C-Band 13acks(211)l)(?l' across a snow 1 ine on Sea I ce

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An exp eri n ent was c a rried out in the winter of 1994 at the out 1001 Geophysical Research Facility (GRF) in the Cold Regions Research and Engineering Laboratory (CRREL). The purpose was to study effects of snow cover on C band b a ckscatter from sea ice. The ice sheet was grown in the CRREL GRF pond filled with sea water of 30[0]/00 salinity with a salt composition similar to that of typical sea water. The dimensions of the pond were 18.3-m long, 7.62-m wide, and 2.14 -m deep. A n ovable gantry provided the support 10 mount the ant enna and RF subsystem of t he C-band polarimetric scatterometer at about 4 m above the surface of" the ice sheet. A tent was set up n ear a corn er of" the])011(1 where the scatt eromet er cont roller was located. On one side of the pond, corner reflectors and a m etallic sphere were dep loyed for the scatterometer calibrations. The sea ice sheet wa s grown to a thickness of about 30 cm. T hen, an area on the ice sheet was exposed, by partially rem oving the roof of the por (1, to a snow fall to an approximately 10 cm thick accumulation. The snow-covered sea ice area was near er to the scatterometer corresponding to sm a ll incident angles.

Fully polarimetric covariance matrices were measured at different azimuthal angles al ong the scatterometer scanning tracts from near to far r ange corresponding to incident angles fr om 20° to 55° . The b a ckscatter for both vertical and horizontal polarizations (11'0])])('(1 by 5 dB from 20° to 30° incident angle. '1'11(' averaged backscatter had lit tle change from 35° to 45° incident angle, and 111('11 plummeted by 6-8 dB from 45° to 55°. At 45° incident angl e, the backscatter signature b eh aved distinctively from the 1'('S])011S(% at other incident angles: a sharp increase in cross p olarized ratio, a strong d eco r relation ('j fect bet v een horizontal and vertical r'('1111'1)s, and a large variation in back sc a tter at different azimuth angles. A geometrical analysis of the scatterometer set 11]) Silo\\'s that these responses are consistent with the scanning of the scatterometer incident angle from the snow-covered area to the bare sea ice across the snow line at 45°. The polarimetric data suggest that the snow- covered sea ice has the lollp;ll-sill'f?l("(" scattering characteristics at small incident angles, the snow line introduces different scattering mechanisms at different polari zations, and the bare ice has t he volume scat t ering properties at large incident angles.