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Chronostratigraphy of Larsen blue ice area, and a reconstruction of surface temperature and accumulation rate during the last glacial termination

Content

Ice coring in blue ice areas (BIAs) serves as an alternative to deep ice core drilling, allowing collection of large-sized old ice samples in a cost-effective way. However, the stratigraphy in many blue ice areas is complicated owing to fold and fault structures. Based on ice layers defined by dust bands and ground penetration radar (GPR) surveys, we show that Larsen BIA has a surface transect of ice with an undisturbed horizontal stratigraphy from mid- to downstream sites. However, the upstream ice exhibits a potential repetition of ages on scales of tens of meters. Correlating $\delta^{18}\text{O}_{\text{ice}}$, $\delta^{18}\text{O}_{\text{atm}}$, and CH_4 records with existing ice cores indicate that the analyzed gas and ice ages range between 9.2–23.4 ka BP and 5.6–24.7 ka BP, respectively. Radiometric ^{81}Kr dating of one of the cores confirms the estimated gas ages within uncertainty. A tentative reconstruction based on a simple analytical framework (using Δage and $\delta^{15}\text{N}-\text{N}_2$ of Larsen ice) suggests a warming of 15 ± 5 °C (1σ) during the last deglaciation, and an increase in snow accumulation by a factor of 1.7–4.6. Climatic interpretation is complicated by the need for upstream flow corrections, evidence for strong surface sublimation during the last ice age, and potential errors in the estimated gas age-ice age difference. Our study shows that BIAs in Northern Victoria Land may contribute to obtain high-quality paleoclimate proxy records through the last deglaciation.

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