HE54A-1568

Ole Valk[1] (ole.valk@awi.de), Sandra Gdaniec[2], Michiel Rutgers van der Loeff[1], Viena Puigcorbe Lacueva [3] Ronja Paffrath[4]

[1] Alfred-Wegener-Institut, Helmholtz-Zentrum für Polar- und Meeresforschung, Bremerhaven, Germany ; [2] SMNH, Swedish Museum of Natural History, Department of Geosciences, Stockholm, Sweden,;[3] UAB, Universitat Autònoma de Barcelona, Institut de Ciència I Tecnologia Ambientals & Department of Physics, Barcelona, Spain; [4] ICBM, Max Planck Research Group for Marine Isotope Geochemistry Institute for Chemistry and Biology of the Marine Environment University of Oldenburg

^{230}Th and ^{231}Pa: tracers for deep water circulation and particle fluxes in the Arctic Ocean

Introduction

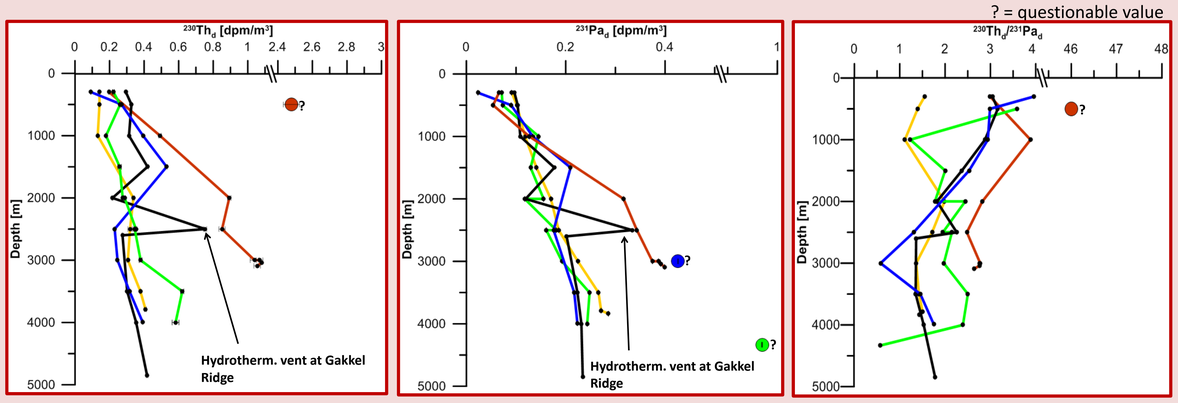
The aim of this study is to find out if the tracers dissolved ^{230}Th and ^{231}Pa show changes in circulation and particle fluxes in the deep sea basins Nansen, Amundsen and Makarov over time.
^{230}Th and ^{231}Pa are produced at a constant rate in the water column by radioactive decay of Uranium isotopes (^{234}U and ^{235}U respectively) (e.g. Anderson et al., 1983). They are both particle reactive and are scavenged on settling particles. As ^{230}Th is more particle reactive than ^{231}Pa, their distribution in the water column and activity ratio give us information about particle fluxes and circulation patterns and intensities (Henderson et al., 1999; Scholten et al., 2001).

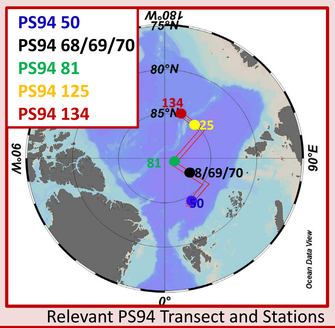
Material and Methods

Seawater sampling and analyses were performed following Anderson et al. (2012).
Seawater samples were collected in the Central Arctic during the 2015 Polarstern section (**GEOTRACES section GN04 2015, PS94**) through the Nansen-, Amundsen- and Makarov Basins.

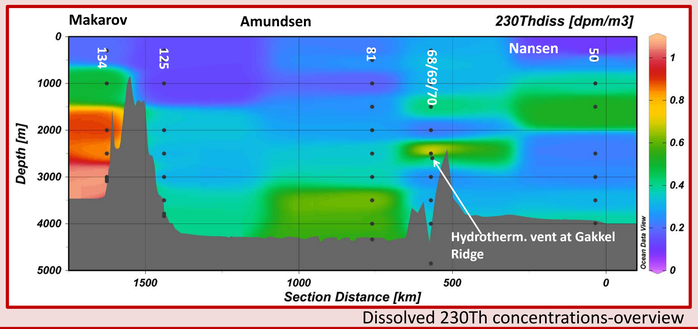
Results

? = questionable value





Relevant PS94 Transect and Stations



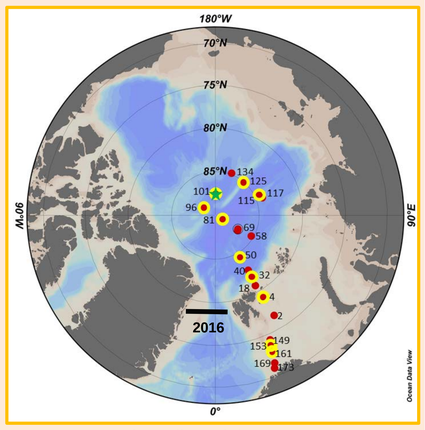
Dissolved 230Th concentrations-overview

Conclusion

- ^{230}Th and ^{231}Pa values in the deep Amundsen and Nansen Basins are lower than in 1991 and 2007 → increasing scavenging rates, due to Shelf-Basin interaction related particle fluxes.
- Decreasing ^{231}Pa and ^{230}Th concentrations in the Makarov Basin: changes in particle fluxes or circulation patterns.

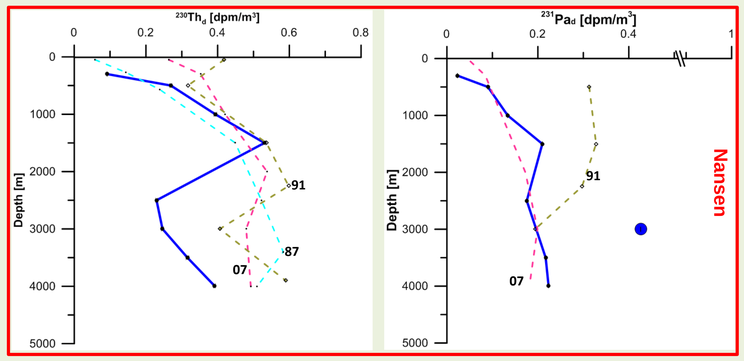
Future research plan

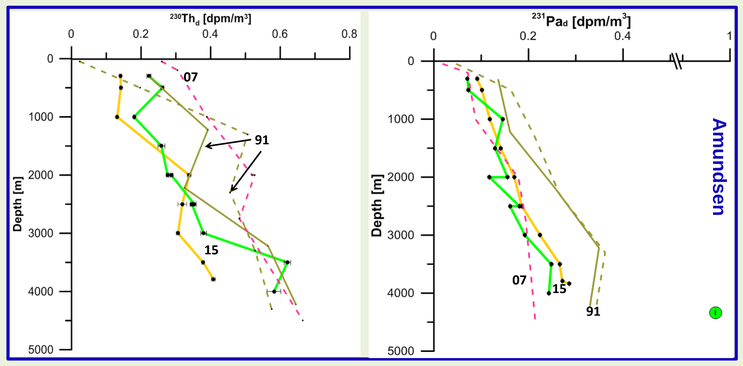
- **GEOTRACES** intercalibration (Crossover station)
- Particulate and sediment samples in addition to dissolved
- Higher amount of samples + surface to 300m data
- Fram Strait samples: better understanding of ventilation of the Eurasian Basins (**GEOTRACES section GN05 2016**)
- Joint Project: REE (Ronja Paffrath) and shelf Th, Pa (Sandra Gdaniec)



Samples collected during expedition PS94

Eurasian Basins 1991 - 2015



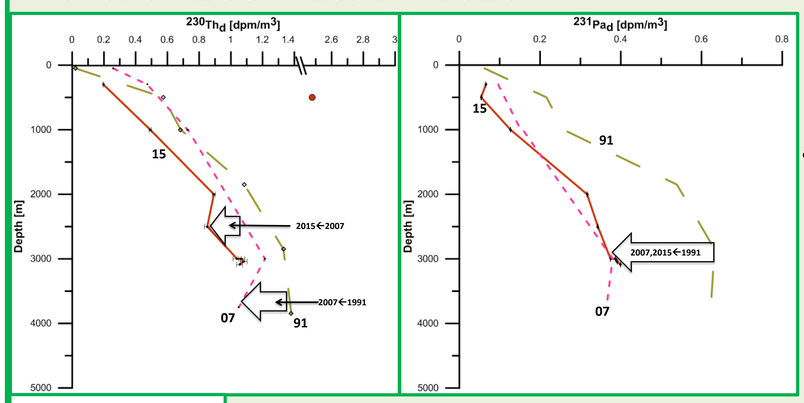


Scholten et al., 1995 (173, 165 (dashed))
Polarstern 2007
Cochran et al. 1995
PS94 81
PS94 125

Dissolved ^{230}Th and ^{231}Pa compared to literature data. Numbers indicate the year of sampling, e.g. 07=2007

- Radionuclide concentrations differ between Nansen Basin and Amundsen Basin.
- **EBDW (E**urasian **B**asin **D**eep **W**ater, ca. 1500-2500m) shows higher ^{230}Th and ^{231}Pa values in Nansen Basin
- Scavenging rates in **EBBW** (**E**urasian **B**asin **B**ottom **W**ater, **>2500m**) in the Nansen Basin may be higher compared to Amundsen Basin
- ^{230}Th below 3000m decreased since 2007 in the Nansen Basin and ^{231}Pa concentrations decreased in the upper water column (300-2500m)
- Amundsen Basin Th concentrations decreased since 2007

Makarov Basin 1991 – 2015



Scholten et al., 1995
Polarstern 2007
PS94 - 134

Dissolved ^{230}Th (left) and ^{231}Pa concentrations from the Makarov Basin and comparism with 2007 and 1991 data

- ^{231}Pa and ^{230}Th concentrations im northern Makarov Basin decreased between 1991 (Scholten et al., 1995) and 2007 (Polarstern 2007.
- ^{230}Th values decrease from 2007 to 2015, too. → increased particle fluxes (decreasing sea ice cover) or enhanced particle resuspension from the Lomonosov Ridge or changing ventilation and circulation

→ **For additional information on changing deepwater circulation please visit poster HE54A-1566**

References

Anderson, R. F., et al. (1983). EPSL **62**: 7-23.
Anderson, R. F. et al. (2012). Limnol. Oceanogr.: Methods **10**, 2012, 179–213
Cochran, J. K. Et al. (1995). DSR II 6, 1495-1517
Henderson, G. M., et al. (1999). DSR I **46**: 1861-1893.
Scholten, J. C., et al. (2001). DSR II **48**: 2383-2408
Unpublished data of Expedition ARKXXII/2: Rutgers van der Loeff, M., Francois, R., Moran, S.B., Lepore, K., Edwards, R.L., Lu, Y.