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The Cryosphere Discussions

Interactive comment on "The "tipping" temperature within Subglacial Lake Ellsworth, West Antarctica and its implications for lake access" *by* M. Thoma et al.

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General comments: The discussion paper utilizes model predictions of Subglacial Lake Ellsworth water column physical (T)/chemical (Sal) properties to determine optimal location for proposed access locations balancing scientific and operational priorities. The modeling is robust (given the assumptions), the manuscript is well written and the discussions are logically presented.

Specific comments: The paper considers only present day lake conditions. It would be useful to develop an analysis of the lake conditions over the history of the lake as the ice sheet above evolved. The accumulation and preservation of sediments is time-

dependent and it is not clear that present conditions prevailed in the past; in fact it is unlikely that they have. Combining knowledge of the evolution of the ice sheet above Lake Ellsworth with the model predictions of lake regimes would provide an integrated view of how the current state of the lake developed which may be as important for access site location as current conditions.

The challenge is to optimally access and sample a feature of several tens of square kilometers. One obvious solution is multiple points of access placed across the lake. If optimal spatial coverage is the objective, locations can be selected on a fixed point basis (sampling lake regions characterized by some set of variables) or randomly selected sites based on some desired spatial density.

The issue of influxes of water from sources external to the lake seems to be quickly dismissed. Evidence elsewhere is that these flows can be substantial (in relation to lake volume), sporadic, and quite high energy. One or more of these events over time would disrupt lake regimes predicted from the Equation of State. Lake regimes that take years to develop based on physical/chemical gradients could be almost instantaneously disrupted requiring a very long time period to recover to some type of steady state condition.

Direct mapping of sediment accumulations within the lake basin by remote sensing methods would be the most direct way to establish where sediments are preserved and most likely to be recovered.

Technical Corrections: none

Interactive comment on The Cryosphere Discuss., 5, 1003, 2011.