

Radio-echo sounding at Dome C, East Antarctica: A comparison of measured and modeled data

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The internal layering architecture of ice sheets, detected with radio-echo sounding (RES), contains clues to past ice-flow dynamics and mass balance. A common way of relating the recorded travel time of RES reflections to depth is by integrating a wave-speed distribution. This results in an increasing absolute error with depth.

We present a synchronization of RES-internal layers of different radar systems (Alfred Wegener Institute, Center for Remote Sensing of Ice Sheets, Istituto Nazionale di Geofisica e Vulcanologia, British Antarctic Survey and University of Texas Institute for Geophysics) with ice-core records from the Antarctic deep drill site Dome C.

Synthetic radar traces are obtained from measurements of ice-core density and conductivity with a 1D model of Maxwell's equations. The reflection peaks of the different radar systems' measurements are shifted by a wiggle-matching algorithm, so they match the synthetic trace. In this way, we matched pronounced internal reflections in the RES data to conductivity peaks with considerably smaller depth uncertainties, and assigned them with the ice-core age.

We examine the differences in shifts and resolution of the different RES data to address the question of their comparability and combined analysis for an extensive age-depth distribution.