AVIRIS Inflight Calibration Experiments in 1999

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OVERVIEW

- Objective
- Laboratory Calibration
- Inflight Calibration Experiment
- Sensitivity Analysis
- Discussion

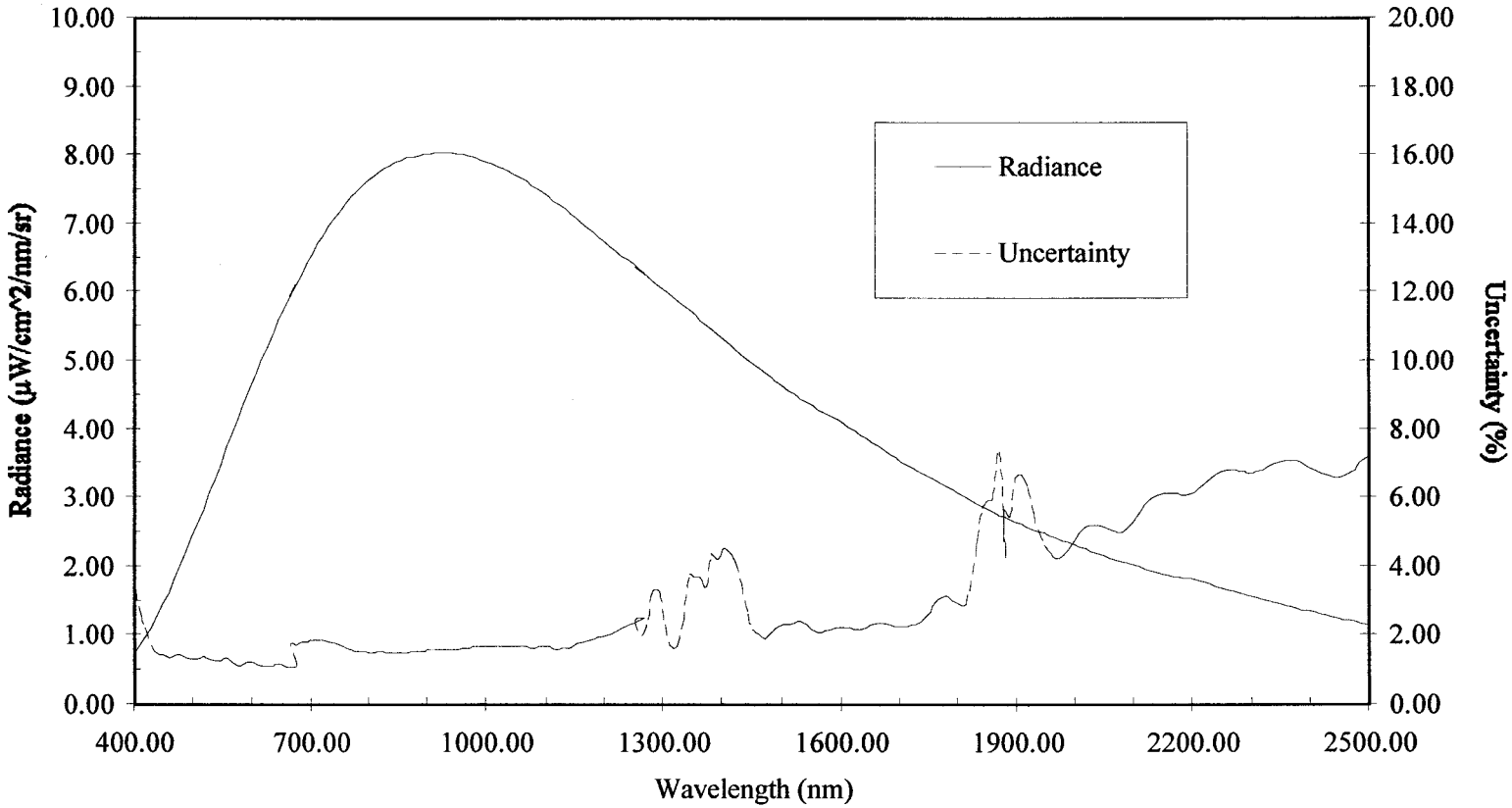
OBJECTIVE

- AVIRIS is calibrated in a laboratory environment that is vastly different from the Q-Bay of the ER-2
- AVIRIS calibration only matter for airborne science and application data sets
- To validate the calibration of AVIRIS inflight an Inflight Calibration Experiment is required
- The Inflight Calibration Experiment compares AVIRIS measured radiance with predicted radiance for a surface calibration target

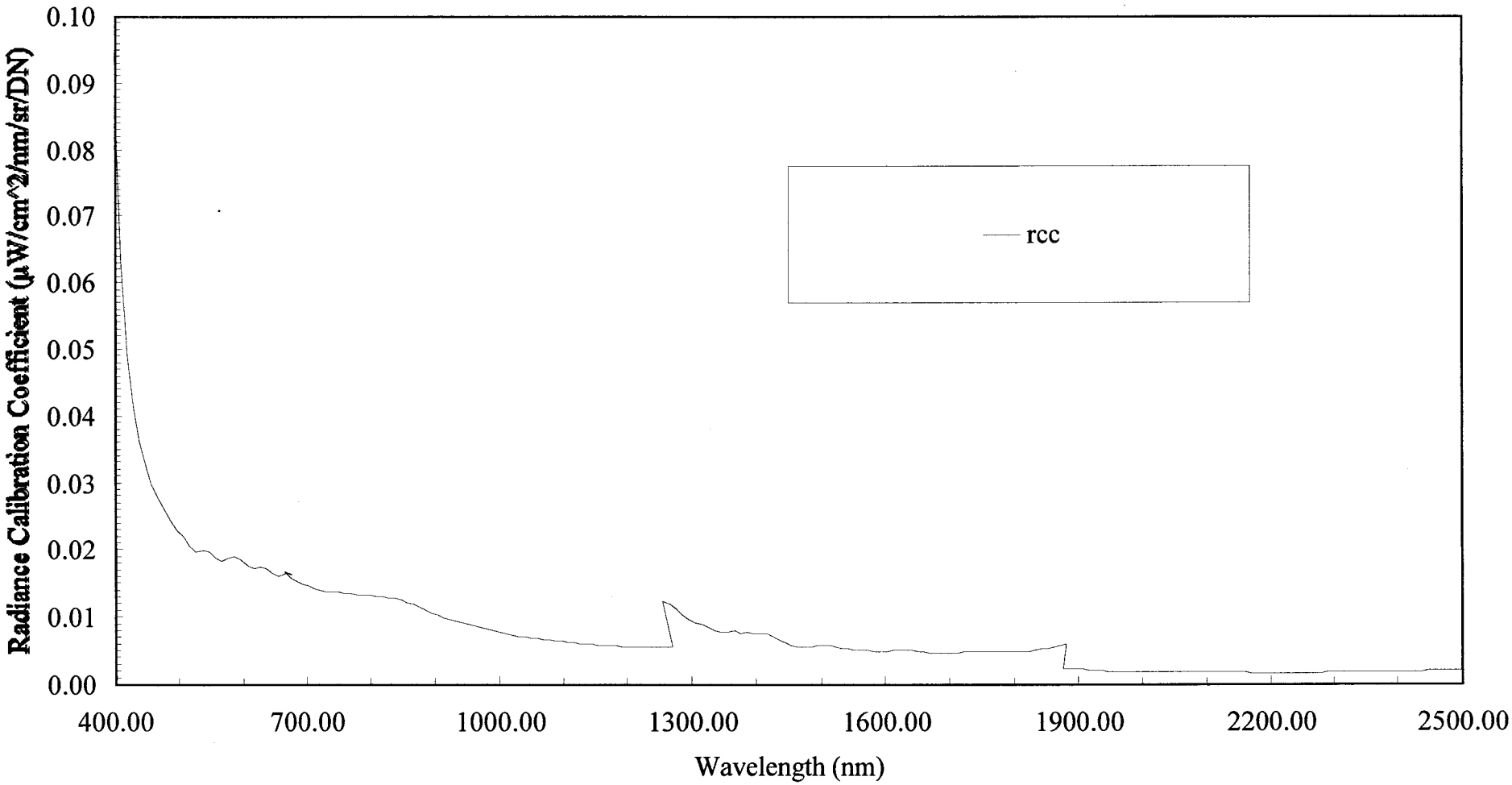
LABORATORY CALIBRATION

- Spectral
  - Range, Sampling, Response, Uncertainties
- Radiometric
  - Range, Sampling, Response, Uncertainties
- Spatial
  - Range, Sampling, Response, Uncertainties

LABORATORY RADIANCE STANDARD



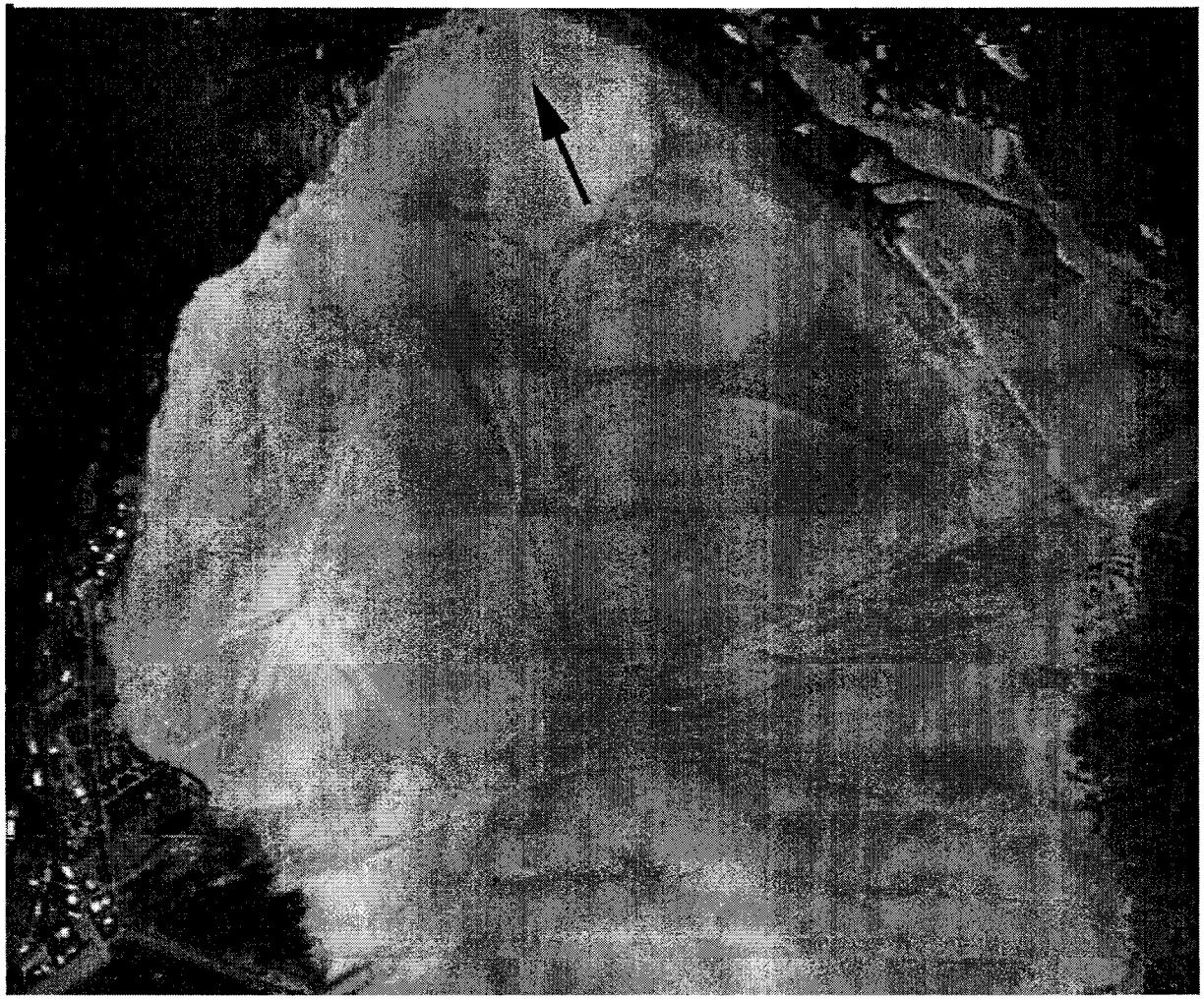
AVIRIS RADIOMETRIC CALIBRATION COEFFICIENTS



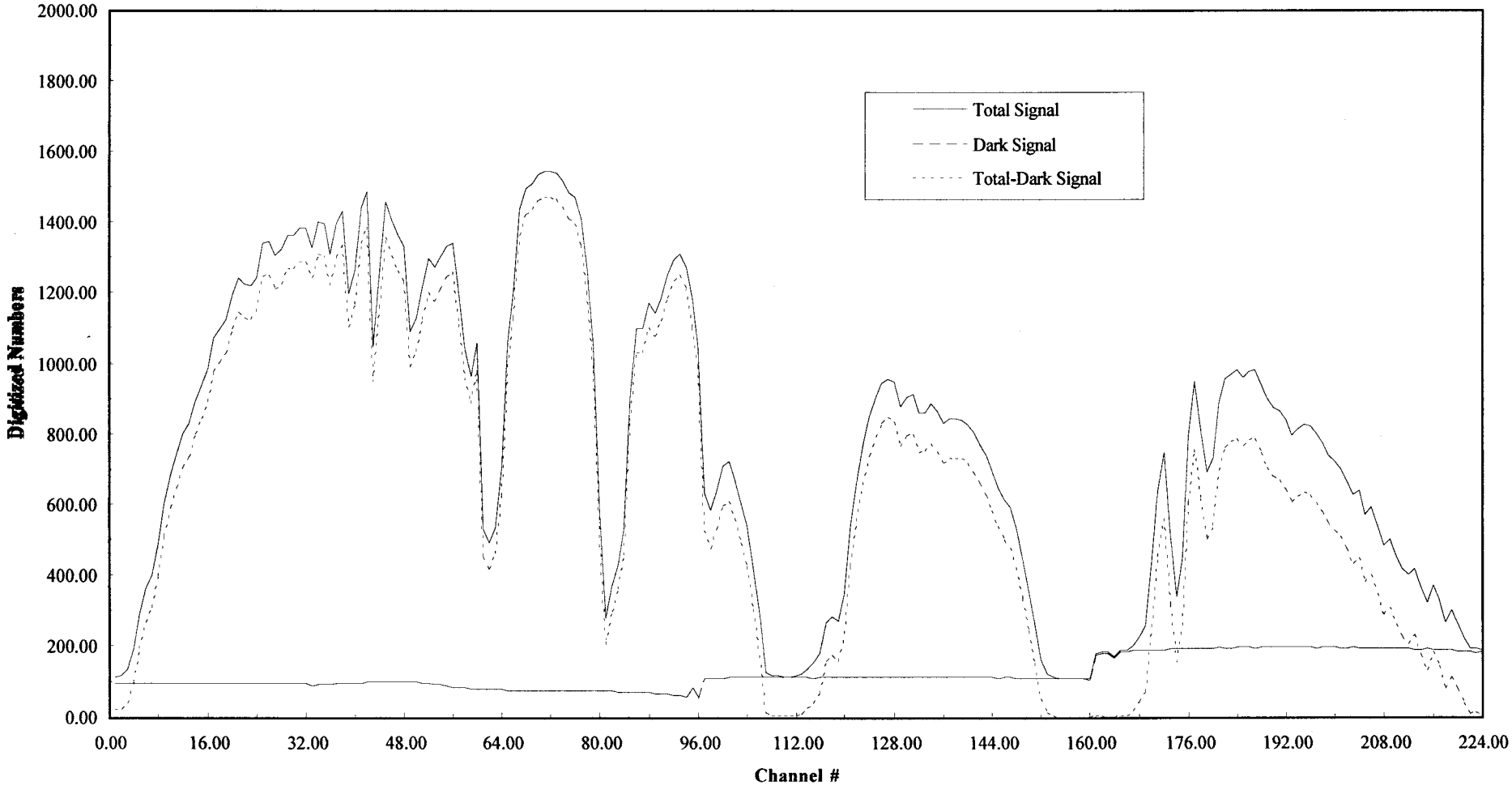
INFLIGHT CALIBRATION EXPERIMENT

- Measure the surface and atmosphere at the time of AVIRIS overflight
- Use surface and atmosphere measurement to constrain a radiative transfer code to predict the radiance at AVIRIS
- Compare and analyze the AVIRIS measured and RTC predicted radiance
- Report the experiment results

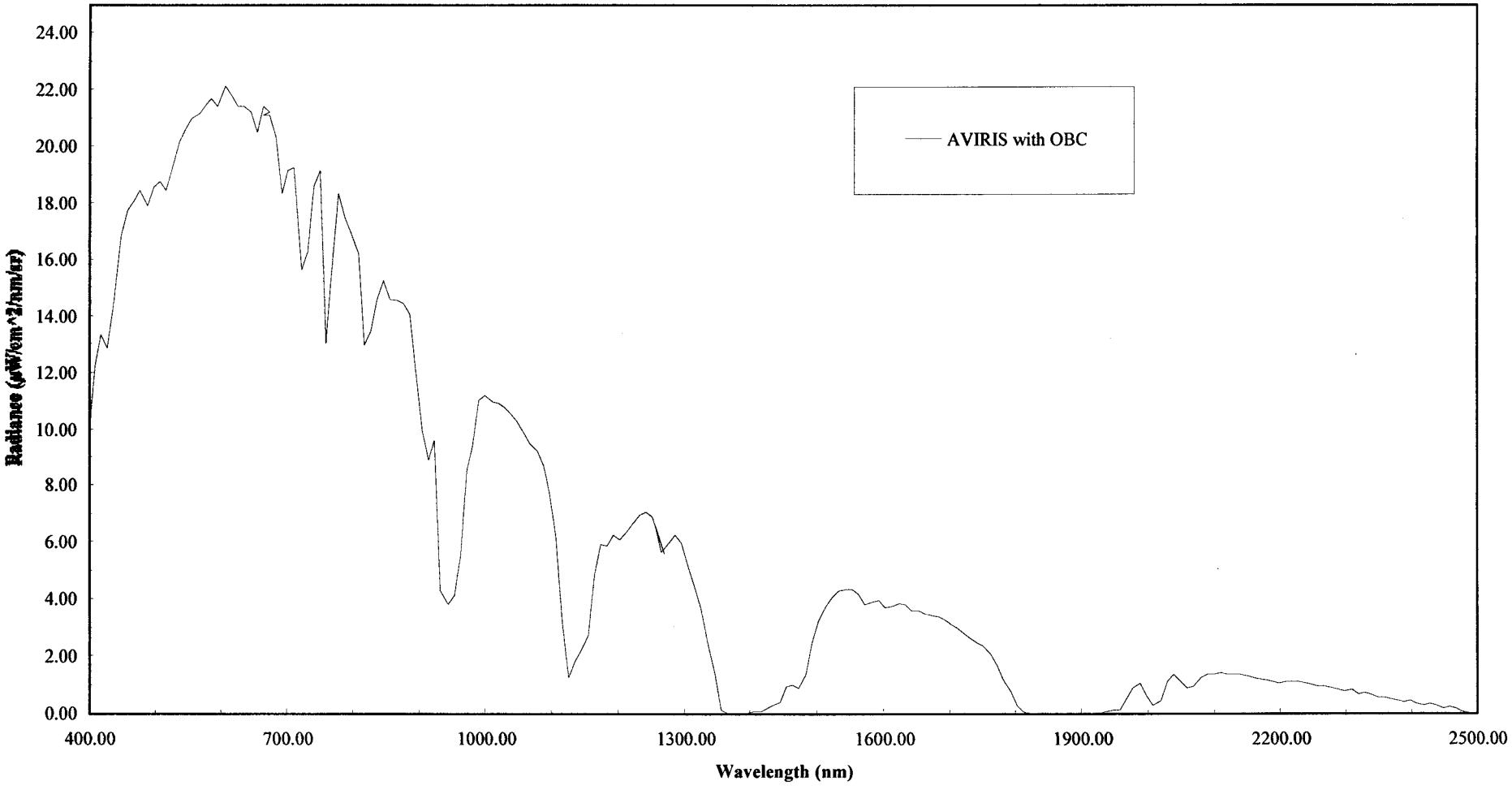
ROGERS DRY LAKE, CA CALIBRATION TARGET



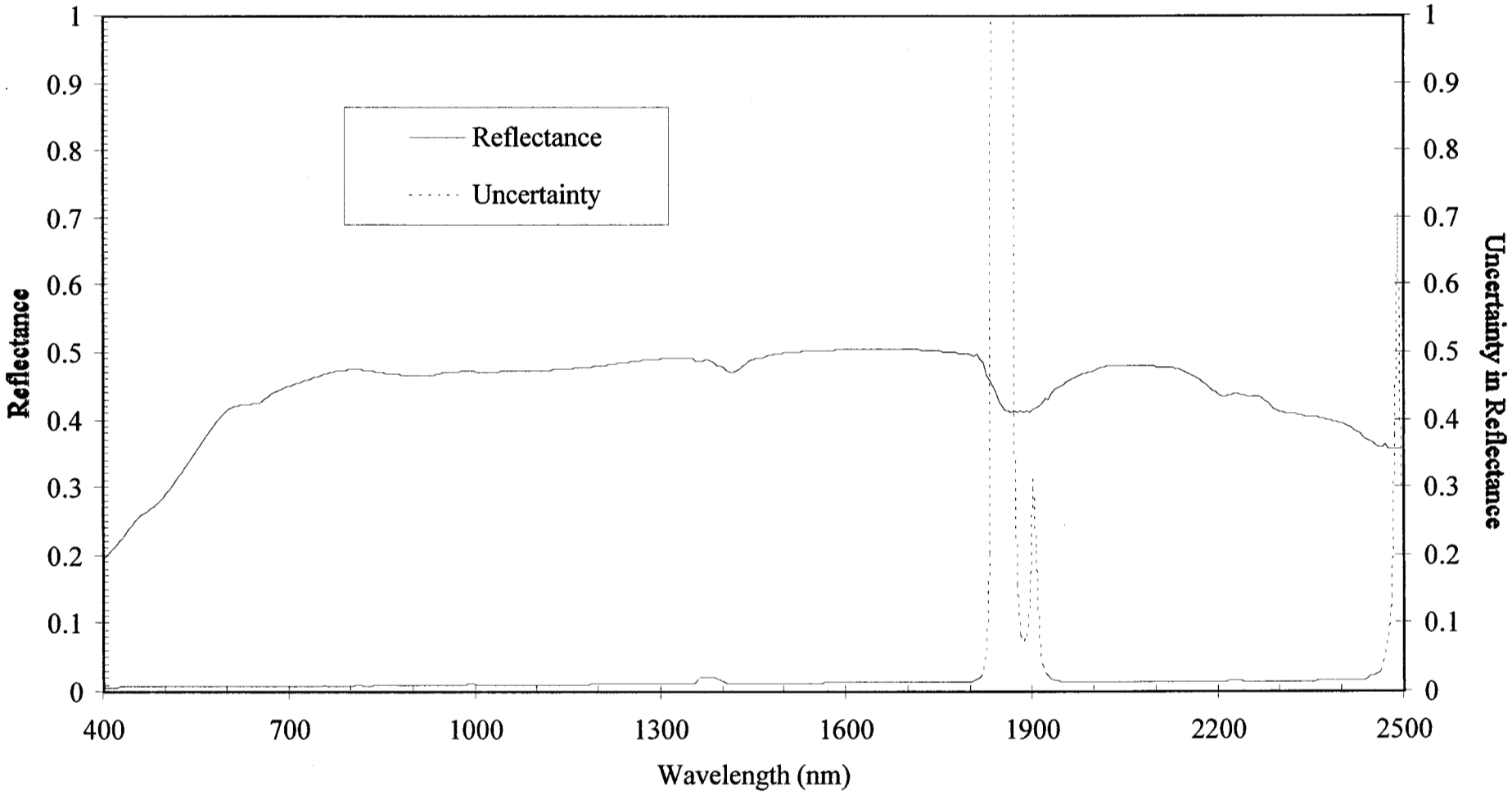
AVIRIS DIGITIZED NUMBERS



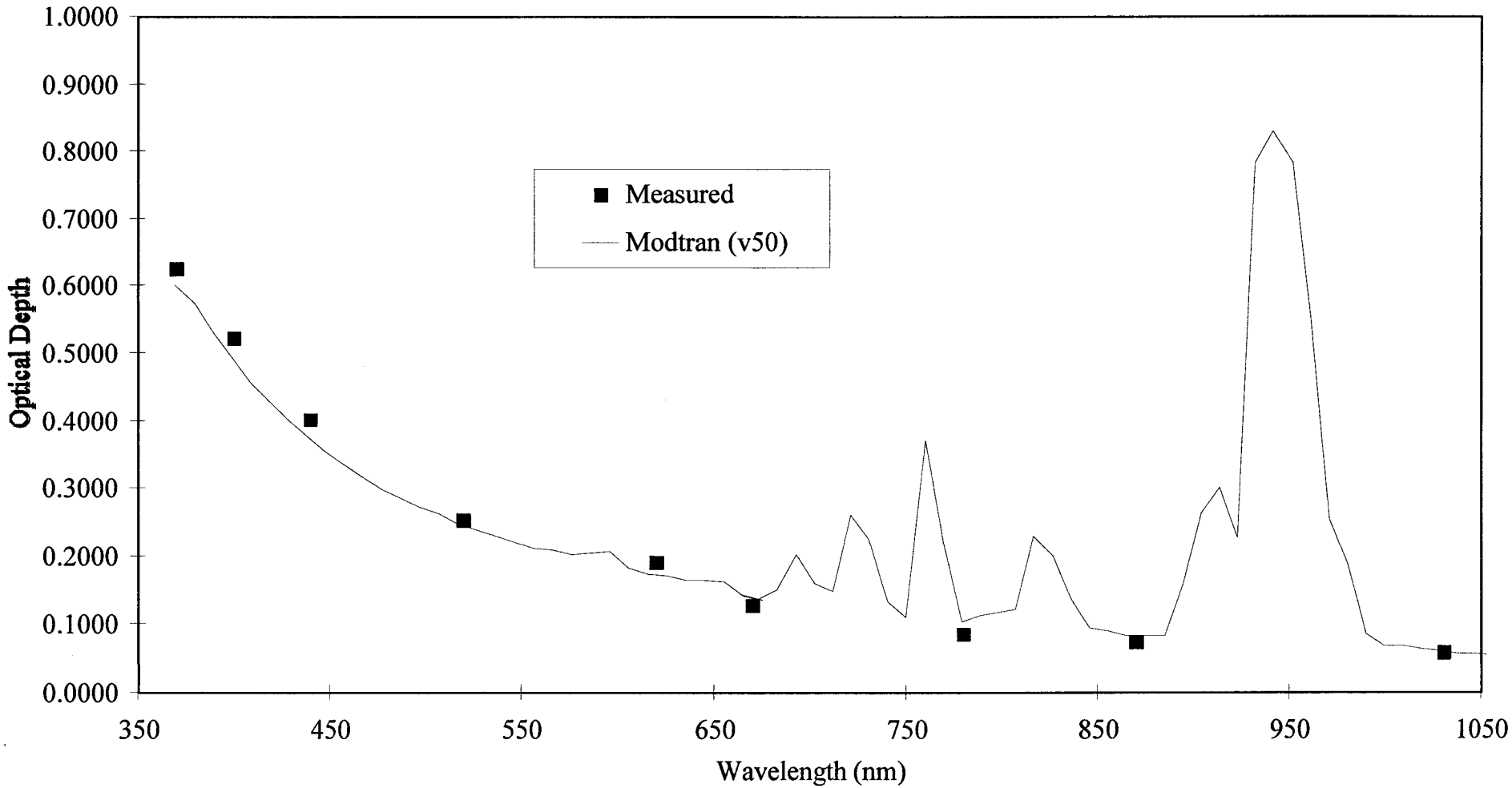
AVIRIS CALIBRATED RADIANCE FOR CALIBRATION TARGET



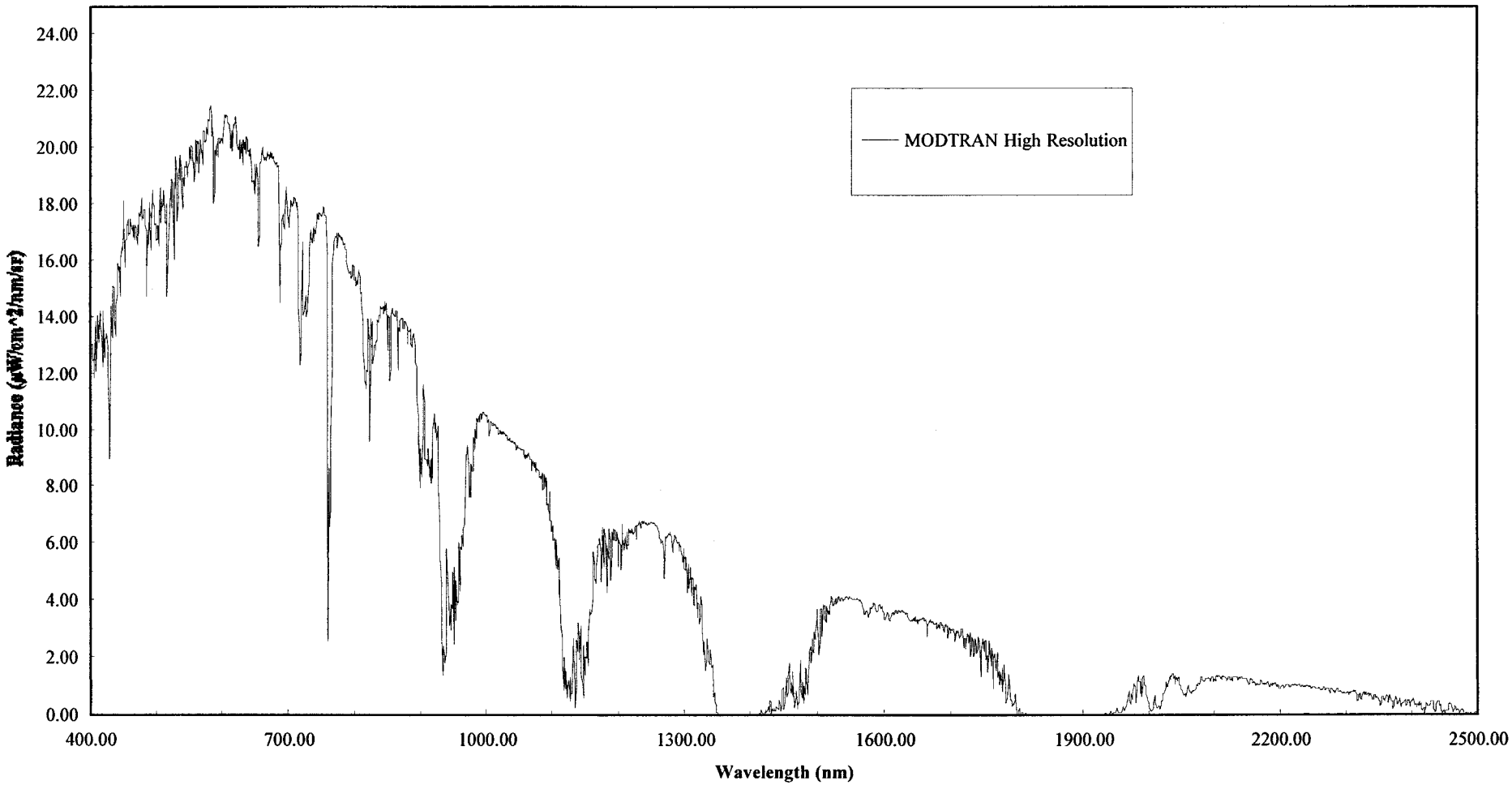
MEASURED SURFACE REFLECTANCE FOR CALIBRATION TARGET



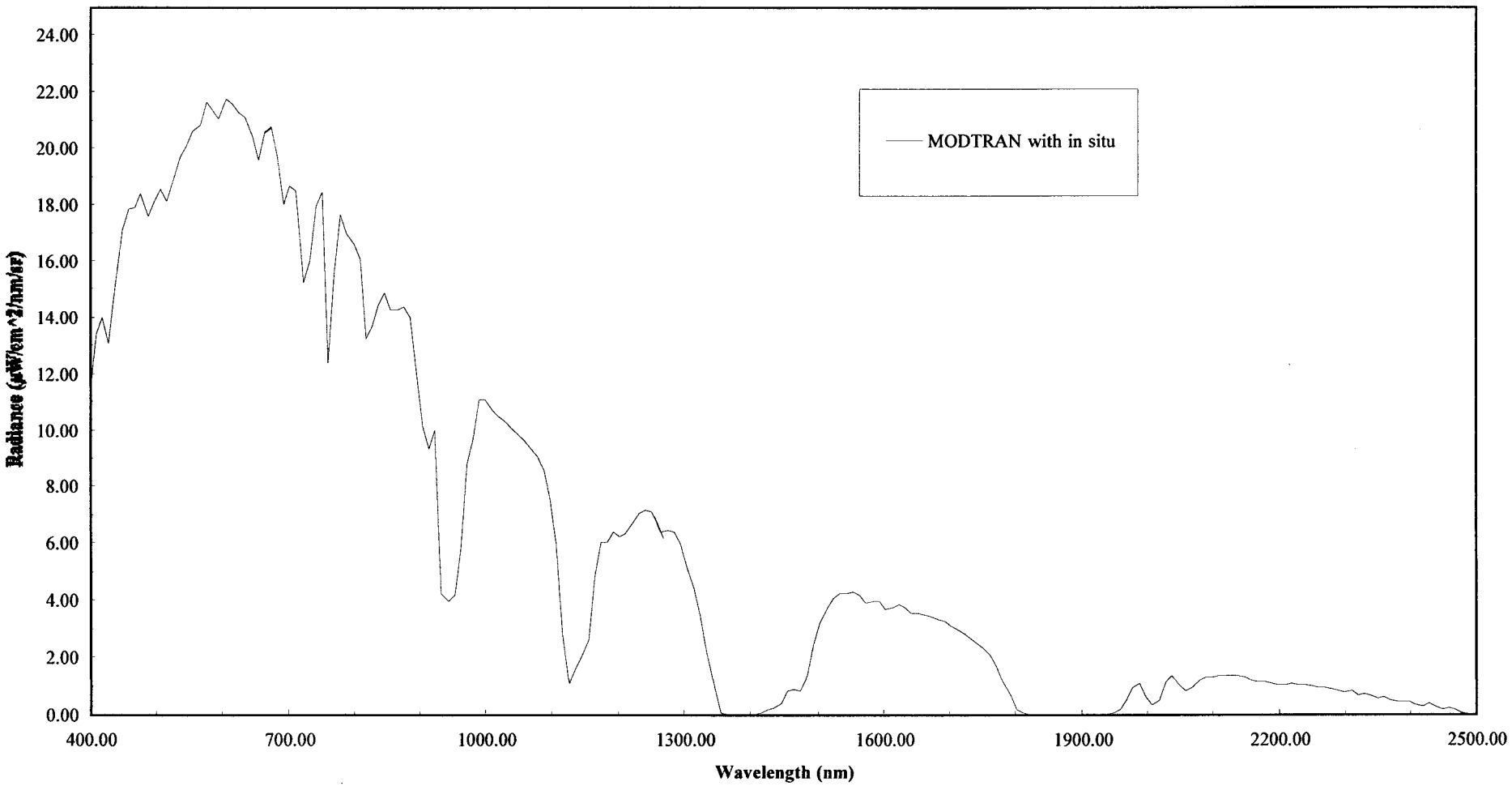
MEASURED AND OPTIMAL MOTRAN OPTICAL DEPTHS



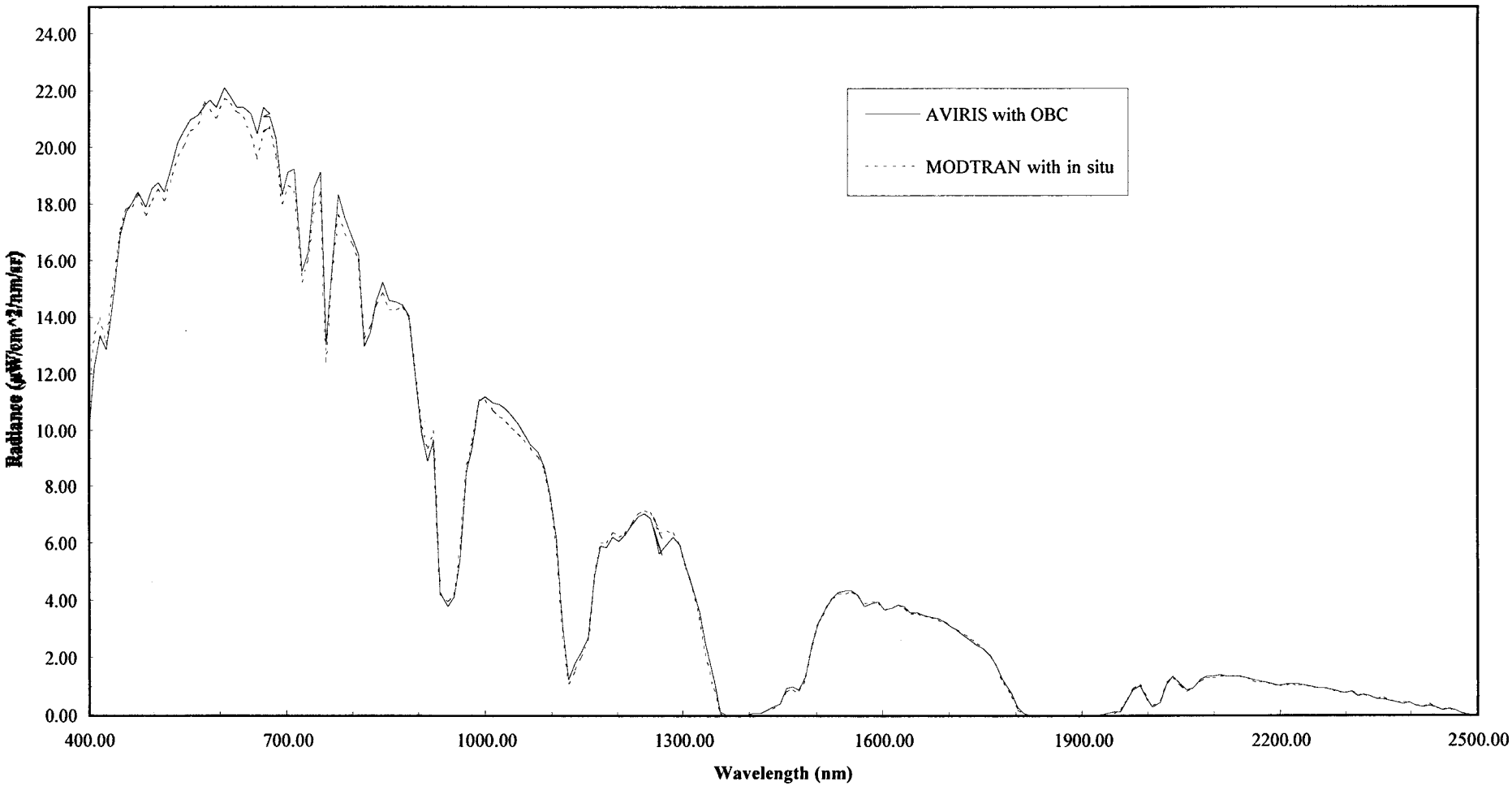
MODTRAN PREDICTED RADIANCE



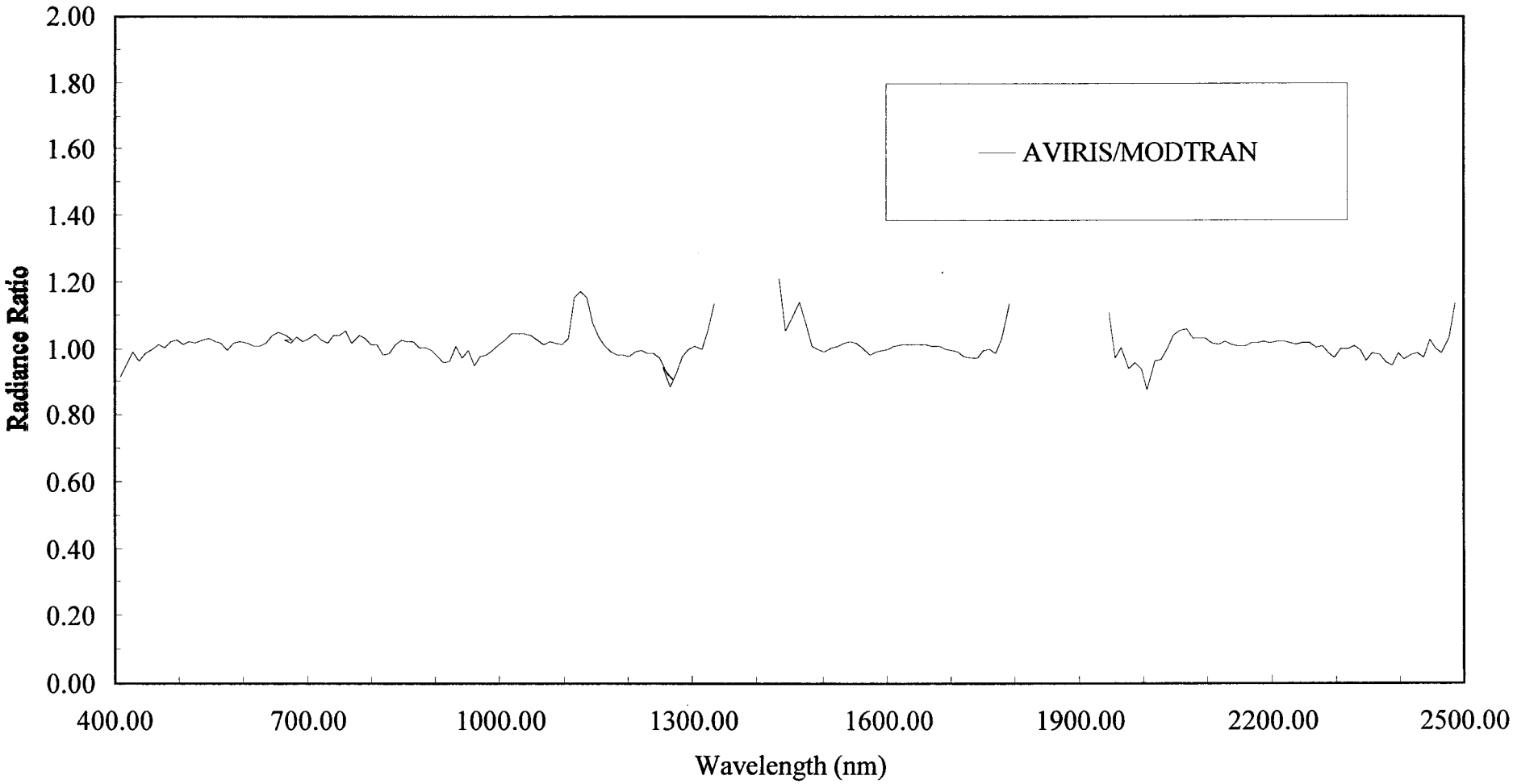
MODTRAN RADAINCE CONVOLVED TO AVIRIS SPECTRAL PROPERTIES



AVIRIS MEASURED COMPARED TO MODTRAN PREDICTED



RATIO MEASURED OVER PREDICTED

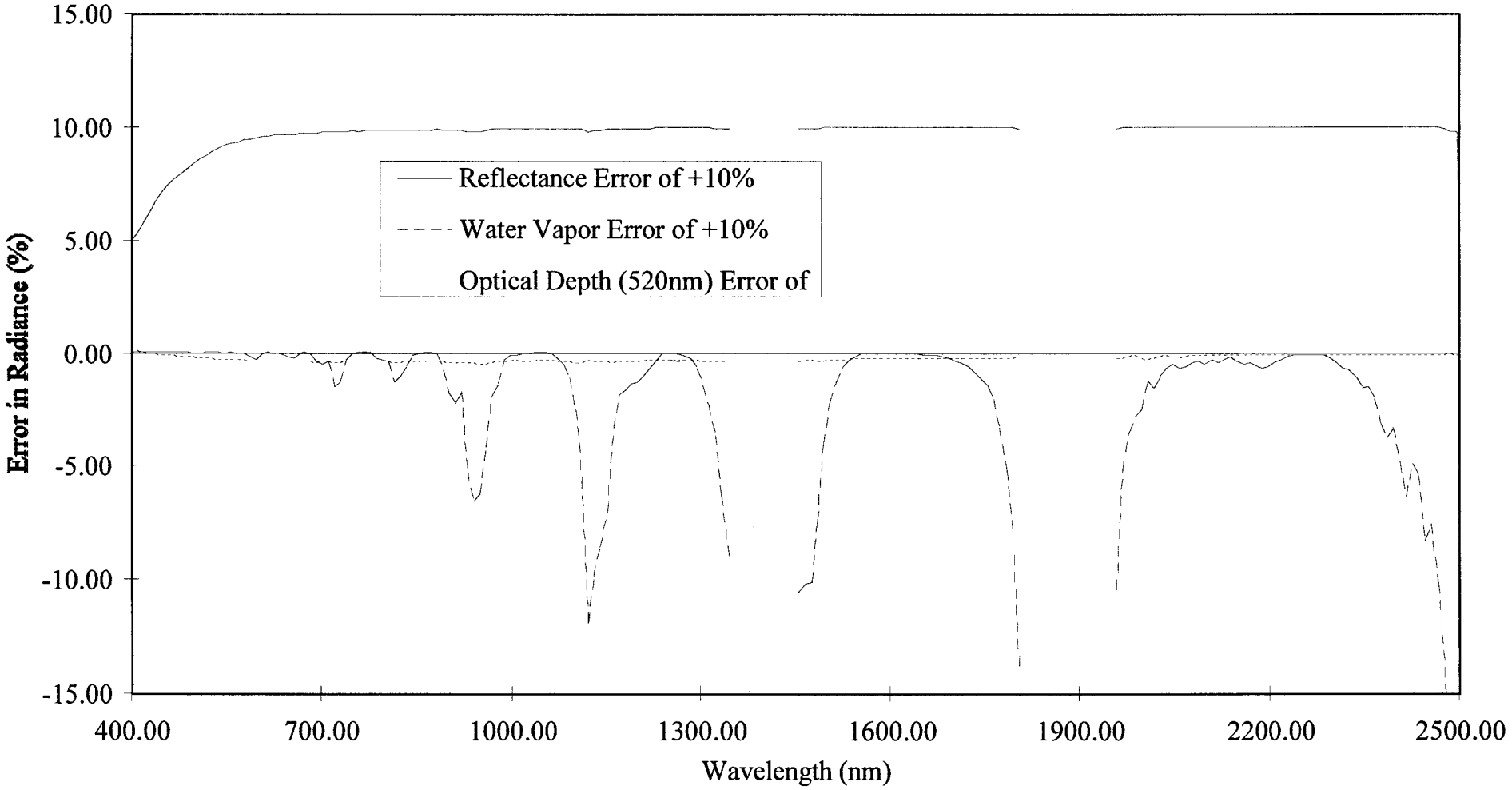


SENSITIVITY ANALYSIS

- Question: How sensitive is the calibration experiment results to the accuracy of the field measurements.

- Test: Calculate the percent error in predicted radiance as a function of errors in:
  - Reflectance
  - Water vapor
  - Aerosol optical depth

SENSITIVITY ANALYSIS RESULTS



DISCUSSION AND CONCLUSIONS

- The Inflight Calibration Experiment shows AVIRIS to be well calibrated in 1999.
- A sensitivity analysis shows the surface reflectance measurement to be most critical to predicting the radiance at AVIRIS
- Work is still needed to explore the residual difference between the AVIRIS measured and the MODTRAN predicted radiance

QUESTIONS?