer@ifm-geomar.de)

The oceans produce a significant amount of the potent greenhouse gas nitrous oxide (N2O). They account for an estimated 5 to 40 percent of the total supply to the atmosphere. Our contribution explores the oceanic N2O budget in order to determine N2O sea-to-air-fluxes more precisely.

Within the SOPRAN research programme we quantified diapycnal flux of N2O across the thermocline in an open ocean region of the Tropical North East Atlantic. Data was collected during two cruises in and near the region of the oxygen minimum zone off West Africa and during several surveys of the TENATSO time series station near Cape Verde.

Diapycnal flux of N2O is calculated in a direct manner by using N2O concentration profiles and associated diapycnal diffusion profiles from a microstructure probe. We focus on the thermocline because this zone acts as a bottleneck for upward mixing of N2O, when on its way from source regions below the thermocline to the mixed layer. In the thermocline turbulent mixing is very low and anisotropic, but still significantly different from molecular diffusion and still accessible to microstructure measurement. The low mixing shows up in a sharp N2O gradient across the thermocline that allows most precise N2O flux quantification here.