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2010 Annual Sheriff Lecture – Student Abstracts

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Onset of a Small But Significant Regional Climate Change Documented in High-resolution Late Holocene Sediment Cores from the Maritime Western Antarctic Peninsula

Alex Barnard

The glaciomarine environment of the Antarctic Peninsula region is one of the fastest warming places on earth. However, late Holocene paleoclimate reconstructions in this region are separated by large distances and details of past changes remain uncertain. This study focuses on a marine sediment core collected in 2007 from the deep Central Bransfield Basin in 1,980 m of water and provides a central tie for other published studies in this region. The core lithology is dominantly diatomaceous mud with some turbidites. Radiocarbon and cesium dates have been used to create an age model that spans the interval 3600 cal yr BP to present. This chronostratigraphic framework was used to establish five units which are grouped into two super-units, based upon: detailed facies descriptions, laser particle size analysis, x-ray radiographic analysis, multi-sensor core logger data, elemental and isotopic data. The two super-units that have been recognized are a lower super-unit (3559-1600 cal yr BP) and an upper super-unit (1600 cal yr BP – present). The upper super-unit signature is described by elevated $\delta^{13}C$ coupled with decreasing $\delta^{15}N$ values, lower magnetic susceptibility values and less frequent facies changes. This signature is interpreted as an increase in primary productivity, and a potential mechanism for this small but significant change may be an increase in surface water temperature and/or shortening of the sea-ice season. The five units that are recognized are comparable with known climatic transitions across the western Antarctic Peninsula: the Mid-Holocene Climatic Optimum, the Neoglacial, the Medieval Warm Period, the Little Ice Age, and rapid recent warming. The super-unit boundary coincides with an early onset of the Medieval Warm Period (1600 cal yr BP) which is typically at 1200 cal yr BP. These changes in the Bransfield Basin have been compared to other published records from the Bransfield Basin, Firth of Tay, Maxwell Bay, and Palmer Deep. These comparisons highlight the diachronous nature of climate change across the Mid-Holocene Climatic Optimum to Neoglacial boundary. There is evidence across the region for the onset of change at about 1600 cal yr BP, although the exact timing remains uncertain.