

Mapping near-surface layers with UWB microwave radar and optimized processing of sounder data to enhance deep layers

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The University of Alabama Remote Sensing Center developed an ultra-wideband radar operating over the frequency range of 2-8 GHz. We designed the radar for surface-based operation and mapping of near-surface internal layers. The radar was operated as a part of the Japan-Norway expedition to Antarctica during the 2018 field season. The radar was mounted on the side of a tracked vehicle and data were collected over a large area near Dome Fuji as part of the experiment. We processed data collected to generate radar echograms and results show layers to a depth of over 15 m.

We have also been involved in the design and development of high-sensitivity radars to map internal layers in the bottom ten percent of the ice. This involved the design and simulation of the radar and antenna array with sufficient gain to map layers close to the bed. We also developed a quick-look and a real-time processor optimized to bring out layers near the bed.

In this paper, we will discuss the design considerations for the UWB microwave radar to map near-surface internal layers and show sample results from the 2018 field campaign. We will present the design and simulation of UWB radar sounders for mapping layers near the bed. We will also discuss the design considerations for a radar signal processor to bring out layers near the bed and show sample results obtained with our processor from data collected as a part of the Japan-Norway expedition.

Keywords: RF & Microwave, FM-CW radar, Radar signal processing