



Specific surface area of snow at Dome C, Antarctica. Rates of change for timescales from 1 day to 60 years

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The specific surface area (SSA) is a central variable to characterize porous media such as snow. Moreover, snow SSA is required to understand the chemical and climatic impact of the snow cover. At present, almost no data is available on the SSA of snow of the largest snow expanse on Earth: the Antarctic ice cap. We have measured the SSA of snow at Dome C, Antarctica (75°S, 123°E, 3250 m elevation) using infrared reflectance at 1310 nm and an integrating sphere. The method has an accuracy of 10%. Several hundred measurements were made to study its spatial and temporal variations. Surface values reach $53 \text{ m}^2 \text{ kg}^{-1}$ and show some slight diurnal variations explained by the formation of surface hoar at “night” and its sublimation in the “day”. SSA vertical profiles down to 5 m were performed, and the lowest value observed is $7.8 \text{ m}^2 \text{ kg}^{-1}$. Given the low accumulation rates at Dome C, these latter data allow the test of SSA rate laws for regimes where the curvature distribution of snow crystals can be expected to be at steady state. In particular, the applicability of Ostwald ripening theories is tested for snows that are up to 60 years old.