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Antarctic ‘Wind Glaze' Extent: Multi-sensor mapping indicates large mass over-estimate for East Antarctic accumulation

Ted Scambos (1), Massimo Frezzotti (2), Terry Haran (1), Jennifer Bohlander (1), David Long (3), Ken Jezek (4), Katy Farness (4), Jan Lenaerts (5), Michiel van den Broeke (5), and Mary Albert (6)

(1) University of Colorado, National Snow and Ice Data Center, Boulder, CO, United States (teds@nsidc.org), (2) ENEA, Rome, Italy, (3) Microwave Earth Remote Sensing Lab, Brigham Young University, Provo, UT, United States, (4) Byrd Polar Research Center, The Ohio State University, Columbus OH, United States, (5) Institute for Marine and Atmospheric Research, Utrecht University, Utrecht, Netherlands, (6) Dartmouth University, Hanover NH, United States

Persistent katabatic winds form widespread areas of near-zero net surface accumulation on the East Antarctic Plateau. These regions have been called 'wind glaze' surfaces due to their wind-polished appearance, particularly in austral springtime. Wind glaze properties that permit satellite remote mapping are: coarse optical snow grain size on the surface (> $\sim$100 micrometers), high backscatter (> $\sim$ -5 dB in Radarsat-1 SAR mapping), lower surface roughness due to the absence of sastrugi, and location in regions of locally higher surface wind speed in the downslope direction. We use a combination of remote sensing data sets and a model-based surface wind field to map the extent of wind glaze areas in the dry snow zone of the East Antarctic Plateau. The data sets are MODIS-derived surface snow grain size, SAR and scatterometer backscatter intensity, and MISR-derived surface roughness. We combine these data with a wind field model (27 km gridding) and high-resolution DEM (2 km) to create a field of surface mean slope in the wind direction (a dot product of the slope and wind vectors). Approximately 4 to 10% of the surface of East Antarctica is mapped as wind glaze. Existing studies of accumulation (surface mass balance) on the East Antarctic Ice Sheet (EAIS) have interpolated values across glaze regions, leading to an overestimate of net mass input to the ice sheet; local accumulation highs adjacent to wind glaze patches do not fully compensate for the overestimated accumulation across the glaze areas. Using our derived wind glaze extent map, we estimate this excess accumulation error, at between 30 and 100 Gt, or $\sim$4.0 to 10% of the total inferred accumulation for the regions above 1000m elevation.