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The following title was submitted:
Radiometric Performance Requirements for Atmospheric Processing of Hyperspectral
Imagery

Abstract (292 words):

The radiometric performance of any hyperspectral sensor is limited due to its quantization, its noise levels, its spectral resolutions, and its calibration accuracy. During the definition phase of the APEX instrument these numbers had to be defined based on the needs in atmospheric correction and in hyperspectral applications. This paper describes the requirements with respect to the measurement of atmospheric constituents such as water vapor, oxygen, and aerosols. The respective parameters all are relevant for the use with atmospheric correction procedures.

The sensitivity of an imaging spectrometer to the columnar water vapor content is high throughout a large number of spectral bands, while the most commonly used absorption feature is situated at 940nm wavelength. The required noise levels as well as the influence of spectral mis-registration within this absorption feature are described first.

The aerosol contents mainly influence the signal in the short wavelengths between 400 to 500 nm due to their scattering function. The signal variation for a variety of standard situations is modeled using the MODTRAN radiative transfer code. The minimal required noise equivalent radiance in these channels then is retrieved and compared to the expected performance.

Another feature of importance is the narrow-band oxygen absorption at 760 nm. It may be used for column aerosol retrieval and for the estimate of the terrain height if no DEM is available. Its sharpness drives the requirements for spectral resolution and spectral position knowledge at this wavelength. The required resolution for the exploration of this feature is defined.

General requirements for radiometric performance can finally be formulated with respect to the atmospheric measurement capabilities of a generic hyperspectral instrument. This specifications have also to be evaluated against the needs of the end-user community, where analogous requirements are defined for various land applications.