**Application of AISA measurements for water quality and benthic habitat mapping in optically shallow waters: challenges in radiometric calibration and atmospheric correction**

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**Abstract**

An Airborne Imaging Spectrometer for Applications (AISA) hyperspectral imager was deployed on a manned aircraft flown at 1305m altitude to collect data over optically shallow waters in the Florida Keys with the ultimate goal of mapping water quality and benthic habitats. As a first step, we developed a practical approach to effect an atmospheric correction (AC) to derive surface remote sensing reflectance (*Rrs*) of aquatic environments using radiative transfer simulations and constraints obtained from field spectral *Rrs* measurements. Lookup tables (LUTs) for Rayleigh scattering and aerosol scattering are generated using MODTRAN. For each pixel, Rayleigh scattering is interpolated using the Rayleigh LUTs. Two NIR bands near 748nm and 850nm were selected to find the atmospheric parameters for calculating aerosol scattering. The iterative approach based on spectral relationships between two NIR bands and one red band are employed to account for the non-zero reflectance at NIR bands. Simulations and comparison with concurrent in situ *Rrs* measurements show the possibility of error in the radiometric calibration of AISA, for which a definitive assessment cannot be made due to lack of enough concurrent in situ measurements. The need for noise reduction and the difficulty in applying vicarious calibration are discussed to help advance the design of future AISA missions.

**Keywords:** Airborne remote sensing; Atmospheric correction; Ocean color; AISA; Vicarious calibration; MODTRAN; Noise reduction