The Snow Cover Product for GOES-R Advanced Baseline Imager

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Snow mapping from the GOES family of environmental satellites has served as a critical and indispensible tool for operational water managers, weather forecasters and climate researchers since the 1970s. The dramatic leap forward in spaceborne imaging technology developed for GOES-R will provide unprecedented accuracy and precision in estimates of snow cover. Earlier snow mapping algorithms have had to rely on only a single visible band of imagery using simple brightness threshold methods to identify pixels that are mostly covered in snow. By contrast, the GOES-R's Advanced Baseline Imager spans the solar spectrum with several imaging bands so that, instead of relying on thresholds and thereby necessarily overlooking some of the snow cover, we can now quantitatively retrieve the fractional portion of any pixel that contains even a tiny portion of snow cover.

The GOES-R Snow Cover product has its legacy in imaging spectroscopy and multi-spectral imaging. With the advent of the Advanced Baseline Imager, the enhancement in spectral sampling coupled with frequent acquisitions will allow the more detailed characterization of fractional snow cover and the grain size of that fractional snow cover. The product comes from optimized spectral mixture analysis that uses the broad spectrum from ABI to determine the fractional cover of snow, vegetation, and soils. With the single visible bands of previous GOES sensors, snow cover mapping was constrained to severe assumptions whereas we can now explore what we now know to be the rich variation in the spectral reflectance of snow.

Even at continental scales, at certain times of the year snow cover can be the most dominant of land surface features. This is certainly true at regional scales where, for certain parts of the year, snow cover is the only significant feature. The climate that we, as humans, enjoy today is highly dependent upon the location, extent and timing of the annual cycle of snow accumulation, persistence, and depletion. The ebb and flow of continental climate conditions is influenced, to a large degree, by snow's high albedo (ability to reflect the sun's energy) and low thermal conductivity (ability to insulate).

In addition to its impact on climate, snow plays a major role in the hydrologic cycle. Depending on the region, the snow pack can store several months of precipitation which, when it finally does melt, may release a season's worth of precipitation in relatively short order. For some of us, this is seen as a huge benefit where snow may be the single most important source fresh water for industrial, agricultural, energy,

recreational and consumptive use. For others, the melting of the snow pack is a harbinger for the onslaught of flooding.