Hyperspectral measurements with the ASD Field Spec from the Dimona aircraft (2008)

Each filename consists of FLUXPAT_campaign_year_month_Spec_Dimo. The original at sensor radiance spectra are stored in separate zip file with the appendix_**raw**. The zip file with the appendix **_V1** contains the georeference data of each spectra.

Parameters given in the header are:

stime [s UTC]:	Primary time of the data set. To be accurate, the unit should be "s GPS time". UTC and GPS time is not exactly the same: UTC in 2008 was 14 seconds behind GPS time (12:00:00 h or 43200 s UTC is 12:00:14 h or 43214 s GPS! In 2009 the difference is 1 s more. When defining an output it can be chosen of this time is interval centered (standard), begin or end of interval
date [yyyymmdd]:	the date of the flight as day/month/year. Since there were no flights around midnight there are no subtle differences between UTC and GPS.
clock [hhmmss]:	stime converted to hours, minutes, seconds.
SpecTim [hhmmss]:	time when the spectra were stored
SpecID [code]:	identification number of each spectra. First number identifies the first Letter of the spectra name (1=a; 2=b;…). The rest of the number corresponds to the numbering of the spectrum.
CamTimC [hhmmss]:	time when the picture was stored
PictIDc [code]:	With this parameter, all pictures can be identified. The code is as follows: the directories a through f are corresponding to 1 to 6 (millions), then there are three ciphers for the stack number and finally the slices. As an example, 5049076 is identifying 070422e_images_000049_76.jpg
Shut [ms]:	sutter time of the camera
Gain [n]:	gain of the camera
NDVI [n]:	Normalized difference vegetation index, calculated from at sensor radiance spectra
DTM [mMSL]:	Digital Terrain Height below the flight track from the SRTM data set (Shuttle Radar Topography Mission of NASA)

zGND [mGND]: height above ground

za [m]: high resolution altitude above sea level using all altitude information (GPS, barometric, and accelerations);

long [−]: longitude (WGS-84) of flight track

lat [−]: latitude (WGS-84) of flight track

xSC [deg]: The eastward coordinate (lon) of any pointing device like the Hyper Spectral Scanner on the ground.

ySC [deg]: The northward coordinate (lon) of any pointing device like the Hyper Spectral Scanner on the ground.

xTR, yTR, xBR, yBR, xBL, yBL, xTL, yTL [deg]: longitudes and latitudes of where the corners of the images are supposed to be (TopRight, BottomRight, BottomLeft, TopLeft).

sole [W/m2]: pseudo "global radiation" from the Meteolabor photometer (upward looking, 350..950 nm, only semi-quantitative, used as a relative information about general solar radiation (daytime) and clouds. For a more quantitative use the characteristics of the sensor has to be determined and the angle between the sun and the sensor has to be calculated. By doing the latter also the characteristics could be described (envelope of the maximum radiation for each angle).

aer03 [n/ml]: standard read out of the optical aerosol counter for particles > 0.3 micrometers, corrected for coincident counts since 2006, where we flew this instrument parallel to a more accurate counter.

Rolc, pitc, azic [deg]: roll, pitch and azimuth angle of aircraft (the suffix "c" denotes that gaps are filled)

Additional Information:

As platform for the hyperspectral measurements the meteorological research aircraft ECO-Dimona from Metair AG (Menzingen, Switzerland) was used. During every flight series information like altitude, aircraft position und orientation was locked (Neininger 2001). In the left underwing pod of the aircraft a Field Spec Pro (ASD Inc., Boulder, CO, USA) was mounted to take hyperspectral reflectance measurements.

Figure: Hyperspectral sensor (Field Spec Pro) mounted in an underwing pod of Dimona research aircraft.

The fiber optic was equipped with a 1° foreoptic and orientated in nadir position. Incident light was integrated over 136 ms and spectrally analyzed in the range from 350 to 1050 nm, with a spectral resolution (FHWM) of 1.44 nm. Spectral measurements were recorded using radiances. To avoid saturation and to get a better signal-to-noise ratio the exposure time was adjusted. As an additional data improvement three spectra were averaged. The instrument was operated in a continuous mode with approximately 2Hz. For additional information and better orientation during the flight video camera (Flea, Point Grey Research, Vancouver, BC, Canada) recorded a video image (640 x 480 pixels, 12-bit, grey values) with a measurement frequency of 2Hz. Both camera and hyperspectral sensor share the same viewing orientation, although the camera has a lager field of view (10.5°).

Literature:

Neininger B. 2001. A small aircraft for more than just ozone: Metair's 'Dimona' after ten years of evolving development. Pages 123-128. Proceedings of the 11th Symposium on Meteorological Observations and Instrumentation. Albuquerque, NM, USA.