

Campaigns and sample preparation for dating of ocean water and glacier ice with ^{39}Ar -ATTA

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Atom Trap Trace Analysis (ATTA) is a novel ultra-sensitive detection method that has been developed for rare krypton isotopes [1]. In Heidelberg, an ATTA setup has been realized for ^{39}Ar (half-life 269 a) which is the only reliable dating isotope for water and ice in the range of 50-1000 a. After the successful demonstration of ^{39}Ar dating for large groundwater samples of 1-2 m³ of water [2], current developments aim at smaller sample sizes of 10-25 L of water or 4-10 kg of ice, which brings ^{39}Ar dating of ocean water and glacier ice within reach.

A pilot study has been conducted in the oxygen minimum zone of the Eastern Tropical North Atlantic, where three vertical profiles have been sampled for ^{39}Ar analysis. Moreover, ice blocks from the Gorner glacier in the Swiss alps have been sampled for ^{39}Ar dating to constrain the unclear age at different positions along the flowlines.

The argon has been separated from the water and ice samples by vacuum degassing and titanium gettering achieving recoveries > 95% and purities > 98%. The ^{39}Ar analysis of the resulting argon samples is currently in progress.

The sampling and purification systems developed in the course of the first pilot studies provide the base for the wide range of applications that the advent of ^{39}Ar -ATTA enables.

[1] Jiang, et al. (2012) *GCA* **91**, 1-6.

[2] Ritterbusch et al. (2014) *GRL* **41**, 6758-6764.