

Snow Near Surface Morphologies and Influence on Solar Albedo

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Low earth orbit science missions that monitor global climate and energy balance through remote sensing require accurate snow optical properties. The interaction of snow's surface with solar radiation is a vitally important area in environmental science. Through metamorphic processes, snow microstructure is continuously evolving. Snow at or near the surface is particularly active due to its atmospheric interface and radiative exchanges. Under certain natural conditions, specific morphologies that develop at or near the surface can result in varied solar reflectivity or albedo. Currently, snow grain size, not grain type, is assumed to be the primary factor defining reflectivity. While this assumption is accurate for particular wavelengths, recent studies suggest that grain type may be important in visible wavelengths. Using MSU's world-unique cold region research facilities, researchers have found preliminary evidence supporting reflectivity dependence on grain type. Near surface snow metamorphism has, for the first time, been replicated in the lab producing important snow morphologies. This proposal seeks to refine and enhance those findings by developing the tools and techniques to make snow albedo and bidirectional reflectance measurements on specific grain types. Experimental evidence of visible bidirectional dependence on snow grain type will be collected. The resulting ability to produce specific snow morphologies coupled with the capability to measure and quantify snow reflectivity will be unique to MSU. Finally, a follow on proposal will be developed for detailed investigation of snow's visible reflectivity. This proposal will be submitted to one of several interested programs within the NASA Earth Science Division.

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