Cosmogenic beryllium isotope analysis of ice sheet dynamics, Adélie Basin, East Antarctica

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The relationship between the Antarctic ice sheets and global climatic and oceanographic change is of major scientific and societal interest as it provides a link between ice sheet dynamics and climate. This link may assist in modeling the response of the ice sheets to future climate changes. The Wilkes Basin of the East Antarctic Ice Sheet (EAIS) is an important focus area as it is very susceptible to retreat due to its down-sloping trough (Taylor-Silva et.al., 2018). The dynamics of the EAIS are poorly constrained, though the Wilkes Land margin is a key region for analysis of the behavior of the EAIS (Brinkhuis et.al., 2010).

One of the objectives of the IODP Expedition 318 drilling of the Wilkes Land margin was to obtain a high-resolution Holocene record of climate variability from the Adélie Basin. The location of core U1357A is ideal as it was not disturbed by either sea level change or glacial erosion during the past 10,000 years (Escutia el.al. 2011). This high-resolution record will aid in the assessment of EAIS dynamics during this period.

Cosmogenic beryllium isotopes (^{10}Be) can be used to track the advance and retreat of the EAIS (Yokoyama et.al., 2016). Atmospherically produced beryllium collects on the sea floor during ice-free periods, whereas there is little beryllium found in sea floor sediments during times of ice cover. Due to the high resolution of core U1357A, we may be able to determine periods of seasonal ice cover as well as times with a more extensive ice sheet.

Using ^{10}Be concentrations along with other proxies, such as radiocarbon dating, diatom abundance, ice-core records from Antarctica’ s coastal ice domes, and other sediment cores from the East Antarctic margin, we will be able to constrain the movement of the ice sheet in this area on annual to decadal scale. With this information, we will be better able to judge the societal impact a changing ice sheet may have due to future coupled climate and atmospheric CO_2 change.

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