(37-240329-A) **Examining Spectral Albedo Measurements of Snow for Impacts of Aerosol Deposition at the SAIL and SPLASH Campaigns**

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The deposition of absorbing aerosol is known to decrease the albedo of snowpack and accelerate snowmelt. The timing of snowmelt impacts streamflow rates and water availability, a critical concern in the Colorado Basin. Spectral albedo measurements were made at 7 solar wavelengths using Multifilter Rotating Shadowband Radiometers (MFRSRs) at the US DOE ARM SAIL deployment and at two NOAA SPLASH sites (Kettle Ponds and Brush Creek) in the East Colorado River basin. Visible wavelengths, like the 415 nm blue channel are impacted by absorbing impurities like dust or black carbon deposition on snow, but are not significantly impacted by changes in snow optical properties like grain size (e.g. Warren, 2019). However, the longer infrared wavelengths are more sensitive to snow properties that change with aging such as snow particle size and phase. This spectral signature will be used to better distinguish the impacts of snow aging versus snow impurities. As shown in the figure, snow aging can be identified by observing slow declines in the infrared albedo after new snow events concurrent with very little change in shorter wavelength albedos. By contrast, when dust is deposited, or exposed by melting snow, both visible and infrared measurements decrease substantially. Timeseries of these spectral albedo measurements will be examined to show the radiative impact of snow aging and dust deposited on the snow over two winter seasons between 2021 and 2023.

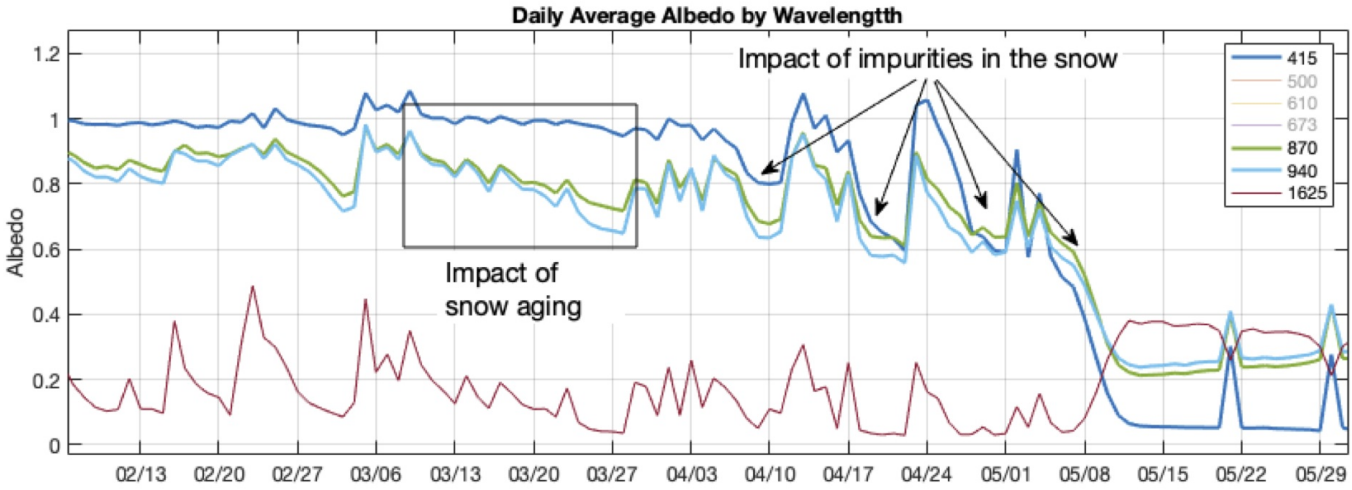

Figure 1. An example of the relative difference between albedo changes at visible and infrared wavelengths from the ARM SAIL site. Over a stretch of several weeks in March without new snowfall, a gradual decline in the infrared albedo wavelength is seen, while little change occurs for the visible albedo at 415 nm (boxed area). However, when melting occurs in April, we see substantial decreases in the albedo at 415 nm as well as at infrared wavelengths which is likely due to the coalescence of absorbing aerosol at the surface under melting conditions.