UP 6: Oceanography

Time: Tuesday 16:30–17:30 Location: G 1.011

Invited Talk UP 6.1 Tue 16:30 G 1.011

Simple relations for mixing in estuaries — •Hans Burchard — Leibniz Institute for Baltic Sea Research Warnemünde, Rostock, Germany

The Knudsen and Total Exchange Flow (TEF) theories derived from the conservation laws of mass and salt by applying Gauss' theorem to the volume of a confined estuarine or marginal sea basin provide a quantitative understanding for estuarine physics. These theories represent exchange flows across an open boundary to the adjacent ocean in terms of bulk values (Knudsen theory: inflow and outflow volume or salinity) or with resolution in salinity space (TEF: profiles of volume and salt flux in salinity coordinates). Here, these theories are extended towards mixing of salinity, defined as the decay of salinity variance due to turbulent mixing. These new Knudsen and TEF relations for mixing are derived by applying Gauss' theorem to the salinity variance equation. As a result, long-term averaged mixing in estuaries and marginal seas can be estimated by simply considering inflowing and outflowing salinities at the open boundary as well as net freshwater run-off.

UP 6.2 Tue 17:00 G 1.011

^{39}Ar-dating with 5 litres ocean water samples — •Sven Ebser[1], Arne Kersting[2], Zhongyi Feng[1], Lisa Ringena[1], Maximilian Schmidt[1], Stefan Beyersdorfer[2], Emeline Mathouchanh[2], Florian Ritterbusch[2], Tim Stöven[3], Toste Tanhua[3], Werner Aeschbach[2], and Markus K. Oberthaler[1] — [1]Kirchhoff-Institut für Physik, Universität Heidelberg, Germany — [2]Institut für Umweltphysik, Universität Heidelberg, Germany — [3]GEOMAR - Helmholtz-Zentrum für Ozeanforschung Kiel, Germany

With a half-life of 269 years, ^{39}Ar is the only available dating tracer on the time scale of 50 to 1000 years, which makes it the perfect tool to investigate ocean ventilation. Up to now, Low-Level Counting was the only available technique for routine ^{39}Ar measurements. Requiring water sample volumes around one cubic meter and 6 weeks of counting, its application was limited to overall 125 ocean samples so far.

We will report the first ^{39}Ar measurements using only 5 litres of ocean water and taking only one day of analysis, based on the atom optical technique Argon Trap Trace Analysis. In 2015, three depth profiles at 8 samples each were taken during an east-west transect investigating the eastern tropical North Atlantic Oxygen Minimum Zone. The samples were further processed and analysed in Heidelberg. All three profiles show a rapid increase of the ^{39}Ar-age with depth in the upper 1500 m followed by a more homogeneous ^{39}Ar concentration down to 4000 m. The ^{39}Ar results are used in combination with CFC-12 and SF_6 data to constrain the Transit Time Distribution (TTD) method better, which is used to describe the ocean ventilation.

UP 6.3 Tue 17:15 G 1.011

Geophysical noise in L-band satellite observations for thin sea ice thickness retrieval — •Catalin Patilea and Georg Heygster — University of Bremen, Institute of Environmental Physics, Bremen, Germany

Thin sea ice thickness can be retrieved from the L-band radiometer Soil Moisture Ocean Salinity (SMOS) based on observations at 40-50° incidence angle. At L-band (1.4 GHz) the atmosphere has a low impact on the brightness temperatures but there are other potential sources of noise.

(1) Microwave radiation passing through the ionosphere can undergo a rotation of the polarization vectors (Faraday rotation) keeping the same intensity but changing the polarization difference. (2) The brightness temperatures recorded by SMOS over the same areas during ascending and descending overpasses can vary due to unequal RFI filtering or in zones with high brightness temperature gradient (e.g. ice edges). (3) Galactic radiation contains the uniform cosmic background radiation and the variable hydrogen emission lines and continuum radiation, thus the reflected radiation recorded by SMOS varies with day of the year and position of the satellite on the orbit.

An assessment of the impact of these noise sources on the sea ice thickness retrieval will be presented.