Geophysical Research Abstracts, Vol. 8, 01174, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01174

Chronology of a perennially ice-covered Antarctic lake and its relevance to subglacial lake studies

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A glacier dammed lake at Citadel Bastion at 72^o S on Alexander Island, Antarctic Peninsula is currently covered by perennial ice up to 5 m thick. The age of the lake is unknown, but at the Last Glacial Maximum (LGM) the area could have been covered by up to 600 m of ice. Biological activity within a 5 m long sediment core is limited, but cyclical changes in bulk organic matter content broadly coincide with variations in some physical properties. Establishing a reliable chronology would enable comparisons with regional palaeoclimate records from ice and marine cores. However, organic macrofossils are absent, preventing organic-matter specific radiocarbon dating, and bulk sediment radiocarbon ages appear to be affected by naturally occurring old particulate carbon. Some units are relatively stable and suitable for palaeomagnetic intensity dating, but disruptive pulses of coarse-grained sediment make precise correlations with global palaeointensity reference curves difficult. Most of the sediment core quartz fraction optically stimulated luminescence (OSL) ages fail laboratory validity tests. In addition, they produce ages of c. 100,000 years, both indicative of partial resetting by light during the final deposition event. In contrast, the c. 5000 yr B.P. quartz OSL age from one of two raised delta deposits in the catchment is valid. Therefore, a lake high stand occurred in the middle of a well-documented mid-Holocene 'warm phase', which likely increased the availability of meltwater. Moreover, all valid OSL delta ages are less than 20,000 years old suggesting the lake is a post-LGM feature. The methods used and problems encountered in this study will be relevant to future studies on cores extracted from subglacial lakes in Antarctica.