

Internal ice-penetrating radar stratigraphy at the Little Dome C Oldest Ice site

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The Little Dome C, just to the south of Dome C, is one of the two target areas for the Beyond EPICA Oldest Ice (BE-OI) European project to drill and recover an ice core climate record that goes back 1.5 million years, in order to sample the Mid-Pleistocene Transition. The Little Dome C area is above a subglacial massif and below the ice divide that separates the large Byrd and Totten glacier catchments. Constraining internal stratigraphy in this region is important to pin point the best Oldest Ice drilling location, but also to provide boundary conditions in modelling efforts to determine ice flow history in the region.

New GPR surveys have been collected under the BE-OI umbrella over the Little Dome C region during the 2016/17 and 2017/18 field seasons. We extend the eighteen internal radar reflections mapped in the older UTIG and OIA radar surveys into these newly acquired surveys in order to obtain the most detailed internal stratigraphy. The dense spatial coverage of the GPR surveys allows the tracing of additional deeper radar reflections that provide constraints on the basal ice stratigraphy in this Oldest Ice target region. Most internal reflections are dated at the EPICA Dome C ice core using the AICC2012 age-depth chronology. The gridded and dense geometry of the new and old radar surveys implies a high number of crossovers which allow for regular checks on tracing accuracy and allow us to obtain rigorous depth uncertainties, following Cavitte et al. (2016).

We then use the Parrenin et al. (2017) 1D inverse model to reconstruct a whole wealth of information on the Little Dome C: basal ages, basal age resolution, basal melting rates, steady-state accumulation rates, p exponent in the Lliboutry flow formulation, depth of the 1.5 Myr isochrone, etc, by inverting the internal dated stratigraphy. This information will help improve our understanding of the Oldest Ice target site. We build on the preliminary modelling work done in the field and discuss the differences obtained with a full set of internal isochrones.