



Using ice-penetrating radars to date ice-rise formation and Late Holocene ice-sheet retreat in the Ronne Ice Shelf region, West Antarctica

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The history of the West Antarctic Ice Sheet in the region currently occupied by the Ronne Ice Shelf is poorly known. This reflects a lack of accessible recently deglaciated surfaces, which prohibits conventional paleo-glaciological techniques that can provide evidence of past ice-sheet extent and retreat, for example ocean coring or exposure-dating of geological material.

We use a glaciological technique, Raymond Effect Dating, to constrain the retreat of the ice sheet through the Ronne Ice Shelf region. During two Antarctic field seasons, we used a pulse-echo ice-penetrating radar to image the base and internal stratigraphy of four ice rises - areas of grounded ice containing ice divides. Towing the radar with skidoos, we conducted over 2000 km of surveys on the Skytrain, Korff, Henry and Fowler Ice Rises and the ice shelf between them. We also used a step-frequency radar called pRES to measure the vertical ice flow in the vicinity of each ice divide.

Isochronal ice layers imaged during the surveys deforming in a predictable way with ice flow, meaning that their shape contains information about past ice flow. Directly beneath ice divides the downward motion of the ice is impeded by an ice-dynamical phenomenon called the Raymond Effect. This causes layers beneath the divides to form 'Raymond Arches' that grow over time.

We will present the data and simulate the growth of the Raymond Arches using our pRES-measured vertical ice velocities and date the onset of ice-divide flow at each ice rise by comparing the size of simulated arches to the arches imaged during our radar surveys. We consider the main sources of uncertainty associated with these ice-rise formation dates and discuss what they can tell us about the retreat of the West Antarctic Ice Sheet through this region during the last few thousand years.