Impacts of an accumulation hiatus on the physical properties of firn at a low-accumulation polar site

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Recent field investigations of a megadunes region of East Antarctica provide evidence that differences in grain size, thermal conductivity, and permeability across a megadune are due to relative accumulation patterns in the absence of significant variations in microclimate. The differences in accumulation patterns include distinct areas of perceptible but low accumulation (less than 40 mm w.e. a^{-1}) and areas of accumulation hiatus within several kilometers proximity, as determined by remote sensing, surface feature classification, and GPR (ground penetrating radar) profiling. We show that near-surface firn properties are very sensitive to the amount of accumulation in low accumulation rate regions, with relatively small differences in accumulation rate (less than 40 mm w.e. a^{-1}) creating large differences in grain size, thermal conductivity, and permeability, accompanied by distinct variations in satellite-based microwave data from both passive and active sensors. The differences in physical snow structure due to varying levels of recrystallization between low accumulation areas and accumulation-hiatus areas in the near-surface are sufficiently distinct that evidence of a past accumulation hiatus should be observable in the physical and chemical properties of an ice core.