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ANTARCTIC MEGADUNES: FIELD MEASUREMENTS OF INTERNAL STRUCTURE, TOPOGRAPHY, ACCUMULATION PATTERN, AND SURFACE WINDFORMS.

TA Scambos[1], RJ Bauer[1], MA Fahnestock[2], CA Shuman[3], TM Haran[1], Z Courville[4], M Albert[4]

[1]NSIDC University of Colorado, Boulder, Colorado, United States, [2]Center for the Study of the Earth from Space, University of New Hampshire, Durham, New Hampshire, United States, [3]Oceans and Ice Branch, Goddard Space Flight Center, Greenbelt, Maryland, United States, [4]Cold Regions Research Engineering Laboratory,, Manchester, New Hampshire, United States

We report on field and remote sensing observations of a set of Antarctic megadunes at 80.28°S, 124.5°E. Ground-penetrating measurements, GPS topographic and ice motion surveys, shallow core accumulation measurements, and photographs of the surface, combined with satellite mapping of extent and regional characteristics, provide a basis for discussing possible formation mechanisms for megadunes. The structures cover more than 500,000 km2, exclusively on the East Antarctic Plateau, at elevations between 1500 and 3200m. Analysis of the recent MODIS Mosaic of Antarctica (MOA) provides the first accurate map of megadune extent, and provides variations in megadune wavelength and amplitude with elevation, slope, and accumulation. The field site is a set of very large and uniform megadunes, 5m in surface amplitude and 3.5 to 4 km in wavelength. A surface photography series every 200m shows gradual trends from high-relief sastrugi exhibiting both accumulative and erosive morphology on the windward faces to low-relief glaze-dominated lee surfaces. GPR measurements at 100 and 250 MHz provide information on megadune structure to 70 meters depth, and indicate that dunes form discrete ‘packets’ of layering approximately 12 m thick overall. Ice accumulation from beta-radiation measurements at the dune crests yields accumulation values of 3.3 to 4.4 cm/yr w.e. Combining this with the GPR profile layering yields accumulations of up to 4.7cm/yr w.e. at the center of the windward accretionary face, and near-zero accumulation (without significant ablation) along the lee face. It is clear from the collection of observations that the unique set of conditions present on the interior of the ice divide on the Plateau sets the stage for the existence of these features, but the area of the Plateau where these conditions predominate is extensive.