

AVIS – Airborne Visible Near Infrared Imaging Spectrometer; a New System for Environmental Monitoring

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Abstract text:

For the purpose of environmental monitoring with Imaging Spectrometers, the choices of system selection are limited. There are no spaceborne systems available, and airborne Imaging Spectrometers such as DAIS, AVIRIS and HYMAP are expensive and difficult to obtain for more than one or two missions per year. Therefore a cost-effective system is needed which is affordable for official institutions and communities to monitor the environment over a longer time period. The Airborne Imaging Spectrometer AVIS (Airborne Visible near Infrared Imaging Spectrometer) was developed at the Institute of Geography, University of Munich, as an attempt to close this gap.

The core of AVIS is a 240-channel Imaging Spectrograph (V9 from Specim). It covers a spectral range from 550 to 1040 nm with a nominal spectral resolution of 2 nm. The spectrograph consists of a narrow slit, a PGP element (prism-grating-prism), and a focussing lens. Radiation entering the spectrograph through the slit is collimated by the first lens and refracted at the prism surface to the correct incident angle of the holographic grating. The grating disperses the light according to the common grating equation. Spatial information at the entrance slit is transferred to the image plain on the axis parallel to the slit length direction. This spectrograph is mounted between an objective (Schneider Cinegon 1,4/8) with a focal length of 8 mm and a 2/3" IR CCD black and white camera (Hamamatsu C5999). Due to the spectrograph slit each recorded image is a line of 390 pixels with a spatial resolution from 2.5 to 10 m, depending on the aircraft altitude. The resulting view-angle is 58 degrees.

The camera section can be installed in a chassis which fits onto an standard aircraft camera mount. The camera section is connected to a computer via a 10 bit frame grabber card for image data capture and processing which provides near-real-time data. The connected monitor enables the captured images to be supervised during flight. Auxiliary DGPS data including date, time, geographical position, and camera data is recorded.

Besides the detailed description of the system, the laboratory calibration including the spectral and radiometric calibration as well as SNR-analysis is presented.. The laboratory calibration is validated with ground truth measurements.

Topic: New Systems