ANALYSIS OF AVIRIS SAN PEDRO CHANNEL DATA: METHODS AND APPLICATIONS

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The U.S. Navy has and/or is developing imaging spectrometers for remote sensing of deep ocean and coastal waters. The AVIRIS test program provides a unique opportunity to evaluate the performance of so-called hyper-spectral systems in marine environments. Data used for this study were collected over San Pedro, California in March 1991 and obtained from the Oceanography Group at the Jet Propulsion Laboratory in Pasadena. Much of what will be presented here is work in progress. Technical pre-prints and software tools will be available from the author at conference time.

Remote sensing of marine environments can be significantly more challenging than surveillance of terrestrial phenomena. This is primarily due to the coupling of low contrast targets and complicated hydro-optic interactions. Therefore, a successful maritime program requires high signal-to-noise ratios, a realistic atmospheric correction, and suitable metrics for hydro-optic analysis.

The initial calibration of AVIRIS data depends upon dark current, vignetting, navigation, and spectral response data. Each is a potential source of error, particularly if the calculation is performed in the domain of integers. Further, the numerical resolution of these data are poor—although proposed sensor upgrades offer substantial improvements. A calibration method based upon dark current smoothing, vignetting curve fits, navigational aberration, spectral overlap, and standard calibration data will be presented.

There are currently many efforts underway to model atmospheric effects in AVIRIS data. Here we present a unique approach involving the recursive tuning of unknown atmospheric parameters via simulated annealing while holding fixed those few parameters measured in situ. This method has potential use for measurements involving joint radar and long-wave IR data *sans* ground truth.

Hydro-optic metrics related to suspended sediment content and other marine phenomena require signal-to-noise ratios near 300:1 at spatial resolutions less than 100 meters. To meet these requirements, neighboring pixels were ganged together in both the spatial and spectral directions. The variance spectra of turbulent structures and chlorophyll concentrations are then compared to previous studies. The ability of AVIRIS to meet marine sensing requirements and implications for HIRIS will also be discussed.