

SMALL SATELLITE MISSIONS SYMPOSIUM (B4)
Small Space Science Missions (2)

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A SMALL SATELLITE MISSION DEMONSTRATING MULTI-ANGULAR HYPERSPECTRAL
APPLICATIONS OVER A PERIOD OF EIGHT YEARS

Abstract

This paper will describe the CHRIS/PROBA hyperspectral imaging mission that has now completed nearly 8 years in orbit and has provided a wealth of unique data for Users across the world. The mission has demonstrated, fairly conclusively, that such sophisticated payloads can be implemented successfully on a small satellite platform and provide valuable information over selected target areas.

The instrument is the Compact High Resolution Imaging Spectrometer (CHRIS) developed within the Optical Payload Group (OPG) of Surrey Satellite Technology Ltd (formerly the Sira Space Group). The instrument is flying on PROBA, a small agile satellite, which was launched in October 2001. The PROBA platform is flying in a sun-synchronous polar orbit with an inclination of 97.89. The altitude of the platform varies over a range approximately from 545 to 675 km. The platform period is 96.8min. The apogee of the orbit rotates around the Earth with an approximate 110 day periodicity. The main purpose of the instrument is to provide detailed spectral information of terrestrial scenes.

The unique feature of this platform is that it provides pointing in both across-track and along-track directions, for target acquisition and multi-angle observations, particularly for measurement of the Bi-directional Reflectance Distribution Function (BRDF) properties of selected targets.

The instrument covers a spectral range from 400nm to 1050nm, at 11nm resolution. The spatial sampling interval at perigee is approximately 17m. In this mode it is possible to read out 19 spectral bands. The locations and widths of the spectral bands are programmable. Selectable on-chip integration can increase the number of bands to 63 for a spatial sampling interval of 34m. The swath width imaged is 13km at perigee.

Observations requests for the science imaging are selected by prioritisation process and scheduled into feasible observations on a daily basis. These observations are then compared with a UK Met Office 48 hour cloud predictions before selecting the preferred image acquisition for each day. Instrument configurations files and target coordinates are then transmitted to the platform from SSTL via the ESOC ground station in Redu, Belgium. The platform implements the request and downloads the data to either Redu or Kiruna in Sweden. Data is then transmitted to SSTL for Level 1a processing before being placed on an FTP server for access by the investigators. Quick-look images are also placed on User accessible website. Other sites are available to provide details such as the observational programme and investigator details.

Over the last eight years the Mission has provided the opportunity for Users to trial a number of applications covering both land, aerosol and marine scenes and a large body of experience now exists in the use of satellite derived multi-angular hyperspectral data. This paper will summarise a number of the applications showing the value of the data sets and the flexibility of the payload and platform operations to provide unique data sets.