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Geophysical explorations of subglacial Antarctic lake environments: in search of viable habitats and sedimentary records of palaeoclimate

John Woodward

School of the Built and Natural Environment

Abstract

Antarctic subglacial lakes are important contributors to the basal hydrological cycle of the Antarctic ice sheets. They are also believed to be aquatic niche ecosystems hosting life and invaluable palaeoclimatic archives. Recent advances in the study of the ice/bed interface using geophysical surveys have allowed the detailed characterization of the physiography of a number of subglacial lakes. In particular, active seismic and airborne gravity surveys have resulted in the calculation of water depths and bathymetries for a number of subglacial lakes. These surveys have also allowed an assessment of the sediments that lie beneath the lakes, sediments that may contain long-term palaeo records. Access programmes are now funded for Subglacial Lake Ellsworth and Subglacial Lake Whillans in the austral summer of 2012/13 and there are ongoing plans to access Subglacial Lake Vostok. These three lakes are very different in character. Subglacial Lake Ellsworth is a long-lived lake located in an over-deepened fjord near the Amundsen-Weddell Ice Divide of the West Antarctic Ice Sheet. Subglacial Lake Whillans is a shallow, dynamic lake located beneath the ice plain of the Whillans Ice Stream, Siple Coast, West Antarctica. Subglacial Lake Vostok, the largest and deepest known subglacial lake, occupies a large subglacial trough beneath the central East Antarctic Ice Sheet. This presentation will summarise the current state of knowledge of the physiography of these, and other subglacial lakes and will assess the ecosystems and palaeoclimatic archives that may be stored within them.