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'Wind glaze' extent on the East Antarctic Plateau: implications for the ice mass balance of East Antarctica

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A combination of satellite sensors is used to identify regions of wind-swept firn surface in East Antarctica. Field data from several traverse expeditions confirm the remote detection technique. Wind-swept 'wind glaze' areas have near-zero accumulation, and exhibit lower albedo, coarser surface snow grains, coarse recrystallized depth-hoar, and a smoother, more forward-scattering 'glazed' surface in visible-band light. Using a combination of visible/near-infrared data from MODIS Mosaic of Antarcitca (MOA), active backscatter from the RAMP AMM-1 mapping and the QuikSCAT sensor on SeaWinds, and surface roughness/scattering from the MISR sensor, we determine that approximately 6% of the East Antarctic surface above 1000 m elevation is wind glaze. Because these areas are much lower in accumulation than current compilations of surface mass balance based on interpolation of point measurements (e.g., Arthern et al., 2006) or climate-model determinations of net accumulation, calibrated by point measurements, (e.g., Van De Berg et al., 2006), the presence of extensive wind glaze implies that surface mass balance is overestimated at present. Our initial results suggest an overestimate of 50 - 65 Gtons/year. The distribution of wind glaze areas suggests that Byrd Glacier, Nimrod Glacier, Ninnis Glacier, Lambert Glacier, Shiraze Glacier, and the uppermost parts of the Recovery Glacier catchment should be the most affected.