



Ice rheometry at natural strain-rates from observations of the Raymond effect using a phase-sensitive radar.

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By recording both the phase and amplitude of the signal, a phase sensitive radar allows one to measure precisely vertical strain-rates in ice. The vertical velocity is proportional to the phase difference measured between measurements at the same site. The vertical strain-rates are obtained by differentiation of the velocity profile. Measurements have been carried out under the two ridges leaving the actual summit of Greenland and under the ridge of NEEM at one year interval. Strain-rates at the order of 10^{-4} a^{-1} have been measured. The Raymond effect is effective under the sharpest of the two ridges near Summit. The Raymond effect is muted by the along ridge flow under the other ridge and near NEEM. Measurements taken under the ridge of Fuchs Ice Rise, show a very high thinning rate of this area, in accordance with altimetric measurements. In this area the Raymond bumps are not in phase with the actual summit and the rheology of ice under these bumps affect the flow of ice and the Raymond effect. Measurements are compared with the results of full-Stokes simulations. A fitting procedure leads to a high value of 4.5 for the Glen index in the Summit area.