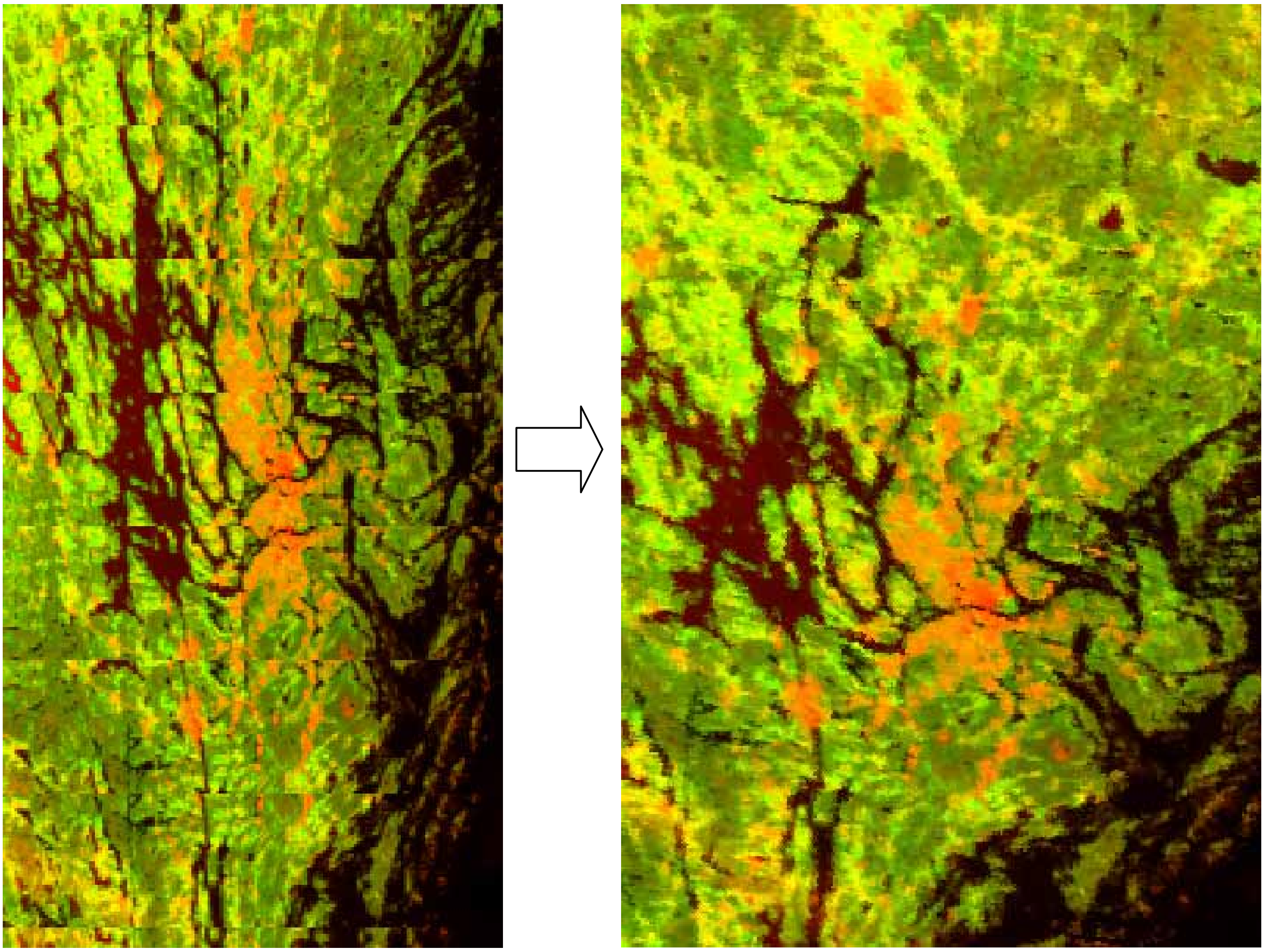
Software for processing HDF-EOS data

User's Guide

Version 1.8



1 Feb 2005

by
Kaj Andersson
VTT Information Technology
kaj.andersson@vtt.fi

Table of contents:

1 Cover

The left hand cover image shows an example of the raw image data at high scan angles. The panoramic “bow” effect can be seen clearly. Same targets appear on several locations. This is due to the scan-to-scan overlap.

The right hand cover image displays the same area after geometric correction. The “bow” effect has been removed and the image corresponds very accurately with the map.

2 Introduction

The HDF-EOS is the scientific data format standard selected by NASA. It is an extension of NCSA HDF and uses the HDF library calls.

This HDFEOS software is written for processing data in HDF-EOS and HDF4 formats. It is developed at the Technical Research Centre of Finland, and is commercially available. The program reads HDF-EOS formatted data, unpacks it and carries out radiometric and geometric corrections. Output data are written either to ER Mapper or ERDAS Imagine format.

The current version support both swath and grid structures, but not the point structure. The software has been designed for processing MODIS data, but it works in some extent also with MISR and Aster data. Unpacking should work with all HDF-EOS and HDF4 data.

The software runs under WIN9X / WIN-NT / WIN2000 and WIN XP operating systems.

3 Data processing flow

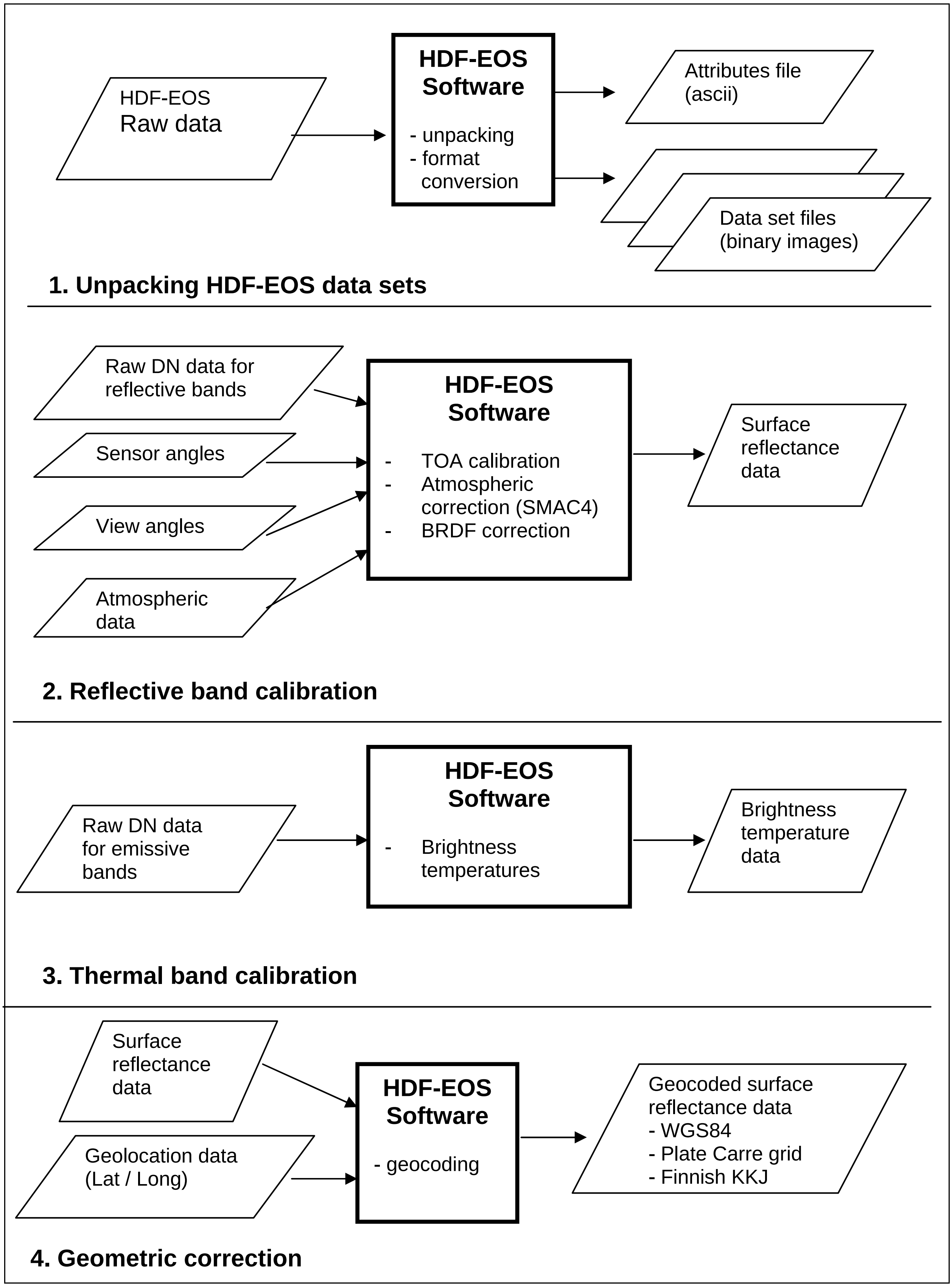
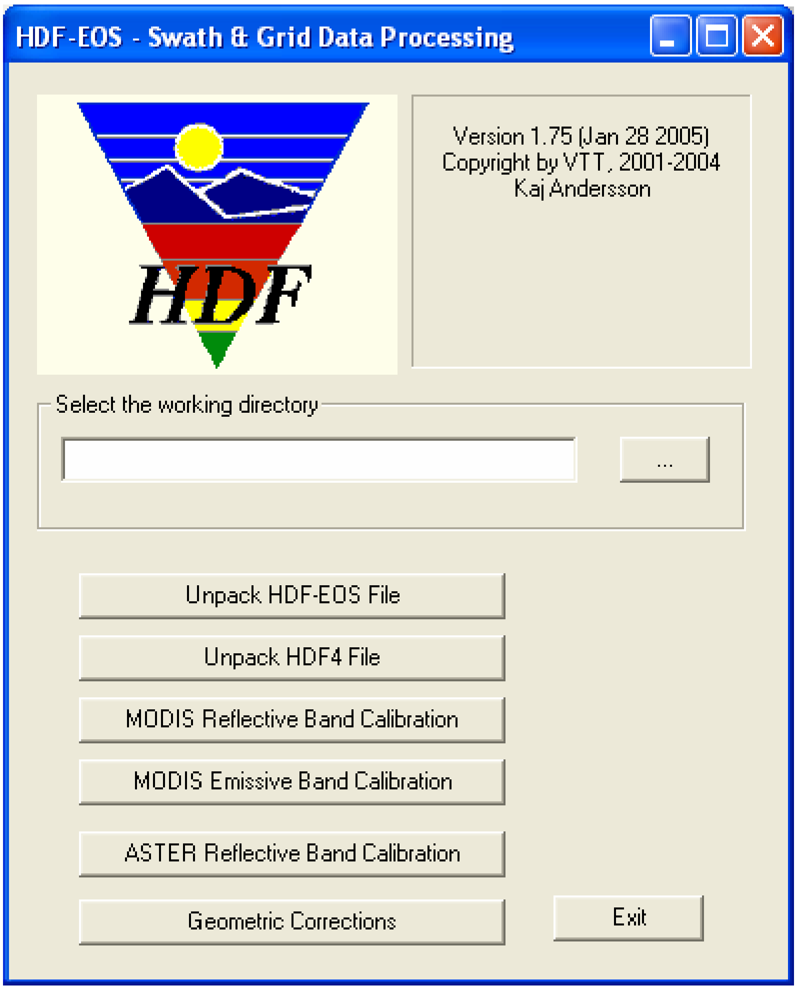


Figure 1. Computing image products from raw HDF-EOS data

4 Program start

After you double-click the HDFEOS program icon, the program starts and the entrance window is displayed.



First select a working directory where to write the data. It is highly recommended to use a local disk.

Then the following options can be chosen:

- Unpack HDF-EOS formatted data to binary images in ER Mapper or ERDAS Imagine format.
- Carry out reflective band calibration. This includes computing either the TOA (Top Of Atmosphere) reflectance or the atmospherically corrected surface reflectance. The illumination and viewing conditions may be normalised using the BRDF correction.
- Carry out emissive band calibration. This includes computing the temperatures.
- Carry out geometric corrections. This will produce geometrically corrected image data.
- Exit.

Unpacking has to be carried out before radiometric or geometric corrections can take place.

5 Data unpacking

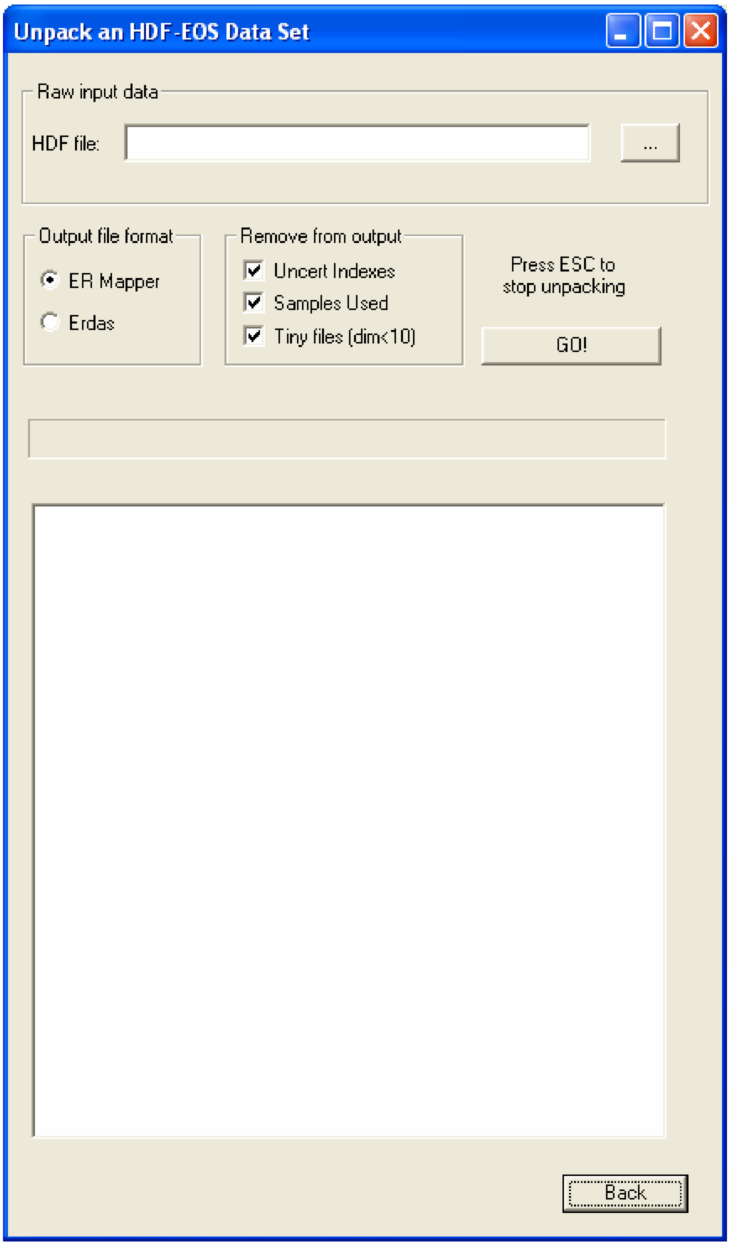
5.1 Input data

If possible, the acquisition time is extracted from the file name. For some “not standard” file names, the output file names might not include the time code. Currently HDF-EOS file names starting with the string MOD02, MOD03, MOD04, MOD07, MOD08, MOD09, MOD13, MOD17, MOD43, GSUB1 and PR1A are supported.

The software has been tested with MODIS data, but it works in some extent also with MISR and Aster data. The metadata files are not used.

5.2 Unpacking HDF-EOS or HDF4 data

After pressing the “Unpack HDF-EOS file” or the “Unpack HDF4 file” button in the entrance window, the unpacking dialog box is opened.



First, the input file name should be entered. Then the output file format should be selected. After pressing the “GO!” button, all data sets are extracted and written in selected image format to the working directory. Some selected data sets, with less importance, may be removed from the output by ticking their appropriate check boxes.

5.3 Output data

The scientific attribute data is written to an ascii file with the extension .attr. This includes data which is needed for example for image scaling and calibration. An example of an attribute data file is shown in Appendix 1.

In the example above (section 5.2), the following output files are generated:

Log fle:	hdfeos.log
Attributes data:	Modis_1KM_01Jul04_1000_attr.txt

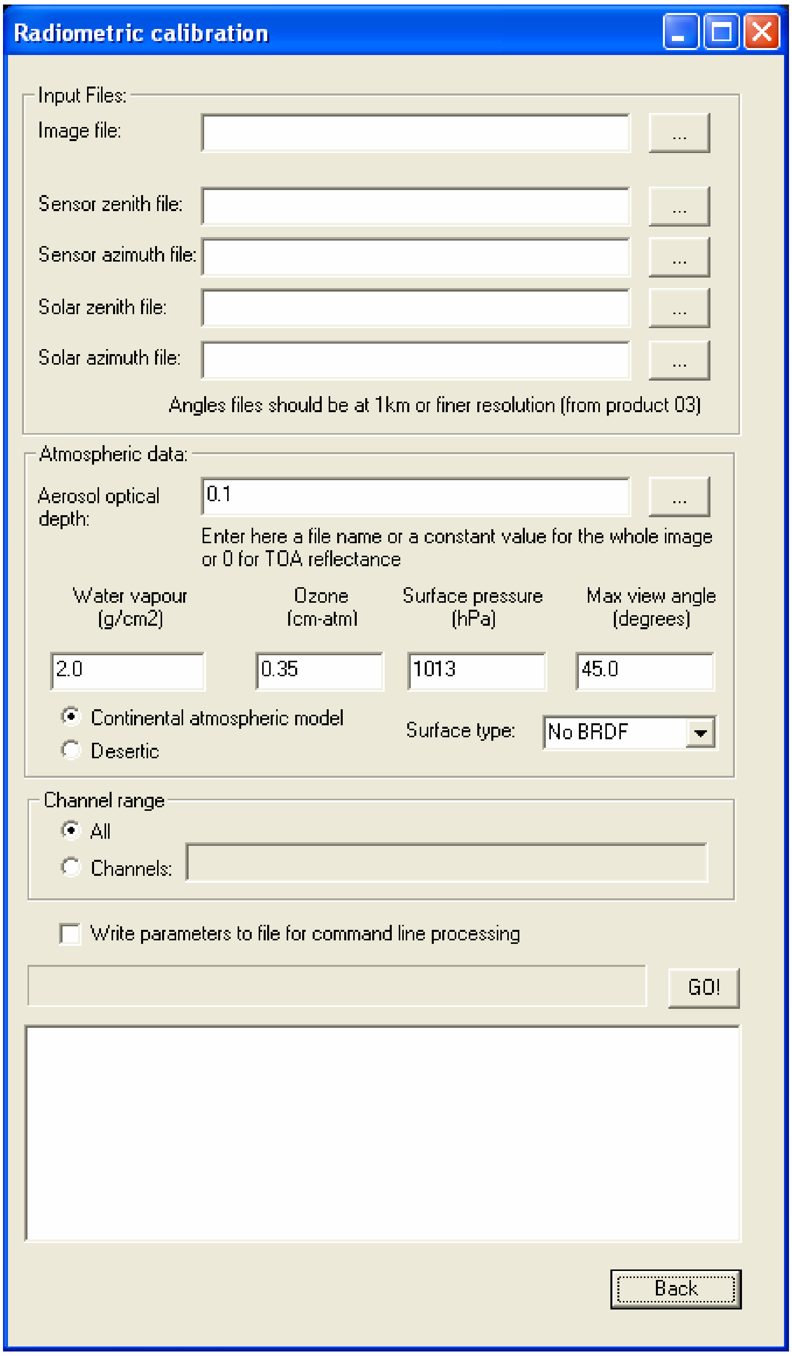
Image files:
Modis_1KM_01Jul04_1000_EV_1KM_Emissive.ers
Modis_1KM_01Jul04_1000_EV_1KM_RefSB.ers
Modis_1KM_01Jul04_1000_EV_250_Aggr1km_RefSB.ers
Modis_1KM_01Jul04_1000_EV_500_Aggr1km_RefSB.ers
Modis_1KM_01Jul04_1000_EV_Band26.ers
Modis_1KM_01Jul04_1000_gflags.ers
Modis_1KM_01Jul04_1000_Height.ers
Modis_1KM_01Jul04_1000_Latitude.ers
Modis_1KM_01Jul04_1000_Longitude.ers
Modis_1KM_01Jul04_1000_Range.ers
Modis_1KM_01Jul04_1000_SensorAzimuth.ers
Modis_1KM_01Jul04_1000_SensorZenith.ers
Modis_1KM_01Jul04_1000_SolarAzimuth.ers
Modis_1KM_01Jul04_1000_SolarZenith.ers

File naming should be self-explanatory. ER Mapper files include an ascii header with the extension .ers and a related image data file without any extension. The image is pure binary raster data in BIL (Band Interleaved by Line) format.

In case the input data is in gridded format and the projection is geographic (linear scale in both latitude and longitude) or sinusoidal, the output file will include geocoding fields.

6 MODIS Reflective band calibration

After pressing the “MODIS Reflective Band Calibration” button, the following dialog window is opened:



6.1 Input data

First, enter the reflected data file name in the image file edit box. This file name should include the string “RefSB”. Then enter the 1 km resolution sensor and solar angles. This data has the string “_LL_” in its name and it has been extracted from the MOD03 Geolocation product. The angles data which is included in the MOD02 product is too coarse (~10km), and can’t be used.

Also note that the image has to be in satellite projection (not geometrically corrected).

6.2 Computing the surface reflectance

Raw digital numbers are first converted to TOA reflectance by using the calibration coefficients and solar zenith angles. These data has been extracted during the unpacking phase. Calibration coefficients are written in attributes file and solar zenith angles are written to a separate image file.

The SMAC model (Rahman *et*.al, 1994) is used for carrying out atmospheric corrections and the bidirectional reflectance effect (BRDF) is corrected using the model presented by Wu (Wu *et* al,1995). From version 1.3 onwards, SMAC version 4 is used for computing atmospheric corrections. Currently the software supports only atmospheric corrections for MODIS and ASTER data. Support for other sensors may be added in the future.

The user has to enter proper values or use the defaults. The aerosol optical depth (AOD) – which is the most important parameter – may be read from an image file, or a constant value may be used throughout the whole image. The AOD data should be coded as real world values, that is to say their values should be in the range of about 0.02 to 0.5. If the aerosol optical depth is set 0.0, no atmospheric correction will be carried out. In this case the TOA reflectance will be computed. The user may select either a continental or desertic atmospheric model.

It is possible to write out a template for a parameters file used by the command line version by checking the “write parameters” box.

It is possible to abandon data at high scanning angles. The default scanning angle limit is set to 45°. Using this default, about 200 pixels from the edges will be masked out in case of MODIS 1 km data.

6.3 Computing the BRDF correction

Viewing and illumination conditions are normalised by using the BRDF correction. This correction can be computed by using one of the four predefined surface types, Forest, Grass, Crop or Barren. The result data is normalised to a nadir view with sun zenith angle of 45°.

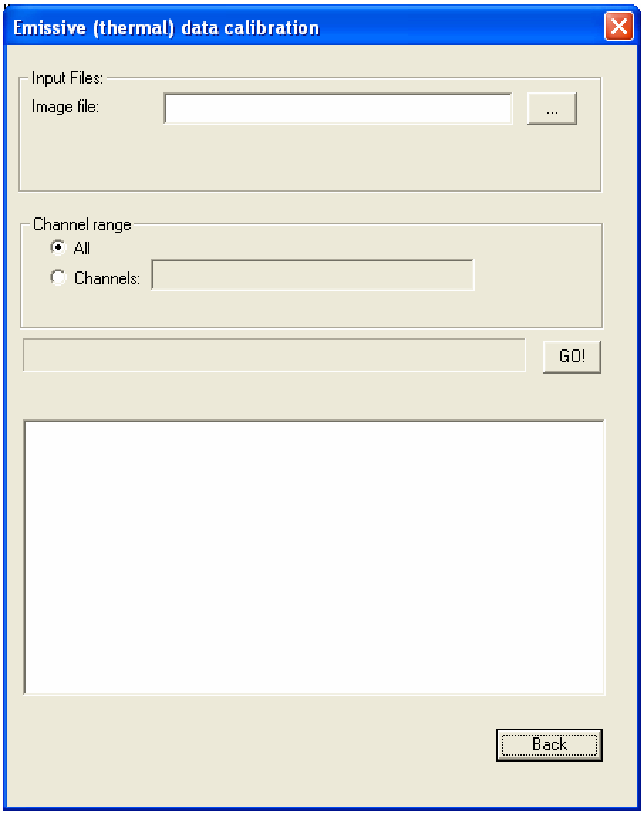
6.4 Output data

Output data channels may be selected in the channel range edit box. If a subset of channels is selected, channel numbers need to be separated by spaces. These numbers refer to channel numbers in the file, not to the original channel numbers.

The string “_smac_brdf” will be inserted in the output file name just before the file name extension. If no BRDF is computed, then only the string “_smac” will be inserted instead. The data is coded as IEEE 4 byte floats. The unit is reflectance percentage, and numerical values are between 0% and 100%.

7 MODIS Emissive band calibration

After pressing the “MODIS Emissive Band Calibration” button, the following dialog window is opened:



7.1 Input data

First select the input image. The file name should include the string “_Emissive”. For example: Modis_1KM_01Jul04_1000_EV_1KM_Emissive.ers. Channel numbers are selected as described earlier.

7.2 Computing the brightness temperature

First the scene radiance is computed using the raw data and calibration coefficients. Then the radiance is converted to brightness temperature using the Planck’s law.

$$T = C_2 * \nu_c / (\ln(1 + C_1 * \nu_c^3 / N_e))$$

where:

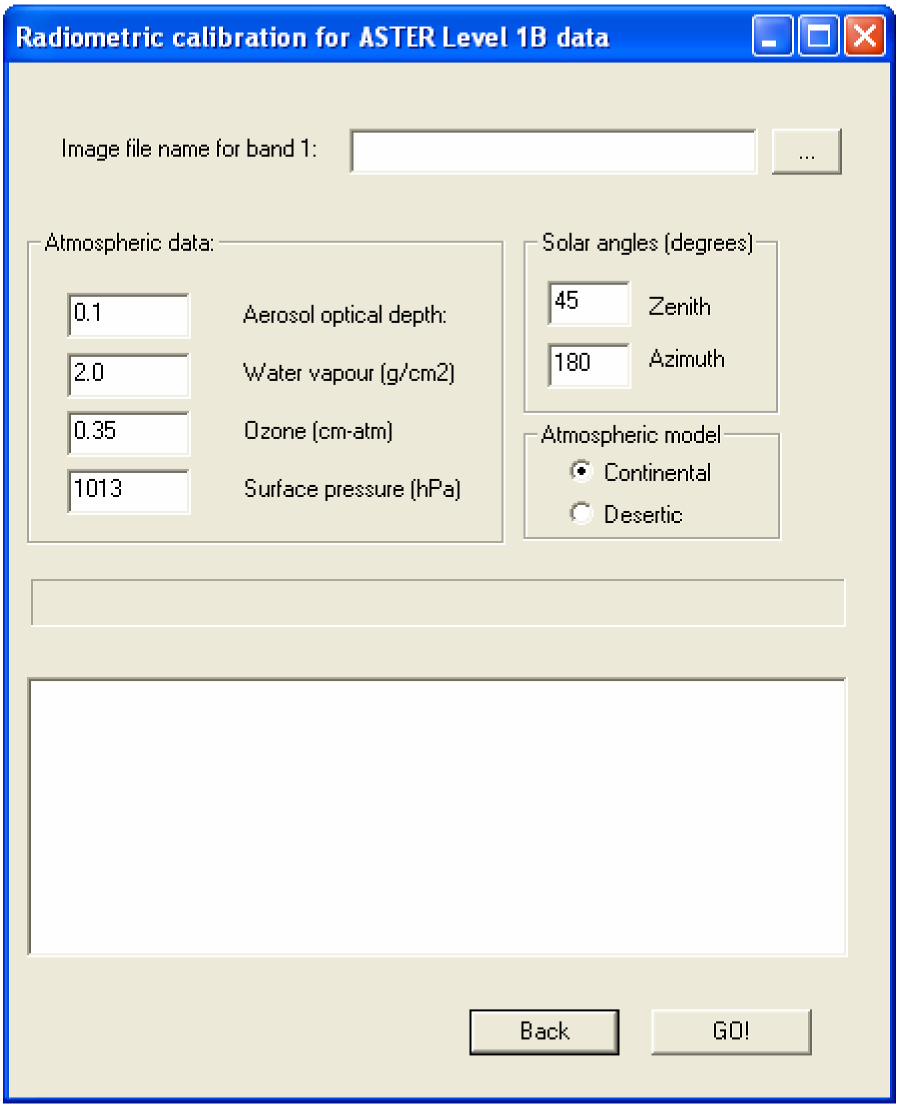
T	= effective temperature
C_1	$= 1.191062 * 10^{-5}$
C_2	= 1.4387863
N_e	= scene radiance
ν_c	= centroid wavenumber for each band

7.3 Output data

Output data is coded as Kelvin degrees in 4 byte IEEE floats. The output file name is composed by adding the string “_kelvin” in front of the file name extension.

8 ASTER Reflective band calibration

After pressing the “ASTER Reflective Band Calibration” button, the following dialog window is opened:



8.1 Input data

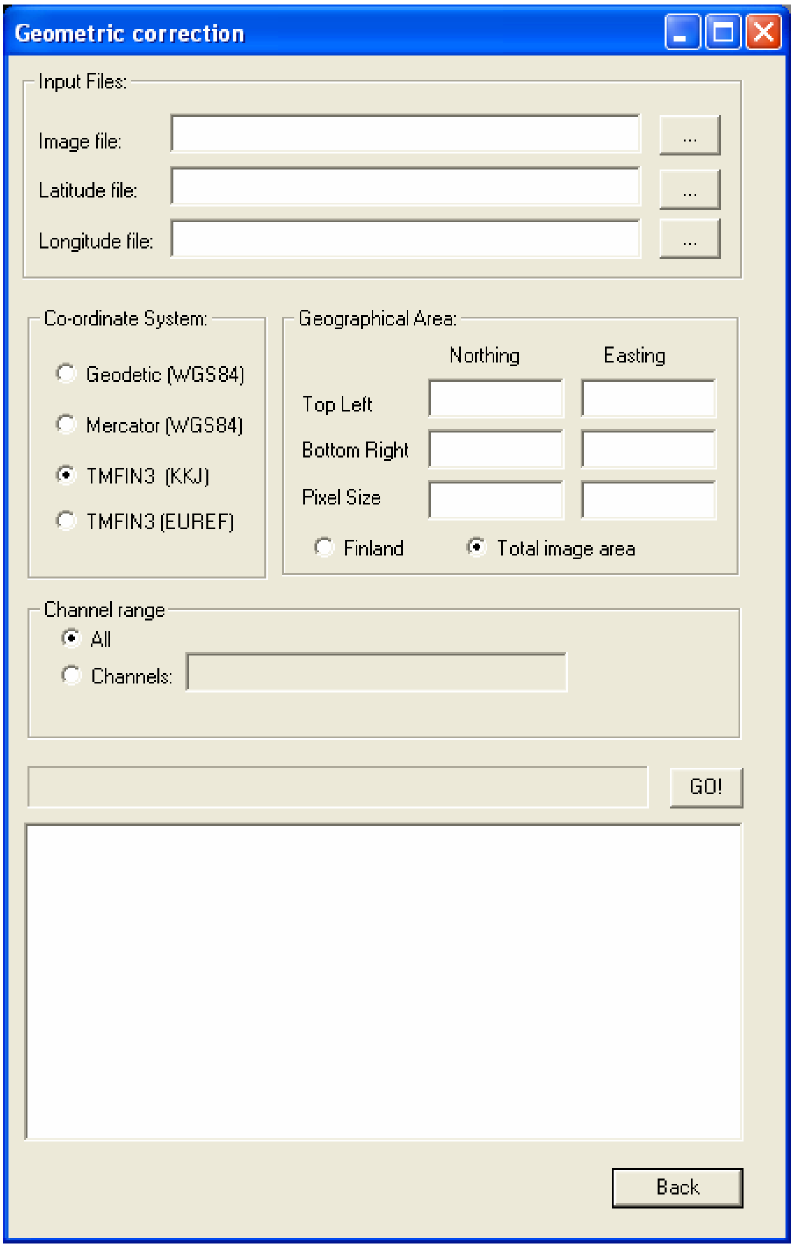
First, enter the Level 1 band 1 file name in the image file edit box. For example: “Aster_1_ImageData1.ers”. The program assumes that each band is in a separate file. Other band names will then be generated from band 1 file name.

By default, the atmospheric correction will be carried out using values in dialog boxes. These may be changed by the user.

Two output data files are generated. The first one includes 15m VNIR data and is composed of three bands (1, 2, 3N). The second file includes 30m SWIR data with six bands (4-9). Filenames include either the string _vnir_ or _swir_ to identify the data. Data type is 4-byte IEEE floats and the unit is surface reflectance in percent.

9 Geometric corrections

After pressing the “Geometric Corrections” button, the following dialog window is opened:



9.1 Input data

Three input files are needed.

1. The image file to be rectified
2. The latitudes file
3. The longitudes file

The latitudes and longitudes files need to be at 1km resolution. These are included in the Modis 250 meter data sets, but not in 1 km data sets. The 1 km geolocation files can be extracted from the MOD03 geolocation product. The 1 km geolocation data will have the string “_LL_” in their names after unpacking, for example: Modis_LL_01Jul03_0915_Latitude.ers.

9.2 Projections and datums

The output image projection can be either a rectangular Latitude/Longitude grid (Plate Carre), Mercator or zone 3 on the Finnish national map system. The datum is WGS84, KKJ or EUREF.

On start the approximate image corner co-ordinates and the default pixel size are written to the geographic area window. The area of Finland may be selected by checking the appropriate radio button. The user is free to change the limits of the output image.

The total output image is read to memory. This may lead to long processing times in case of large data sets.

9.3 Output data

The output file is coded using the same data type as the input image. The file name is composed by adding the string “_rect” in front of the file name extension.

10 Command line version “hdfeos_com”

The command line version of the software has same functionality as the windows version. The name of the command line version is hdfeos_com.

The general syntax for it is:

hdfeos_com task *task_option* <u>processing options</u> od *output_directory*

where task options are:

Table 1. Task options

key	options (select one)	explanation
task	*uphe* *uph4* *mref* *memi* *aref* *geo*	unpack an HDF-EOS file unpack an HDF4 file MODIS reflective band calibration MODIS emissive band calibration ASTER reflective band calibration carry out geometric corrections
od	*directory*	output directory name (optional)

For example for unpacking data: hdfeos_com task *uphe* df *file_name*

Quick help may be received by typing hdfeos_com task and then one of the supported task names. For example hdf_eos task aref.

Processing examples can be found in Appendix 2.

Table 2. Unpacking options for task uphe or uph4

key	user input	explanation
df	*filename*	HDF-EOS/4 file name
fmt	*format*	output file format erm for ER Mapper (default) erd for ERDAS Imagine
rem	*text*	remove tiny files, yes or no (default yes)

Table 3. MODIS reflective band calibration options (task mref)

key	user input	explanation
parf	*filename*	input data parameters file name

Table 4. Description of MODIS reflective band input parameters file. This file may be created with hdfeos software.

key	user input	explanation
imf:	*filename*	reflective data file name
sez:	*filename*	sensor zenith file name
sea:	*filename*	sensor azimuth file name (optional)
soz:	*filename*	solar zenith file name (optional)
soa:	*filename*	solar azimuth file name (optional)
attr:	*filename*	attributes file name (optional)
aod:	*filename or value*	aerosol optical depth (default 0.1)
h2o:	*value*	water vapor contents (default 2.0 g/cm^2)
o3:	*value*	ozone contents (default 0.35 cm-atm)
pre:	*value*	surface pressure (default 1013 hPa)
view:	*value*	max view limit (default 45 degrees)
brdf:	*text*	surface type, one of forest, barren, grass or crop. (optional)
amod:	*text*	atmospheric model, continental or desertic (optional, default continental)
chn:	*integer numbers*	list of channel numbers separated by spaces (default: all channels)

Table 5. MODIS emissive band processing options (task memi)

key	user input	explanation
df	*filename*	unpacked emissive image data file name
c	*integer numbers*	list of channel numbers separated by spaces (default: all channels)

Table 6. ASTER reflective band calibration options (task aref)

key	user input	explanation
df	*filename*	unpacked ASTER level1 data file name for band 1
smac	*4 values*	Atmospheric data, 4 values separated by spaces; aod h2o o3 pressure. If any value is missing TOA reflectance will be computed.
sol	*2 values*	solar zenith solar azimuth in degrees
amod	*text*	atmospheric model, continental or desertic (optional, default continental)

Table 7. Geometric corrections (task geo)

key	user input	explanation
parf	*filename*	input data parameters file name

Table 8. Description of the geocoding input parameters file

key	user input	explanation
imf:	*filename*	image data file name
lat:	*filename*	latitudes data file name
lon:	*filename*	longitudes data file name
crd:	*text*	co-ordinate system, one of: geodetic_wgs84 mercator_wgs84 tmfin3_kkj (default) tmfin3_euref
area:	*6 numbers* *or* *finland* *or* *total*	lon_min lon_max lon_inc lat_min lat_max lat_inc any of these may be replaced with the default value ‘d’ predefined area limits of Finland total image area (default)
chn:	*integer numbers*	list of channel numbers separated by spaces (default: all channels)

Input parameter files may include text and comments. The software looks for a key ending with a colon ‘:’, and then parameters following it.

Table 9. An example of an input parameters file for MODIS radiometric calibration module

```
imf: E:\junk\Modis_1KM_02Mar16_1045_EV_250_Aggr1km_RefSB.ers
sez: E:\junk\Modis_LL_02Mar16_1045_SensorZenith.ers
sea: E:\junk\Modis_LL_02Mar16_1045_SensorAzimuth.ers
soz:  E:\junk\Modis_LL_02Mar16_1045_SolarZenith.ers
soa:  E:\junk\Modis_LL_02Mar16_1045_SolarAzimuth.ers
attr: E:\junk\Modis_1KM_02Mar16_1045_attr.txt
aod:  0.10
h2o:  2.00
o3:   0.35
pre:  1013
brdf: forest
amod: continental
view: 45.0
chn:  1 2
```

Table 10. An example of an input parameters file for geometric correction module

```
imf: e:\junk\Modis_1KM_02Mar16_1045_EV_250_Aggr1km_RefSB.ers
lat: e:\junk\Modis_LL_02Mar16_1045_Latitude.ers
lon: e:\junk\Modis_LL_02Mar16_1045_Longitude.ers
crd: tmfin3_euref
area: 3300000 3700000 1000 6500000 8000000 1000
area###: finland  commented out
chn: 2
```

11 References

HDF-EOS Library Users's Guide. Vol 1 and Vol 2. June 1999. http://ulabibm.gsfc.nasa.gov/hdfeos/HDF-EOS_UG.pdf

MODIS Level1B Products Data Dictionary. GSFC.

MODIS Level1B Product Users's Guide. GSFC.

MODIS Level1A Earth Location. GSFC.

Rahman, H., Dedieu, G., 1994. "SMAC: a simplified method for the atmospheric correction of satellite measurements in the solar spectrum". International Journal of Remote Sensing, Vol 15.

Wu, A., Li, Z., Cihlar, J., 1995, "Effects of land cover type and greenness on AVHRR bidirectional reflectances", Journal of Geophysical Research, vol 100.

Appendix 1. An example of the attributes file generated by the unpacking routine

```
HDF File: E:\MOD021KM.A2001185.1000.003.2001186184054.hdf
Data Set 0: Latitude
   units: degrees
   valid_range: -90 90
   _FillValue: -999
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 1: Longitude
   units: degrees
   valid_range: -180 180
   _FillValue: -999
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 2: EV_1KM_RefSB
   long_name: Earth View 1KM Reflective Solar Bands Scaled Integers
   units: none
   valid_range: 0 32767
   _FillValue: -1
   band_names: 8,9,10,11,12,13lo,13hi,14lo,14hi,15,16,17,18,19,26
   radiance_scales: 0.00781845 0.00500345 0.00375655 0.00293255 0.00233116
0.00120537 0.000898663 0.00116908 0.00065138 0.000988176 0.000954542 0.00709309
0.00958613 0.00702907 0.00287466
   radiance_offsets: 316.972 316.972 316.972 316.972 316.972 316.972 316.972 316.972
316.972 316.972 316.972 316.972 316.972 316.972 316.972
   radiance_units: Watts/m^2/micrometer/steradian
   reflectance_scales: 1.45518e-005 8.53954e-006 6.16165e-006 5.05709e-006 4.00291e-
006 2.52976e-006 1.88606e-006 2.51873e-006 1.40337e-006 2.47977e-006 3.18758e-006
2.46545e-005 3.56501e-005 2.61555e-005 2.55937e-005
   reflectance_offsets: 316.972 316.972 316.972 316.972 316.972 316.972 316.972
316.972 316.972 316.972 316.972 316.972 316.972 316.972 316.972
   reflectance_units: none
   corrected_counts_scales: 0.126194 0.126194 0.126194 0.126194 0.126194 0.126194
0.126194 0.126194 0.126194 0.126194 0.126194 0.126194 0.126194 0.126194 0.126194
   corrected_counts_offsets: 316.972 316.972 316.972 316.972 316.972 316.972 316.972
316.972 316.972 316.972 316.972 316.972 316.972 316.972 316.972
   corrected_counts_units: counts
Data Set 3: EV_1KM_RefSB_Uncert_Indexes
   long_name: Earth View 1KM Reflective Solar Bands Uncertainty Indexes
   units: none
   specified_uncertainty: 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5 1.5
1.5
   scaling_factor: 7 7 7 7 7 7 7 7 7 7 7 7 7 7 5
   uncertainty_units: percent
Data Set 4: EV_1KM_Emissive
   long_name: Earth View 1KM Emissive Bands Scaled Integers
   units: none
   valid_range: 0 32767
   _FillValue: -1
   band_names: 20,21,22,23,24,25,27,28,29,30,31,32,33,34,35,36
   radiance_scales: 6.2624e-005 0.00314951 6.9216e-005 7.9104e-005 3.15561e-005
5.63982e-005 0.000117557 0.00019245 0.000532487 0.000406323 0.000840022 0.000729698
0.000262264 0.000200696 0.000176708 0.000118339
   radiance_offsets: 2730.58 2730.58 2730.58 2730.58 1077.44 1560.33 2730.58 2317.49
2730.58 1560.33 1577.34 1658.22 2501.3 2501.3 2501.3 2501.3
   radiance_units: Watts/m^2/micrometer/steradian
Data Set 5: EV_1KM_Emissive_Uncert_Indexes
   long_name: Earth View 1KM Emissive Bands Uncertainty Indexes
   units: none
   specified_uncertainty: 0.5625 2.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.375 0.375 0.5
0.5 0.5 0.5
   scaling_factor: 5 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
   uncertainty_units: percent
Data Set 6: EV_250_Aggr1km_RefSB
```

```
   long_name: Earth View 250M Aggregated 1km Reflective Solar Bands Scaled Integers
   units: none
   valid_range: 0 32767
   _FillValue: -1
   band_names: 1,2
   radiance_scales: 0.0269867 0.0110805
   radiance_offsets: 0 0
   radiance_units: Watts/m^2/micrometer/steradian
   reflectance_scales: 5.45931e-005 3.62857e-005
   reflectance_offsets: 0 0
   reflectance_units: none
   corrected_counts_scales: 0.124973 0.124973
   corrected_counts_offsets: 0 0
   corrected_counts_units: counts
Data Set 7: EV_250_Aggr1km_RefSB_Uncert_Indexes
   long_name: Earth View 250M Aggregated 1km Reflective Solar Bands Uncertainty
Indexes
   units: none
   specified_uncertainty: 1.5 1.5
   scaling_factor: 7 7
   uncertainty_units: percent
Data Set 8: EV_250_Aggr1km_RefSB_Samples_Used
   long_name: Earth View 250M Aggregated 1km Reflective Solar Bands Number of
Samples Used in Aggregation
   units: none
Data Set 9: EV_500_Aggr1km_RefSB
   long_name: Earth View 500M Aggregated 1km Reflective Solar Bands Scaled Integers
   units: none
   valid_range: 0 32767
   _FillValue: -1
   band_names: 3,4,5,6,7
   radiance_scales: 0.0214156 0.0186374 0.00514627 0.0023899 0.00074182
   radiance_offsets: 0 0 0 0 0
   radiance_units: Watts/m^2/micrometer/steradian
   reflectance_scales: 3.33267e-005 3.24539e-005 3.52515e-005 3.23246e-005 2.66852e-
005
   reflectance_offsets: 0 0 0 0 0
   reflectance_units: none
   corrected_counts_scales: 0.124973 0.124973 0.124973 0.124973 0.124973
   corrected_counts_offsets: 0 0 0 0 0
   corrected_counts_units: counts
Data Set 10: EV_500_Aggr1km_RefSB_Uncert_Indexes
   long_name: Earth View 500M Aggregated 1km Reflective Solar Bands Uncertainty
Indexes
   units: none
   specified_uncertainty: 1.5 1.5 1.5 1.5 1.5
   scaling_factor: 7 7 5 5 5
   uncertainty_units: percent
Data Set 11: EV_500_Aggr1km_RefSB_Samples_Used
   long_name: Earth View 500M Aggregated 1km Reflective Solar Bands Number of
Samples Used in Aggregation
   units: none
Data Set 12: Height
   units: meters
   valid_range: -400 10000
   _FillValue: -32767
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 13: SensorZenith
   units: degrees
   valid_range: 0 18000
   _FillValue: -32767
   scale_factor: 0.01
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 14: SensorAzimuth
   units: degrees
   valid_range: -18000 18000
```

```
   _FillValue: -32767
   scale_factor: 0.01
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 15: Range
   units: meters
   valid_range: 27000 -1
   _FillValue: 0
   scale_factor: 25
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 16: SolarZenith
   units: degrees
   valid_range: 0 18000
   _FillValue: -32767
   scale_factor: 0.01
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 17: SolarAzimuth
   units: degrees
   valid_range: -18000 18000
   _FillValue: -32767
   scale_factor: 0.01
   line_numbers: 3,8
   frame_numbers: 3,8,13,...
Data Set 18: gflags
   Bit 7(MSB): 1 = invalid input data
   Bit 6: 1 = no ellipsoid intersection
   Bit 5: 1 = no valid terrain data
   Bit 4: 1 = DEM missing or of inferior quality
   Bit 3: 1 = invalid sensor range
Data Set 19: EV_Band26
   long_name: Earth View Band 26 Scaled Integers
   units: none
   valid_range: 0 32767
   _FillValue: -1
   radiance_scales: 0.00287466
   radiance_offsets: 316.972
   radiance_units: Watts/m^2/micrometer/steradian
   reflectance_scales: 2.55937e-005
   reflectance_offsets: 316.972
   reflectance_units: none
   corrected_counts_scales: 0.126194
   corrected_counts_offsets: 316.972
   corrected_counts_units: counts
Data Set 20: EV_Band26_Uncert_Indexes
   long_name: Earth View Band 26 Uncertainty Indexes
   units: none
   specified_uncertainty: 1.5
   scaling_factor: 5
   uncertainty_units: percent
Data Set 21: Band_250M
   long_name: 250M Band Numbers for Subsetting
Data Set 22: Band_500M
   long_name: 500M Band Numbers for Subsetting
Data Set 23: Band_1KM_RefSB
   long_name: 1KM Reflective Solar Band Numbers for Subsetting
Data Set 24: Band_1KM_Emissive
   long_name: 1KM Emissive Band Numbers for Subsetting
Data Set 25: Noise in Thermal Detectors
Data Set 26: Change in relative responses of thermal detectors
Data Set 27: DC Restore Change for Thermal Bands
Data Set 28: DC Restore Change for Reflective 250m Bands
Data Set 29: DC Restore Change for Reflective 500m Bands
Data Set 30: DC Restore Change for Reflective 1km Bands
```

Appendix 2. An example of batch processing

```
rem hdfeos_com processing chain for MODIS data

rem unpack HDFEOS data and write results to e:\junk
rem write to default file format (ER Mapper)
rem command line parameters on a single line

hdfeos_com task uphe
     df d:\data\MOD021KM.A2002075.1045.003.2002078012818.hdf
     od e:\junk
hdfeos_com task uphe
     df d:\data\MOD03.A2002075.1045.003.2002078002450.hdf
     od e:\junk

rem ----------------------------------------------------
rem carry out MODIS reflective band calibration
rem read inputs from parameters file

hdfeos_com task mref parf radio_cor_prm.txt od e:

rem ----------------------------------------------------
rem carry out MODIS emissive band calibration od e:
rem process channels 1, 2 and 16

hdfeos_com task memi
     df e:\junk\Modis_1KM_02Mar16_1045_EV_1KM_Emissive.ers
     c 1 2 16 od e:

rem ----------------------------------------------------
rem carry out geometric correction

hdfeos_com task geo parf geo_cor_prm.txt od e:


rem ----------------------------------------------------
rem hdfeos_com processing for ASTER data
rem unpack and carry out atmospheric correction

hdfeos_com task uphe
     df d:\data\AST_L1B_00309012003101045_09222003114413.hdf od e:
hdfeos_com task aref
     df e:\junk\Aster_03Sep01_1010_1_ImageData1.ers
     smac 0.1 2.3 0.34 1020 sol 55 177 od e:
```