Multi-angle, Frequency and Polarization Radar Measurement of Ice Sheets

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Radio echo sounding of polar ice sheets provides important information on the ice bed topography and internal layers. These data have been used by scientists to create 3D maps of polar ice sheets for climate modeling as well as to reconstruct the climate history that dates back to hundreds of thousands of years. In this paper, we present the design, and development of three surface-based multi-channel radars in the VHF and UHF bands. We provide results from radar data multi-frequency and polarization radar data collected over the Greenland ice sheet. All the three radars shared the same digital waveform generator and digitizer, and were installed in and operated on a tracked vehicle. The radars are operated with 3 different antenna arrays designed for operation over 170-230 MHz, 180-340 MHz and 600-900 MHz. The results we sounded more than 2.7 km thick ice with radars operating at frequencies as high as 850 MHz with more than 40 dB signal-to-noise ratio.

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