FIRE TEMPERATURE AND FRACTIONAL AREA DERIVATIONS OVER THE WORLD TRADE CENTER DISASTER SITE FROM IMAGING SPECTOMETER MEASUREMENTS.

R. O. Green(1), R. N. Clark(2), and J. Boardman(3)

(1) Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California rog@spectra.jpl.nasa.gov
(2) U. S. Geological Survey, Denver, Colorado
(3) Analytical Imaging and Geophysics, LLC Boulder, Colorado

As part of the World Trade Center disaster response, the NASA Airborne Visible/Infrared Imaging Spectrometer (AVIRIS) was flown over the site on the 16th and 18th of September 2001. AVIRIS measures the solar reflected spectrum from 370 to 2500-nm at 10-nm sampling. For this flight the data were acquired at 1.5-m spatial sampling with image coverage of the entire disaster site. AVIRIS measurements are spectrally, radiometrically, spatially calibrated in the laboratory and validated in flight.

Rapid examination of the World Trade Center AVIRIS data in the 2300 nm spectral region showed numerous high radiance targets indicative of burning fires. A new spectroscopic algorithm was implemented to simultaneously solve for the temperature and fractional area of the fires. This algorithm uses the Planck function in conjunction with the full spectral shape measured by AVIRIS to determine the temperature and fractional area of the fire. This spectral algorithm overcomes the ambiguity between temperature and area that exists in single-spectral-band temperature estimation methods.

With these AVIRIS data set and new algorithm, 8 hot spot zones were identified in the September 16th data with temperatures ranging from 700 to 1019-K and fractional areas from 1.1 to 18-%. Analysis of the data set acquired on September 18th showed 7 of the hot spot zones still present with temperatures ranging from 471 to 952-K and fractional areas from 0.5 to 36-%. These imaging spectrometer derived physical parameters of fire temperature and fractional-area were found useful to the personnel making decisions on the ground. The complete set measurements, analyses, and results of this effort are reported in this paper.