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Interactive comment on "Distributions of ^{210}Po and ^{210}Pb activities along the North Atlantic GEOTRACES GA01 (GEOVIDE) cruise: partitioning between the particulate and dissolved phase" *by* Yi Tang et al.

Anonymous Referee #1

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Review for Biogeosciences (bg-2018-210) Authors: Tang, Castrillejoi, Roca-Marti, Masque, Lemaitre and Stewart Title: "Distribution of 210-Po and 210-activities along the North Atlantic GEOTRACES GA01 cruise"

General Comments: This paper presents valuable data of high quality in an important region of the far North Atlantic. Previous data over the past decades since GEOSECS and other expeditions are presented in comparison. However much of this older data lacked the high resolution in space and time, including both dissolved and particulate samples in two size fractions. Thus provided is how the nuclide distribution is im-

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pacted over the course of the cruise track period. The data is treated primarily in a statistical oceanographic manner that lends insight into how this temporally sensitive daughter/grandparent nuclide pair compare to biogenic parameters such as satellite chlorophyll and apparent oxygen utilization. As such it provides a historical context on the conditions that proceeded the cruise while the couple relaxed over the previous months.

Specific Comments: One unfortunate aspect of the paper is that it fails to model the data in the context of biogenic carbon flux, the primary strength of the nuclide pair. Perhaps the organic carbon data are missing, or awaiting a more complete synthesis with other nuclides such as 234-Th, as done admirably before by the UAB lab group.

Technical Issues:

1 Introduction It is noted that there is significant benthic disequilibrium (210-Po deficiency) well below the euphotic zone, indeed significantly below the main thermocline at times (e.g. 4000 meters at Station 13; 1400 meters at station 60). This dilemma and benthic consequences has been discussed in the recent literature (Rigaud, et al., 2014). Page 3: As such, maybe the literature citations in the introduction that need to be updated for the current millennium!

2 Methods Page 4: What is meant by “Xlarge” station (26), as the number of depths are less than others? Page 5: Is six hours sufficient for equilibration, or were there previous tests performed to verify this?’ What was the time lag between sample processing on board, and nuclide separation in the lab on shore, unless both were done on board? This can be important as reviewed in Rigaud, et al. 2013. Evidently this is reflected in the data reported in supplemental tables, although there are not errors assigned to the nuclide ratios in Table 2. Page 6: Who are the “Planquette group”?

3 Results Page 7: As noted above, stations 13 and 30 appear to have total 210-Po deficiency at depth (Fig. 2), not excess. Page 8: Increase in activity with depth for both nuclides is not evident in Figs. 2 and 3, rather decrease.

4 Discussion Page 10: Usually in the far North Atlantic, 210-Pb association with aerosol dust is not as evident in the east, rather alternative fresh water sources (e.g. precipitation) as noted in the west. Page 11. The lithogenic source of a depleted 210-Po/210-Pb ratio should only be evident if the atmospheric scavenging was in the form of precipitation. Alternatively or as with lithogenic particles from the continental margin, the 210-Po has been preferentially extracted lately in fecal pellets by organisms. Page 12: The alternative scenario is noted here at the end of section 4.2. As such, might there be a corresponding dissolved ration greater than one? Page 13: The negative relationship between AOU and 210-Po/210-Pb is not very strong. Page 14: Line 387 appears not to be clearly expressed indeed!

5 Conclusion Page 15: The impact of a terrestrial origin on the 210-Po/210Pb ratio less that unity might indeed be born out in the Arctic basin during summer seasons of strong biogenic processing. Maybe there is evidence in the recent GEOTRACES cruises on time scales of several months conclusive with that of the grand-daughter/parent nuclide pair?

Figure Captions 4) . . .bloom defines the date when the next bloom began. 5) The black and blue colored circles are not well distinguished.

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