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Testing paleoceanographic hypotheses using inverse methods: Application to ^{231}Pa/^{230}Th data for the Heinrich Event 1

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The analysis of marine sediments constitutes the only avenue to extend the instrumental records of direct measurements in the water column. However, interpreting sediment data in terms of oceanic processes is a daunting task: the data are scarce, available only at the boundaries (seafloor), and suffer from various errors associated with the chronology of the sediment cores and the oceanic representativity of the properties measured in the sediment. Nevertheless, thanks to the significant advances in paleoceanography over the last decades, sediment observations have reached the point where useful hypotheses regarding oceanic conditions during specific time intervals of the geological past can be tested. Here we will discuss the possibility to extract information about the circulation during a time interval of the last deglaciation (the so-called Heinrich event 1) from measurements of the ratio between two radioisotopes (protactinium-231 and thorium-230) in bulk sediment samples from the North Atlantic basin. More specifically, the null hypothesis that these measurements *are* consistent with the modern circulation in the basin will be tested. Emphasis will be put on the extent to which the uncertainties in the distribution of both radioisotopes during H1 and the uncertainties in our current understanding of their behavior in the water column affect our capability to reject H0 with confidence.