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Recovery giant subglacial lakes: new assessments using IceGRAV airborne radar data

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Recovery Glacier penetrates deep into the interior of East Antarctica. The subglacial hydraulic system beneath this glacier includes active lakes aligned along the glacier trunk (Smith et al., 2007, J. Glaciol.) and four giant lakes near the onset of the fast flow (Bell et al., 2007, Nature). Characteristics of this subglacial system and its impacts on ice flow are therefore central questions for the dynamics of the Antarctic Ice Sheet. However, all of these lakes are hypothesized to explain satellite-measured ice-surface motion and smoothness. Direct evidence of the latter lakes is limited to ground-based radar measurements during IPY (Langley et al., 2011, GRL), showing that the lakes A and B were not distinct lakes at the time of the measurement (January, 2009) and probably have drained recently.

In order to fill the significant data gap over the Recovery catchment identified by the BEDMAP2 project (Fretwell et al., 2013, The Cryosphere), over 29,000 line km of radio-echo sounding, laser altimetry, gravity and magnetic data were acquired using a British Antarctic Survey Twin Otter during the IceGRAV 2012-13 field season. Analysis of the region-wide data characteristics and its interpretations are currently underway.

Here, we present the subset of this Recovery Frontier dataset in the vicinity of the giant lakes to assess their current conditions. Bed reflectivity derived for a range of englacial attenuation rates indicates that the lake surface has larger reflectivity than the adjacent grounded areas, by more than 10 dB. Bed reflectivity varies little over short distances (< 1 km), both around the lakes and adjacent areas. Hydraulic potential varies little over the lakes as well as their downstream sides but increases in the upstream directions. These recent characteristics are distinct from the previous measurement in 2009. A possible interpretation of these features is that the lake is slowly filling.