Science Measurement Requirements for Imaging Spectrometers from Airborne to Spaceborne

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Spectroscopy has been used as a powerful tool to answer science questions based upon the interaction of light with matter. In the late 1970s concepts for earth-looking imaging spectrometers were conceived and the Airborne Imaging Spectrometer (AIS) acquired measurements in 1982. From this beginning a series of airborne and more recently, early spaceborne imaging spectrometer have been developed and have acquired measurements for science investigations.

In parallel with the development of these instruments, our understanding of the critical spectral, radiometric and spatial measurement requirements in order to pursue rigorous science research has evolved. For example, early signal-to-noise ratio requirements were set at 50:1 for bright targets. Today the leading relevant science research requires measurements with precision of 500:1. A comparable growth in our understanding of the importance of the requirements for spectral-spatial uniformity as well as measurement calibration has occurred. This paper presents a review our understanding of spectral, radiometric and spatial science measurement requirements for imaging spectrometers based up science research results from past and current airborne and spaceborne instruments. We then look to the future requirements that will enable the next level of imaging spectroscopy science.