

Interactive comment on “Circulation changes in the Amundsen Basin from 1991 to 2015 revealed from distributions of dissolved ^{230}Th ” by Ole Valk et al.

Anonymous Referee #1

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The authors present a time-series study of seawater ^{230}Th in the Arctic Ocean, which could potentially provide useful information to monitor changes in water circulation and particle dynamics in the Arctic Ocean under the impacts of climate change. The authors observed a decline in seawater ^{230}Th in the Amundsen Basin from 1991 to 2015, which they considered to be due to the enhanced advection transporting more Atlantic water into the Arctic Ocean and increased particle scavenging during the transit. Overall, I think the study is novel and the discussion is thorough. However, I list a few issues below, which I think the authors should consider in their revision.

1. The authors suggest that the decline in seawater ^{230}Th in the Amundsen Basin is

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due to the enhanced advection of Atlantic water and the increased particle scavenging on the shelf in the Atlantic water pathway. I was wondering if the authors have any explanation why the scavenging only affects ^{230}Th but not ^{232}Th in the water pathway? Another related question, if the scavenging on the shelf were the dominant signal to explain the decline in ^{230}Th over time, one would imagine that the terrestrial signal should increase and the salinity should decrease. Why is the salinity increasing instead of decreasing in this case?

2. It would be more useful if the authors could provide a quantitative analysis to determine the rate of decline in ^{230}Th from 1991 to 2015, and then to use other tracers (e.g. salinity or $^{129}\text{I}/^{236}\text{U}$) to distinguish the signal of water advection from particle scavenging, so that the authors can work out the change of particle scavenging fluxes on the shelf over this period. These calculations could provide more meaningful information for ocean modeling in the Arctic Ocean.

3. I understand that the reversible exchange model used in section 2.4 and 4.5 (and Fig. 7) is cited from another reference. To help to clarify the model in this manuscript, please provide some details of the model either in the method section (if there is enough room) or in a supplementary document. In Fig.7, please add the measured data for comparison.

Minor comments: Fig.8, the caption is wrong (the current version is a repeat of Fig.3). P3/L5, The Lomonosov Ridge into the... P7/L28, ...then slightly increased towards 4500m.

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