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Measuring Snowfall Events on Ice Sheets from Space

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Passive microwave emissions at 85GHz are used to identify changes in the snow surface of ice sheets. These changes are shown to correlate well with new snowfall. The interference of cloud cover on the 85GHz signal is demonstrated by observation and modeling to be less than the surface changes. This allows surface changes to be identified and mapped regardless of cloud conditions. We use this correlation to map potential new snowfall over both Greenland and Antarctica for multiple years. It is recognized that some identified events involve little new accumulation and are the result of high winds or surface direct vapor to solid sublimation.

To determine the magnitude of new snowfall, the timing and location of potential events are used to parse and analyze ICESat laser altimeter data. The crossover measurements in areas of expected new snow are compared with crossovers in areas of no new snow for the same time period. Examples are shown of how this approach leads to estimates of snowfall amounts well beneath the approximately 10-centimeter, single-shot precision of ICESat laser altimeter data.