Massive melting of West Antarctic Ice Sheet during the latest Pleistocene and Holocene: Hydrogen isotopic records of sedimentary biomarkers in Ross Sea

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West Antarctic Ice Sheet (WAIS) is one of the major concerns for our community, because it is grounded well below the modern sea level and susceptible to collapse as a consequence of the global warming [e.g., 1]. In this study we report the first evidence of hydrogen isotopic compositions for plankton biomarkers including sterols, stanols, phytol, and fatty acids in the sediments receovered from northwest Ross Sea, a major embayment located by the WAIS. Based on these evidence, we reconstructed hydrogen isotopic composition of paleo-surface-water of Ross Sea (δD_{water}) during the last 30 kyr by applying the isotopic fractionations associated with the biosynthesis of these molecules determined previously [2,3]. Around 18, 10.5, 5.5, 2.5, and 1.5 kyr ago, the δD_{water} values were estimated to be -200‰ or lower, strongly suggesting a large amount of meltwater influx to the Ross Sea in these periods. Since air-temperature is quite low even in summer, we think that the basal melting of WAIS (mean δD value is around -250‰) could be principally responsible for these events. Our consideration is basically consistent with other independent evidence including ages of raised beach [4] and surface exposure age of glacial deposits [5]. We propose that the melting (grounding-line retreat) of WAIS may have occurred as repeated massive surges induced by basal melting sporadically occurred in the latest Pleistocene and Holocene.

References

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