Estimating Pleistocene ice thickness from pillow lava melt inclusions in the south-central highland of Iceland

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Paleoclimate records show that Iceland was at times fully covered during Pleistocene glaciations. Models and data for the last glacial maximum indicate that the ice sheet at this time extended several tens of kilometers beyond the present coast. In contrast, much is known about the extent of the ice sheet during other times of the Weichselian glaciation, and very little information exists on possible variations of earlier glaciations. The regions near Þórisvatn, Jökulheimar, and Bláfjöll in the south-central highland of Iceland contain many outcrops of Pleistocene pillow lavas. The volatile contents in the glassy rims of pillow lavas may record the ambient pressure during eruption. This could offer insight into syn-eruptive glacier thickness. 15 samples were collected from three sample locations near Þórisvatn, one near Jökulheimar, and four near Bláfjöll from August 14 to August 15, 2023. Samples were crushed and sieved into 0.5-2.0 mm grains, and the glassiest grains were double polished with thicknesses between 88–219 µm for FTIR analysis. The spectra showed strong similarity to FTIR spectra of Holuhraun samples of similar thickness. H_2O contents of the samples varied between 0.22–0.32 wt%, with a median of 0.30 wt%. CO_2 was under the detection limit of the FTIR analyses. This may be an artifact of polishing grains too thin, and thus separate analyses with thicker grains will be carried out to accurately assess ambient pressure due to pressure model sensitivity to CO_2. Further analysis will include S concentrations, which will be used alongside H_2O and CO_2 to calculate a precise ambient pressure with the Sulfur_X model (Ding et al., 2023). The derived parameters will be used to estimate glacier thickness.