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Is the Antarctic Peninsula a possible source for MWP - 1A?

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We present the results of field investigations undertaken in Northern Palmer land during the 2008-09 field season, aimed at improving estimates of changes in the Antarctic Peninsula Ice Sheet volume since the Last Glacial Maximum (LGM). This work represents the first attempt to constrain ice sheet behavior in the eastern sector of the Antarctic Peninsula. The study location stretches from Mount Faith in the Eternity Range to Engel Peaks, providing a 100km transect from the mountainous backbone of the Peninsula towards the coast and Larson C Ice Shelf. We aim to reconstruct past ice sheet changes since the LGM and to determine if this sector of the Weddell Sea made a substantial contribution to Meltwater Pulse – 1A (MWP-1A).

To date, the source of MWP -1A remains ambiguous. It has been suggested that a southern hemispheric source for MWP-1A could explain the onset of the Bølling Allerød warm phase. Recent research undertaken on the Western Antarctic Ice Sheet in the Weddell Sea embayment has reconstructed past ice sheet thickness in the area. The research concluded that the volume of ice in the Weddell Sea embayment during the Last Glacial Maximum would have been capable of causing a 1.4 – 2m rise in global sea level. This is insufficient in making a significant contribution to MWP – 1A (Bentley et al. 2010), as data from the Barbados sea level curves show that, over a 500 year period from 14.2Ka BP, MWP – 1A caused a 20m rise in global sea level.

Using our geomorphological data, exposure ages from twinned terrestrial cosmogenic isotope analysis and data from biological refugia we can investigate the dynamic changes in ice sheet surface profile since the LGM. Field investigations record erratics up to 750 meters above the modern ice sheet. These field data suggest that, in parts this sector, the Antarctic Peninsula Ice Sheet has decreased in volume by up to 40% since the LGM. Exposure ages of bedrock surfaces and erratics calculated using Cosmogenic Isotope Analysis determines if the maximum altitude of erratics marks maximum ice sheet thickness during the LGM. Twinned isotope analysis using Be10 and Al26 is being used to look at the complexity or simplicity of the areas erosive ice sheet history. Data from biological refugia will help determine if ice free areas have existed in the Antarctic Peninsula for extended periods predating the LGM, thereby extending recent studies that have concluded much longer continuous presence of biological communities in this region and across Antarctica than previously thought (Convey et al. 2008).

With data of inferred grounding lines in the Weddell Sea (Bentley et al. 2009) and data from the Antarctic Digital Database we can begin modeling an offshore projection of the Antarctic Peninsula Ice Sheet during the LGM. This model will be used to calculate the volume of ice in the eastern Antarctic Peninsula sector during the LGM and therefore be used to determine if the volume of Ice in this region during the LGM was sufficient to make a significant contribution to MWP – 1A.