

Relating Radarsat SAR backscatter variations to ice sheet surface conditions along the US ITASE Traverse

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The RADARSAT-1 Antarctic Mapping Project (RAMP) mosaic shows significant variations in radar brightness, or backscatter, across the ice sheet. Radar backscatter over Antarctica varies according to the physical properties of the near surface, such as surface roughness, grain size, density, stratigraphy and moisture content. These physical properties are intrinsically linked to larger scale properties including ice divide location, topography, accumulation rate, ice flow and surface melt patterns. Comparing brightness variations in radar imagery with field observations of surface properties enables a fuller understanding of backscatter patterns and makes the Radarsat mosaic a powerful tool for exploring ice sheet processes and behavior.

Detailed surface topography maps and shallow radar profiles along the >5,000 km of US ITASE traverse routes in West Antarctica are used to study causes of radar backscatter variations. A series of isolated ice cores, connected to one another by isochronous horizons tracked with ground penetrating radar, yield accumulation rates along the traverse routes. Here, we correlate satellite radar brightness variation with surface topography, accumulation rate and density along the ground traverses, then proceed to infer the surface characteristics of other regions of the ice sheet.