

The isotopic composition of atmospheric and dissolved molecular H₂ along an Atlantic meridional transect

S. Walter¹, T. Steinhoff², B. Fiedler², P. Fietzek², A. Kock², M. Krol¹, E. Popa¹, Q. Chen¹,
T. Tanhua, and T. Röckmann¹

[1]{Institute for Marine and Atmospheric Research (IMAU), Utrecht University, The Netherlands}

[2]{Marine Biogeochemistry, GEOMAR/Helmholtz-Centre for Ocean Research, Kiel, Germany}

Oceans are a net source of molecular hydrogen (H₂) to the atmosphere, a trace gas with the general potential to support solving the climate problem as a future energy carrier. The production of marine H₂ is attributed mainly to biological production by N₂ fixation, but also photochemical pathways are discussed. Although H₂ has an important impact on atmospheric chemistry, lots of details of the global budget still remain unclear due to a lack of measurements.

Here we present atmospheric molecular H₂ measurements covering two seasons over the southern and northern Atlantic from 2008 to 2010. Aim of the study was to get a high-resolution picture of the distribution of H₂ along a meridional marine transect and increase the data sets available for global budget modeling. Besides this we present the first results of the isotopic composition of molecular H₂ extracted from surface water. The isotopic signature of dissolved H₂ in surface waters clearly indicates a mainly biological production of H₂.

In total almost 400 samples were taken, and the results give a detailed overview of temporal and spatial atmospheric patterns. The atmospheric measurement results were compared with model results using a TM5 model and demonstrate, that the existing H₂ models are consistent with the experimental data.