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High resolution noble gas profile in a sediment core from the Stockholm archipelago

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For the first time a large set of spatially "high-resolution" pore water samples for the noble gas analysis were taken in intervals of $\sim$2 cm from a sediment core in the Stockholm archipelago in the Baltic Sea (for the experimental details see [1], for an application see [2]).

The data indicate that there are significant noble gas concentration differences within the sampled core. Small noble gas peaks that are present within the profile may be related to a seasonal temperature change of the water body above the sediment column.

A strong concentration increase of atmospheric noble gases at 0.4-0.5 m depth correlates with a distinct change in the sedimentological record: above 0.4 m the sediments are well laminated, below they show a "homogeneous" texture.

One explanation for the concentration changes can be that this structure was generated by a side-slip of near surface material containing atmospheric air compoment (e.g. turbidites from the surface) because below 0.5 m all air-borne gases are supersaturated.

Preliminary results of sediment dating (^{137}Cs and ^{210}Pb) indicate that the observed sedimentological "disrupture" might have occured 250-300 years ago. It is too early to conclusively judge whether the slump may be related to changes in sedimentation in response to the little Ice age.

The possibility that the textural change at 0.4-0.5 m depth may also influence the parameters which determine the fluid transport (e.g. effective diffusitity) within the

sediment column cannot be excluded. Therefore it can be speculated that the sedimentological change acts as a “transport” barrier and the noble gas signatures may come from “below” the analyzed depth.

Additional data from the tritium measurements will yield insights into the possible transport mechanisms which are responsible for the observed noble gas concentration profile in the sediment core.

References

[1] Brennwald, M. S., Hofer, M., Peeters, F., Aeschbach-Hertig, W., Strassmann, K., Kipfer, R., and Imboden, D. M. (2003). *Analysis of dissolved noble gases in the pore water of lacustrine sediments.* Limnol. Oceanogr. Methods, 1:51-62.

[2] Tomonaga, Y., Brennwald, M. S., Kipfer, R. (2007). *Spatial variability in the release of terrigenic He from the sediments of Lake Van (Turkey).* Goldschmidt Conference 2007, Köln (Germany).