Session: C33 Poster: W264A

Spectra reflectance characteristics of different snow and snow-covered land surface objects and mixed spectrum fitting

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Snow cover is a key hydrological parameter influencing on climate and water cycle in the global and regional scales. Accurate measurement and analysis of snow spectral characteristics is an important approach for improving the retrieval of snow cover characteristics in land surface of climate system. In recent years, many observed spectra characteristics of land cover types such as vegetation, soil, water body and mineral have been studied in the world. However, the research on spectral characteristics of snow is still limited; especially, there are seldom reports for the spectral characteristics of snow cover analysis in winter time regarding to the complex surfaces in Northern China; and few study concerns snow spectral fitting and decomposition based on field spectral measurement. In this study, the field spectroradiometer (Analytical Spectral Devices FieldSpec FR) was used to measure spectra of different snow (compacted snow, partial melting and thinner snow, general snow, unmelting and deep snow, and pine leaf with snow) and snow-covered land surface objects(pine leaf on snow-background, road, snow under shadow old snow by the road, snow on the vegetation, vegetation, bare and wet soil, and wet grass) in Beijing region. The result showed that, for a pure snow spectrum, the snow reflectance peaks appeared from visible to 800 nm band locations; there was an obvious absorption valley of snow spectrum near 1030 nm wavelength. Comparing with fresh snow, the reflection peaks of the old snow and melting snow showed different degrees of decline in the ranges of 300-1300 nm, 1700-1800 nm, 2200-2300 nm, the lowest was the compacted snow and frozen ice. For the vegetation and snow mixed spectral characteristics, it indicated that the spectral reflectance increased for the snow-covered land types (including pine leaf with snow and pine leaf on snow background), due to influence of snow background in the range of 350-1300 nm. However, the spectrum reflectance of mixed pixel remained vegetation spectral characteristics. In the end, based on the spectrum analysis of snow, vegetation, and mixed snow/vegetation pixels, the mixed spectral fitting equations were established, the results showed there were good correlation between spectral curves by simulation fitting and observed ones (correlation coefficient R≤ =0.9509).
*This study was supported by the Basic Research Key Project (Grant No.2010CB951302).