



Snow & Ice

“Albedo, the ratio of incoming to reflected solar radiation, plays an important role in climate by regulating the amount of shortwave radiation reflected or absorbed and subsequently reradiated as longwave radiation by a surface.” (Burakowski et al., 2015)

Albedo changes are related to light scattering which is caused by changes in particle (crystal size) packing density and foreign materials such as algae or dust on the snow; these things impact the melt rate and can be an indicator of snow/water equivalent, which is important for reservoir management.

The value of VNIR and Full-Range Spectroradiometers for Snow & Ice:

- “Considering the high spatial and temporal variability of albedo and the fact that most snow covered areas are difficult places to reach to perform field measurements, remote sensing is the most suitable tool to determine spatial and temporal variability of snow albedo.” (Dumont et al., 2010)
- “...scientists can distinguish between snow and ice based on their spectral characteristics – the spectral slopes and absorptions are clues to a material’s identity.” (Horodyskyj, 2015)
- “Since light absorption by ice varies substantially depending on wavelength, the spectral distribution of solar radiation after absorption and scattering by snow grains varies within the visible and NIR spectra.” (Aoki et al., 2011)
- “...the range of measurements across the electromagnetic spectrum requires ground measurements of grain size for accurate data interpretation. To fully understand the radiative and convective energy balance in snowy regions, large datasets of ground-based grain size measurements are needed. This is only possible with new techniques allowing for much more rapid acquisition than previously available.” (Berisford et al., 2013)

Maintain accurate data collection of Snow & Ice properties via Ethernet or wireless functionality:

- ASD’s Windows®-compatible **RS³™ Spectral Acquisition Software** has a user interface that is optimized for field data collection with easy configuration of averaging, field-of-view, storage and display of raw, reflectance, radiance and irradiance spectra in ‘real-time’
- The flexibility, portability, and efficiency of the ASD systems allow you to collect many properties, for example: snow grain size stratigraphy, surface reflectance spectra and broadband albedo, snow physical properties, spectral radiance, snow directional reflectance (HDRF), light-absorbing impurities

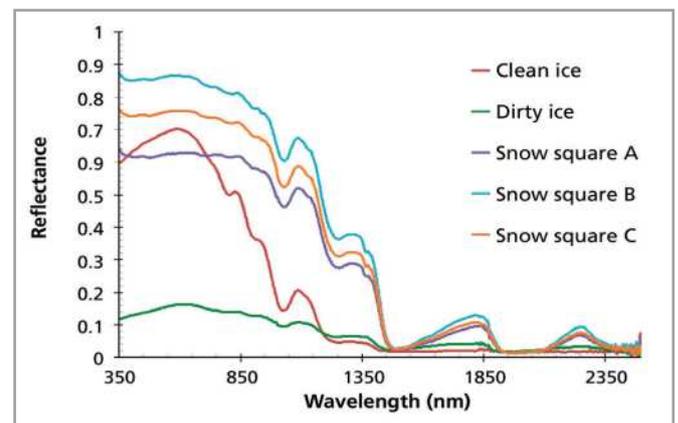


Figure 1. Reproduced with permission from Ulyana Horodyskyj. Spectral data characteristics from snow squares of snow and ice; the reflectance signature is characteristic of the morphology of snow and ice and is indicative of other compositional factors such as the degree of contamination by organic and inorganic deposition. (Horodyskyj, U.N., 2013)

ASD pioneered the science of field spectroscopy over 25 years ago and continues to lead the industry with the world’s most trusted field-portable spectroradiometers.

The Solution:

ASD spectroradiometers have the added value of being portable and with optimal signal-to-noise design for faster measurements, and wide spectral coverage of 350-2500 nm for determining a variety of compositional and important climatological parameters. ASD offers different instrument configurations and many accessory options for a variety of set-up and sampling approaches for the most convenient and productive measurement scenarios.

ASD instruments are a practical solution to analyze and discover Snow & Ice composition properties.

FieldSpec® 4 full-range spectroradiometers designed specifically around the challenges researchers face when performing spectral measurements in the field.



FieldSpec HandHeld 2 a versatile and durable hand-held spectroradiometer that utilizes the FieldSpec 4 VNIR spectrometer for accurate analysis in the 325 – 1075 nm spectral range.



Contact Probe for field measurements of solid materials. Use for snow stratigraphy and grain size studies.



Ideal for Snow & Ice applications:

- Portable solution
- Simple, rapid and cost effective real-time measurement (data and analysis in the field)
- Use to ground truth hyperspectral imaging data

References

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