
Is there 1.5 million-year old ice near Dome C, Antarctica?

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Résumé

Ice sheets provide exceptional archives of past changes in polar climate, regional environment and global atmospheric composition. The oldest deep ice drilled in Antarctica has been retrieved at EPICA Dome C (Antarctica), reaching 800,000 years. Retrieving an older paleoclimatic record from Antarctica is one of the biggest challenges of the ice core community (Jouzel and Masson-Delmotte, 2010). Here, we use a combination of internal layers identified with airborne radar and ice-flow modeling to estimate the age of basal ice along airborne transects in the Dome C area. The forward model used is one-dimensional based on the Lliboutry (1979) velocity profile. The inverted parameters are: the surface accumulation rate, the $p+1$ exponent of the velocity profile and the geothermal heat flux. We identify a region located only ~ 40 km from the dome on a bedrock ridge where the estimated basal melting is small or non-existent. As a result, basal age is estimated to be $> 1,500,000$ years. Other old spots might also exist. The optimization method used is based on the Levenberg-Marquardt algorithm but, since the forward model is highly non-linear, we plan to implement a Monte Carlo Markov Chain method.

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