



Tipping temperatures within Subglacial Lake Ellsworth, West Antarctica

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One of the most remote and undiscovered regions on Earth are subglacial lakes. More than 275 of these lakes have been identified so far. However, from most lakes little more is known but the location or the lateral extent. Their inaccessibility increases the importance of numerical models to investigate the physical conditions in these environments. During the Southern Summer 2008/09, the British Antarctic Survey (BAS) performed field measurements in the Ellsworth Mountains, West Antarctica to survey Subglacial Lake Ellsworth. We apply a three-dimensional fluid-dynamics lake model on the geometry of this lake. We present results, indicating that Subglacial Lake Ellsworth has a unique temperature profile, constituted by the pressure induced by the ice thickness above as well as the slope of the ice-lake interface and compare this with the previously modelled Subglacial Lakes Vostok and Concordia. While Lake Vostok and Lake Concordia show a clear convective regime, driven by geothermal heating from the lakes bottom for the overall lake, the ice load on Lake Concordia constitutes a regime where the line of maximum water density crosses through the lake. This divides the lake into branches with completely different convective regimes. Sensitivity studies for glacial and probable future scenarios, where the ice coverage might thin, are discussed.