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Fakultät für Physik

Isotopenphysik

I N V I T A T I O N

for a

V E R A – S E M I N A R

with

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How AMS contributed to the understanding of ocean circulation in the Arctic and North Atlantic

Releases of anthropogenic radionuclides from European nuclear fuel reprocessing plants enter the surface circulation of the high-latitude North Atlantic and are transported northward into the Arctic Ocean and southward from the Nordic Seas into the deep North Atlantic, thereby providing tracers of water circulation, mixing, ventilation, and deep-water formation. Recent work has benefited from advances in accelerator mass spectrometry to enable the measurement of the conservative, long-lived radionuclide tracers ^{129}I and ^{236}U, that added to the former use of ^{137}Cs. Latest studies of these tracers include the use of transit time distributions (TDs) to accommodate circulation timescales and mixing, providing a rich inventory of transport data for circulation in the Arctic and North Atlantic Oceans that are of great importance to global thermohaline circulation and climate.

In this talk I will present a summary of the work we have been doing in the last decade at ETH Zürich, and the future plans within the TITANICA project. In particular, results of ^{129}I and ^{236}U from three expeditions that took place under the Arctic GEOTRACES programme in 2015 and 2016. Distribution of these two radionuclides in the three sections offered an unprecedented snap-shot of the pathways of Atlantic waters flowing into the Arctic Ocean during an atmospheric anti-cyclonic regime. The combination of the two tracers, having different input functions but same sources, allowed us to constrain tracer ages at the surface, and transit time distributions at the Atlantic layer, updating the previous dataset that was built a decade ago using ^{137}Cs instead of ^{236}U [1]. Existing time series at Labrador Sea and deep North Atlantic (Line W) from 1990s and 2000s show the penetration of ^{129}I at the deep Labrador Sea and downstream at the Deep Western Boundary Current thus proving the connectivity between the Arctic and the Atlanic Oceans. Future work at ETH will cover several sections in the Arctic and subpolar North Atlantic Ocean, and will make use of the newly developed ^{129}I-^{236}U tracer pair to understand flow features and timescales of Atlantic Meridional Overturning Circulation.

[1] N. Casacuberta & J. Smith. Nuclear Reprocessing Tracers Illuminate Flow Features and Connectivity between the Arctic and Subpolar North Atlantic Oceans, *Annu. Rev. Mar. Sci.* 15:16.1-16.19 (2022).

Thursday, 22. June 2023, 16:30 o‘clock

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