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New insights on the subglacial Recovery Lakes from airborne radar data

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The Recovery Region, consisting of Recovery, Bailey and Slessor Glaciers, discharges 5 % of the total fresh water outflow of Antarctica into the Filchner Ice Shelf. The ice shelf is subject to extensive sub-shelf melting under ongoing climate change. Several active subglacial lakes have been identified in the Recovery Region from satellite data, indicating the existence of a dynamic subglacial hydrologic system. Our recent analysis of airborne radar data shows topographic as well as hydrologic controls on fast ice flow in this region. Here, we present new insights on the "giant subglacial Recovery Lakes" located in the flat basal basin upstream of Recovery Glacier. These four subglacial lakes were inferred using MODIS satellite imagery, visible due to their anomalously flat surface and estimated to have a total area of 13300 km^2. A following ground based radar survey found that Lake A and B were not water filled during the survey and suggest they might have drained recently. We conducted two extensive airborne radar surveys over the Recovery Lakes. The 2013 survey with 20 km line spacing concentrated on Lake A and B. A more detailed survey in 2015 was done over Lake A, B, and C. The 2015 survey includes a repeat of a 2013 flight across Lake B. From the two data sets, we derive ice thickness and bed elevation, refining the bed topography map in the region. The bed topography map shows a connection between the area south of Lake A and B to the deep Recovery trough. Using bed elevation data and bed return power no distinct giant lakes can be identified but we do find indication of water in the region of Lake A and B in the form of smaller lakes and larger "swampy" areas. Differences in our two data sets show that a smaller lake, present in 2013 in the center of Lake A drained by 2015. We suggest that the Recovery Lakes are not big lakes comparable to Lake Vostok but are instead smaller, active water bodies connected by areas of saturated sediments or "swamps".