WHAT SPATIAL RESOLUTION IS NEEDED FOR MINERALOGIC MAPPING WITH HYPERSPECTRAL IMAGING?

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Hyperspectral imaging systems produce 20-50 times more data than multispectral sensors. Sensor development requires tradeoffs and the quickest way to reduce the throughput and, therefore, the cost of a hyperspectral sensor is to increase the IFOV (instantaneous-field-of-view). A common concern of users of remote sensing data is the spatial resolution, the higher, the better. In this paper we show that at natural scales of outcrops it is possible to relax requirements for spatial resolution by making statistical good use of the overdetermined nature of hyperspectral data. Flights of AVIRIS (Airborne Visible-Infrared Imaging Spectrometer) at high and low altitudes, yielding pixel sizes different by a factor of 8, were analyzed using unmixing methods over Cuprite, Nevada and along the Colorado Front Range. In general, the number of end-members found in the images did not vary with resolution. However, when high resolution image pixels were summed to match the lower resolution pixel size, the increase in signal-to-noise ratio made it possible to pick out 50% more endmembers, implying that the limiting factor is not spatial resolution but rather signal-to-noise ratio. We show that, in the areas studied, that the natural scale of mineral mixing on the surface plsys an important part in this result. We can show that the same quality of information can be obtained from high-flying sensors with a further advantage of a larger area covered per flight hour.