The Automated Satellite Data Processing System

MERIS Processing

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The Automated Satellite Data Processing System: MERIS Processing

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Chapter 1. Introduction

MERIS is a space-borne five-camera push-broom sensor on board the European Space Agency's (ESA) polar orbiting enviromental satellite (ENVISAT-1). It has 15 spectral bands in the visible and near-infrared regions.

Acquistion

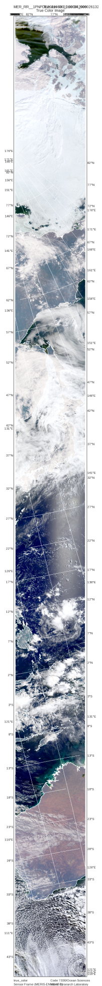
MERIS data is collected by the ESA. Access to the data is available through a scientific agreement. NRL scientists have access to the MERIS Level-1 and Level-2 1200m (reduced-resolution) global data sets. The full-resolution 300m MERIS data has been accessed at Level-2. Some Level-1 data has been collected.

The MERIS Level-1 data contains the MERIS top-of-atmospheric radiance data. The MERIS Level-2 data contains the normalized reflectance with the atmospheric correction performed by ESA. The MERIS Level-2 data divides each pixel into a classification: land, ocean, or atmosphere. For each classification, the pixel has been processed by the particular suite of algorithms designed for that class.

The MERIS data collected by NRL is placed into upto four different locations depending upon the resoltion and level. All MERIS Level-2 reduced resolution data is stored in `/rs/lvl2/meris/<year>/<month>`. The MERIS Level-1 reduced resolution data is stored in `/rs/lvl1/meris/<year>/<month>`. The full resolution MERIS data is stored in a similar structure replacing `meris` with `hmeris`.

At NRL, MERIS reduced-resolution data is obtained using the **apsDownloadSearch.rb** from the ESA global rotating archives `oa-es.eo.esa.int` and `oa-es.eo.esa.int`. An example of a full orbit is shown in Figure 1.1, “MERIS Level-1 Orbit”.

Figure 1.1. MERIS Level-1 Orbit



These data are processed by APS by creating symbolic links to the desired files in the APS “in” directory. The results for each region of interested are placed into the Level-3 data directories. For example, a MERIS reduced resolution Level-1 scene is processed using the standard APS ocean color atmospheric correction with the results are placed in the directory `/rs/lvl3/meris/<region>/<year>/<month>`.

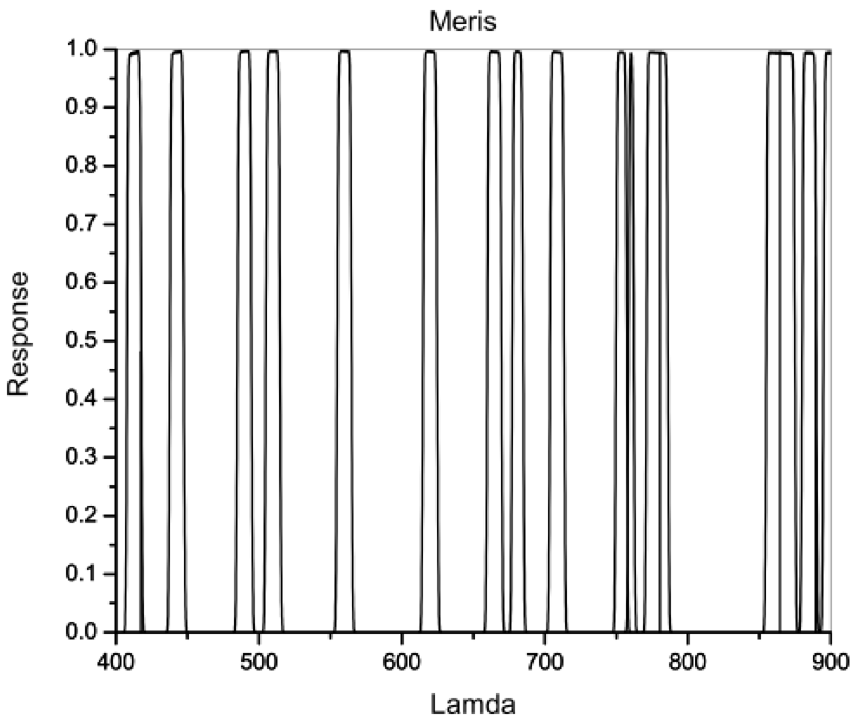
Chapter 2. Processing

The MERIS instrument has a very similar spectral suite as other ocean color satellites. Therefore, it is processed using the same general methods described in the ocolor color processing documentation. This chapter will only discuss the deviations from general processing specific to MERIS.

Sensor Response

The MERIS instrument's sensor response is given below.

Figure 2.1. MERIS Relative Spectral Response



The MERIS Level-1 data received by NRL is processed using the standard Gordon/Wang atmospheric correction as used by the other satellites (SeaWiFS and Aqua) using the ocean color processing module of APS. After the atmospheric correction is performed, the standard in-water suite of algorithms are processed. This includes the Stumpf 412 iteration.

Since the MERIS Level-2 data received by NRL is atmospherically corrected by ESA, the APS will only perform the in-water suite of algorithms. That is, the standard APS atmospheric correction is by-passed. However, the Stumpf 412 iteration is performed.

Chapter 3. Products

The following sections describe the list of available products that can be generated by APS for the MERIS data. Note, however, that the list of available products will differ based upon the input level of the MERIS data. The atmospheric pararmeters are only available when the input MERIS data is Level-1.

Top-of-Atmosphere Products

The top-of-atmosphere products include the atmospheric properties of the total radiance at the sensor. These are only available when the input is a MERIS Level-1 data file. Here, *nnn* may be one of: 412, 443, 490, 510, 560, 620, 665, 681, 708, 754, 761, 779, 865, 885.

Product	**Description**
Lt_*nnn*	calibrated TOA radiance at *nnn* nm
rhot_*nnn*	TOA reflectance at *nnn* nm
TLg_*nnn*	TOA glint radiance at *nnn* nm
glint_coeff	glint radiance normalized by solar irradiance
tLf_*nnn*	foam (white-cap) radiance at *nnn* nm
Lr_*nnn*	Rayleigh radiance at *nnn* nm
t_sol_*nnn*	Rayleigh-aerosol transmittance,sun to ground at *nnn* nm
t_sen_*nnn*	Rayleigh-aerosol transmittance,ground to sensor at *nnn* nm
t_oz_sol_*nnn*	ozone transmittance,sun to ground at *nnn* nm
t_oz_sen_*nnn*	ozone transmittance,ground to sensor at *nnn* nm
t_o2_*nnn*	total oxygen transmittance at *nnn* nm
t_h2o*nnn*	total water vaport transmittance at *nnn* nm
taua_*nnn*	aerosol optical depth at *nnn* nm
tau_*nnn*	same as taua_*nnn*
brdf_*nnn*	BRDF coefficient at *nnn* nm
La_*nnn*	aerosol radiance at *nnn* nm
Es_*nnn*	extra-terestrial surface irradiance at *nnn* nm
cloud_albedo	cloud albedo at 865 nm
foq_*nnn*	f/Q correction to nadir at *nnn* nm

Atmospheric Correction Products

These are derived during the atmospheric correction. These are only available for the MERIS Level-1 data. Here, *nnn* may be one of: 412, 443, 490, 510, 560, 620, 665, 681, 708, 754, 761, 779, 865, 885.

Product	**Description**
La_*nnn*	aerosol radiance at *nnn* nm
aerindex	aerosol index

Product	**Description**
aer_model_min	minimum bounding aerosol model #
aer_model_max	maximum bounding aerosol model #
aer_model_ratio	model mixing ratio
aer_num_iter	number of aerosol iterations, NIR correction
epsilon	retreived epsilon used for model selection
eps_78	same as epsilon
angstrom_*nnn*	aerosol angstrom coefficents (*nnn*,865) nm
eps_*nnn*_*lll*	ratio of *nnn* to *lll* single-scattering aerosol radiances
rhom_*nnn*	water + aeorsol reflectance at *nnn* nm (MUMM)

Water-leaving Products

These are derived during the atmospheric correction. As such, these are primarily available only for the MERIS Level-1 data. However, since the MERIS Level-2 data obtained by ESA contains “normalized reflectance”, the remote sensing reflectance product may be requested. In this case, APS will output the ESA “normalized reflectance” after removal to the pi term. Here, *nnn* may be one of: 412, 443, 490, 510, 560, 620, 665, 681, 708, 754, 761, 779, 865, 885.

rrs_*nnn*	remote sensing reflectance at *nnn* nm
nLw_*nnn*	normalized water-leaving radiance at *nnn* nm
Lw_*nnn*	water-leaving radiance at *nnn* nm

Geometry Products

These products include the viewing angles, location, and sensor information. These products are only available when processing MERIS Level-1 data.

Product	**Description**
pixnum	pixel number
detnum	detector number
latitudes	latitudes (-90.0 to 90.0)
longitudes	longitudes (-180.0 to 180.0)
solz	solar zenith angle
sola	solar azimuth angle
senz	satellite zenith angle
sena	satellite azimuth angle

Ancillary Data Properties

The following are ancillary data properties used during the atmospheric correction. These products are only available when processing MERIS Level-1 data.

Product	Description
windspeed	magnitude of wind at 10 meters
zwind	zonal wind speed at 10 meters
mwind	meridional wind speed at 10 meters
windangle	wind direction at 10 meters
water_vapor	precipital water concentration
humidity	relative humidity
pressure	barometric pressure
ozone	ozone concentration
no2_tropo	tropospheric NO2
no2_strat	stratospheric NO2

Chlorophll-a Products

Since the algorithms are general in nature, the user may modify the algorithms by defining the follow parameters for each number of band ratios. These parameters are used by **n2gen**. See the APS Ocean Color User's Guide for more information about **n2gen**.

chloc2_coeff
: The coefficients for the 2-band chlorophyll-a algorithm. Defaults are [0.357630,-2.83357, 2.72941,-3.034710,-0.46199].

chloc2_wave
: The sensor specific wavelengths for 2-band chlorophyll-a algorithm. Defaults are [490,560].

chloc3_coeff
: The coefficients for the 3-band chlorophyll-a algorithm. Defaults are [0.240900,-2.47680, 1.52960, 0.106100,-1.10770].

chloc3_wave
: The sensor specific wavelengths for 3-band chlorophyll-a algorithm. Defaults are [443,490,560]

chloc4_coeff
: The coefficients for the 4-band chlorophyll-a algorithm. Defaults are [0.40657,-3.6303, 5.44357, -5.48061,1.75312].

chloc2_wave
: The sensor specific wavelengths for 4-band chlorophyll-a algorithm. Defaults are [443,490,510,560].

The algal products are only available when processing MERIS Level-2 data.

Product	Description
chl_oc2	chlorophyll-a concentration using OC2 algorithm
chl_oc3	chlorophyll-a concentration using OC3 algorithm
chl_oc4	chlorophyll-a concentration using OC4 algorithm
chlor_a	chlorophyll-a concentration using OC4 algorithm
chl_stumpf	chlorophyll-a concentration using Stumpf's algorithm
chl_carder	chlorophyll-a concentration using Carder's algorithm
algal_1	chlorophyll-a concentration using ESA algorithm

Product	Description
algal_2	chlorophyll-a concentration using ESA algorithm

Diffuse Attenuation Properties

The following diffuse attenuation products are available. Here, *nnn* may be one of: 412, 443, 490, 510, 560, 620, 665.

Product	Description
Kd_532	diffuse attenuation at 532 nm using 490/555 ratio
K_length_532	diffuse attenuation at 532 nm using 443/555 ratio
Kd_*nnn*_lee	diffuse attenuation at *nnn* nm using Lee algorithm
Kd_490_morel	diffuse attenuation at 490 nm using Morel Eq8
Kd_490_morel_ok2	diffuse attenuation at 490 nm using Morel OK2
Kd_490_mueller	diffuse attenuation at 490 nm using Mueller
Kd_490_obpg	diffuse attenuation at 490 nm using OBPG
Kd_PAR_morel	diffuse attenuation (PAR) using Morel algorithm (1st optical depth)
Kd_PAR_lee	diffuse attenuation (PAR) using Lee algorithm (1st optical depth)

Euphotic Properties

The following euphotic products are available. Here *ddd* is the percent depth from 0 to 100.

Product	Description
Zeu_lee	euphotic depth, Lee algorithm
Zeu_morel	euphotic depth, Morel algorithm
Zhd_morel	Heated layer depth, Morel algorithm
Zp_*ddd*_lee	Photic depth at *ddd*, Lee algorithm
Zsd_lee	Secchi depth, Lee algorithm
Zsd_morel	Secchi depth, Morel algorithm

IOP Products

For the QAA product suite, the available wavelengths *nnn* are 412, 443, 490, 510, 560, and 620.

Product	Description
a_*nnn*_carder	total absorption at *nnn* nm using Carder algorithm
aph_*nnn*_carder	phytoplankton absorption at *nnn* nm using Carder algorithm
adg_*nnn*_carder	detris/gelbstuff absorption at *nnn* nm using Carder algorithm

Product	**Description**
bb_*nnn*_carder	backscatter at *nnn* nm using Carder algorithm
b_*nnn*_carder	total scattering at *nnn* nm using Carder algorithm
c_*nnn*_carder	beam attenuation at *nnn* nm using Carder algorithm
a_*nnn*_gsm01	total absorption at *nnn* nm using GSM01 algorithm
aph_*nnn*_gsm01	phytoplankton absorption at *nnn* nm using GSM01 algorithm
adg_*nnn*_gsm01	detris/gelbstuff absorption at *nnn* nm using GSM01 algorithm
bb_*nnn*_gsm01	backscatter at *nnn* nm using GSM01 algorithm
b_*nnn*_gsm01	total scattering at *nnn* nm using GSM01 algorithm
c_*nnn*_gsm01	beam attenuation at *nnn* nm using GSM01 algorithm
a_*nnn*_qaa	total absorption at *nnn* nm using QAA algorithm
aph_*nnn*_qaa	phytoplankton absorption at *nnn* nm using QAA algorithm
adg_*nnn*_qaa	detris/gelbstuff absorption at *nnn* nm using QAA algorithm
bb_*nnn*_qaa	backscatter at *nnn* nm using QAA algorithm
b_*nnn*_qaa	total scattering at *nnn* nm using QAA algorithm
c_*nnn*_qaa	beam attenuation at *nnn* nm using QAA algorithm
flag_qaa	quality flags from QAA algorithm
mod_rrs_qaa	modeled rrs at 640 nm from QAA algorithm

Water Mass Classification Products

These products are used for water mass classification. In the case of these algorithms the wavelengths available are for *nnn* are 412 or 443.

The following **n2gen** parameter controls the version of the algorithm to use for output.

wmc_version The available options are **`200702`** or **`200711`**. The default is **`200711`**.

Product	**Description**
water_mass	water mass classification image using Gould algorithm
PIM_gould	particulate inorganic matter using Gould algorithm
POM_gould	particulate organic matter using Gould algorithm
TSS_gould	total suspened particles using Gould algorithm
aph_*nnn*_gould	phytoplankton absorption at *nnn* nm using Gould algorithm
asd_*nnn*_gould	sediment and detrital absorption at *nnn* nm using Gould algorithm

Product	**Description**
asd_*nnn*_gould	sediment and detrital absorption at *nnn* nm using Gould algorithm
ag_*nnn*_gould	gelbstuff absorption at *nnn* nm using Gould algorithm
ap_*nnn*_gould	particulate absorption at *nnn* nm using Gould algorithm
as_*nnn*_gould	sediment absorption at *nnn* nm using Gould algorithm

Chapter 4. In-situ R_{rs} Matchup

Remote sensing reflectance, R_{rs} derived from the MERIS sensor are each compared with NRL's *in situ* data base of remote sensing reflectance measurements collected by hand-held spectroradiometer(s).

The results show that the blue region of the spectrum has the least correlation with the *in situ* reflectance data. As one moves toward the red portion of the spectrum, the data has a greater correlation. These differences can be associated with the residual reflectance (glint) in the *in situ* data and the atmospheric correction in the remote sensing data.

Remote Sensing Reflectance

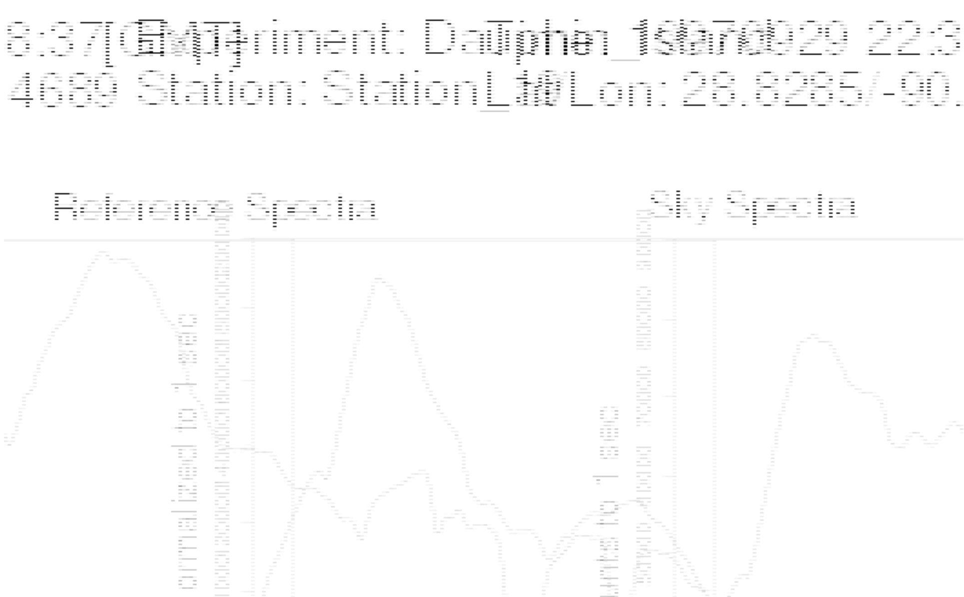
The MERIS-derived remote sensing reflectance is compared with *in situ* R_{rs} measurements processed with NRL's *in situ* data processing system.

In-situ data collection

For well over ten years, the Naval Research Laboratory collected in-situ measurements in water properties, including data from the Arabian Gulf, Mediterranean Sea, Pacific Ocean off of the Hawaiian Islands, Monterey Bay, New York Bight, and Gulf of Mexico. Due to the proximity of the Gulf of Mexico to the laboratory, the majority of the data was from this region. Since the laboratory's emphasis was the coastal ocean, much of that in-situ data collection was in the very complex Case 2 water columns.

The Naval Research Laboratory used several instruments to derive the remote sensing reflectance. This reflectance, known as "ocean color", related to the inherent optical products of the water column from which estimates of diver visibility and mine detection were derived. Thus, the remote sensing reflectance was a very important product to estimate and the primary focus of this matchup.

Figure 4.1. Plot of Processed Spectra



The instruments to collect this remote sensing reflectance were known as field spectrometers. The radiometers had spectrally high-resolution but very low spatial resolution since data collection was labor intensive. The collection required the personnel to obtain reads from the sky, water, and reference; usually a grey card. The collection had a rigorous protocol sequence, which included dark current, angle, and sea state as conditions considered and recorded by the personnel.

Once the data was collected, it was processed by Naval Research Laboratory software which implemented the equations of the NASA Ocean Color Protocols to derive the remote sensing reflectance. For each station, the plotted data (see Figure 4.2, “Station Locations”) showed the three input targets (sky, water, reference) and the derived remote sensing reflectance. The resulting reflectance was written to a SIMBIOS formatted in-situ file and contained the time and location of collection as well as other metadata like the cruise, experiment, investigators, etc.

In-situ Data Base

After each cruise, all the in-situ data processed by Navy personnel was placed into a simple file-system data base stored under /projects/insitu. The database was organized by region, cruise, and instrument. It included data collected from other instruments and from laboratory work as well as the field spectrometers' data. Even though some cruises did not collect spectrometer data, more than 20 gigabytes of data was gathered in this directory of over 50 cruises and data collects.

Atmospheric Correction

The basis for the atmospheric correction used by the Automated Processing System came from the work of Gordon and Wang (1994) where they proposed computing a model of the aerosol distribution by using two bands in the near infrared. Based on the “black water pixel” assumption, the reflectance from the water column was totally absorbed and, therefore, the contribution to the total signal at the sensor was zero.

However, in the coastal regime, the introduction of more constituents into the watermass caused that assumption to be invalid. The deficiency noted early in the life span of the SeaWiFS (Sea-viewing Wide Field-of-View Sensor) introduced several attempts to correct this. The best approach identified a reflectance based method which originated out of the Naval Research Laboratory. With this approach, the “black water pixel” assumption was discarded and instead, used an iterative attempt to estimate the true water reflectance. The “Near infra-red iteration” (NIR) used the relationship between the remote sensing reflectance and the inherent-optical properties of water. Furthermore, the algorithm iteratively estimated the true water contribution. Once the water contribution was known, it was removed from the NIR bands used in the Gordon/Wang aerosol prediction.

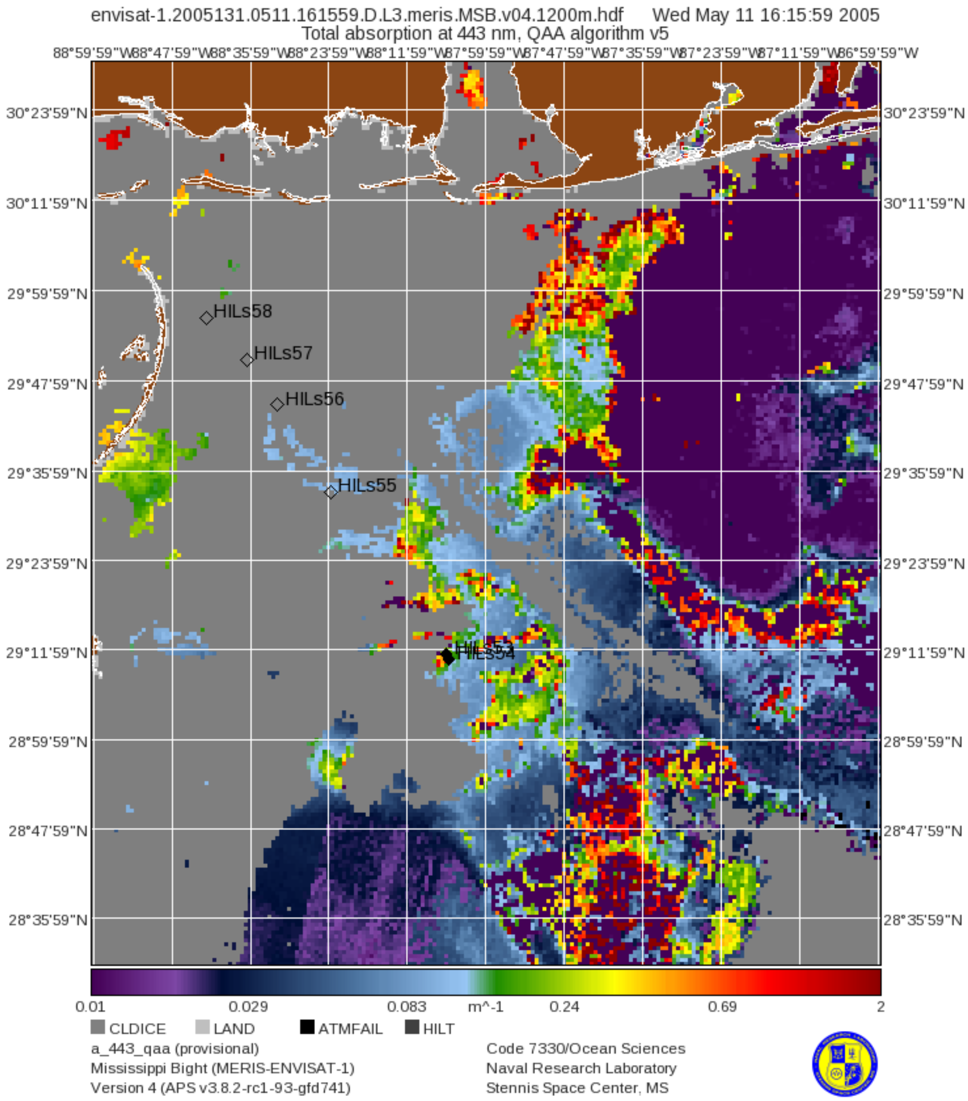
On the other hand, based on the aerosol model suite used, the Gordon/Wang atmospheric correction was unable to distinguish absorbing aerosols from non-absorbing aerosols. Thus, following the work of Rick Stump, a correction which attempted to estimate the reflectance in the blue band (412 nm) was implemented and run on each pixel. Each pixel whose Gordon/Wang derived reflectance was lower than the estimate was assumed to have been a product of an absorbing aerosol. The over compensation by the Gordon/Wang algorithm was then backed out of the remote sensing reflectance.

Match up system

To accomplish this comparison, the developers took several steps. To begin, they examined the in-situ data base for all cruises that contained field spectrometer data which was collected during the life span of each satellite. The NRL in situ data base contained data collected several years prior to the launch of the MERIS instrument. For this report, over 30 cruises were examined but only 22 used.

As each cruise was examined, the locations of each in-situ collection were entered into an ASCII file used by imgBrowse. These “points” files were placed into the match up system in data/rs/points. Once this file wascreated, the remote sensing database was examined for all scenes that were collected during that time frame. Each satellite pass was processed and four quick look browse images were created. Using these files, the satellite data was visually examined for a match.

Figure 4.2. Station Locations



For example in Figure 4.2, “Station Locations”, the station locations of six stations collected during the SEED cruise in May 2005. The diamonds represented the locations of the in-situ data. Open diamonds indicated that no comparison was performed. The filled diamonds indicate the stations that were used during the comparison. This product (absorption at 443 nanometers) shows a scene where cloud cover elimenatated some stations.

A script was created for this insertion so that the database could be quickly rebuilt placed each in-situ point and satellite pass into a SQL database after physical examination.

Once the SQL databases contained the in-situ and satellite data, NRL software (**matchup**) generated a match up. In order to accomplish this task, the software tooka series of parameter files that control the comparison’s in-situ data collection. The criteria consists of which instruments to use, which database to use, and whether to perform a convolution on the input in-situ data.

Additionally, the comparison software filtered the satellite data by sensor, time frame, and which data flags to use to filter the data. For example, large satellite zenith angles or high glint or coastal waters (based on bathymetry). For this comparison, flagged data such as land, cloud, glint or high satellite zenith angle (edge pixels). The in-situ data must have been collected within a three hour window of the satellite overpass.

The **matchup** program produced a text file which provided a report of all in-situ data used for the comparison and the corresponding satellite file. For any satellite or in-situ point that failed, the report indicated the reason the comparison was flagged. Additionally, the program produced a plot of the data as well as a station location plot of both valid and invalid data.

After all the in-situ stations were examined against the MERIS data processed by APS v3.8.2, the following match-ups were found Figure 4.2, “Station Locations”.

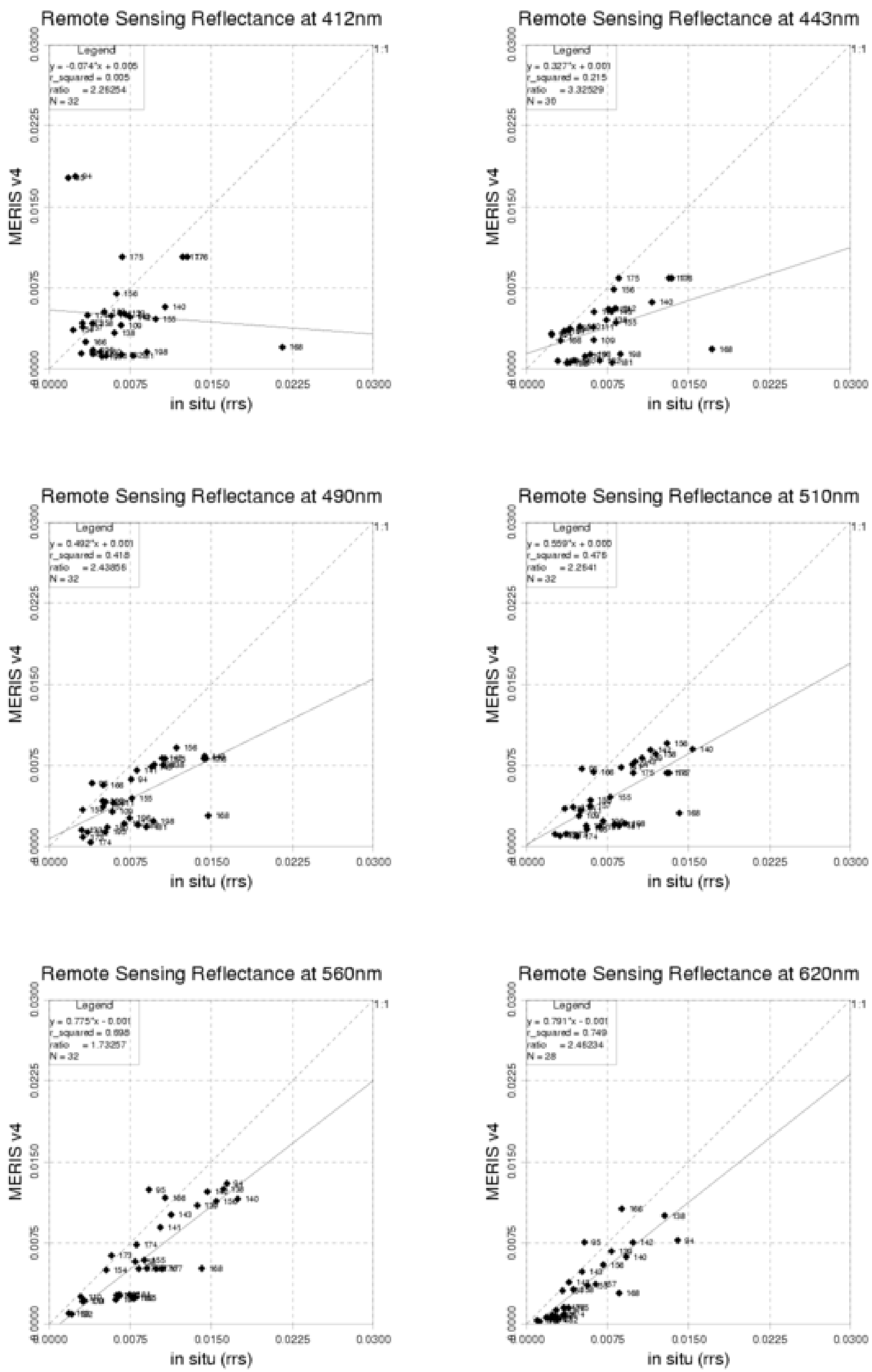
Table 4.1. In-situ/MERIS Matchup Counts by Cruise

Cruise	Date	MERIS L1	MERIS L2
CoJet 7	May 2002	2	0
SEED	May 2005	9	11
RV/Ocolor	December 2005	6	0
RV/Ocolor	February 2007	5	0
EPA	May 2007	2	2
EPA	July 2007	2	1
BioSpace	October 2008	7	6

Results

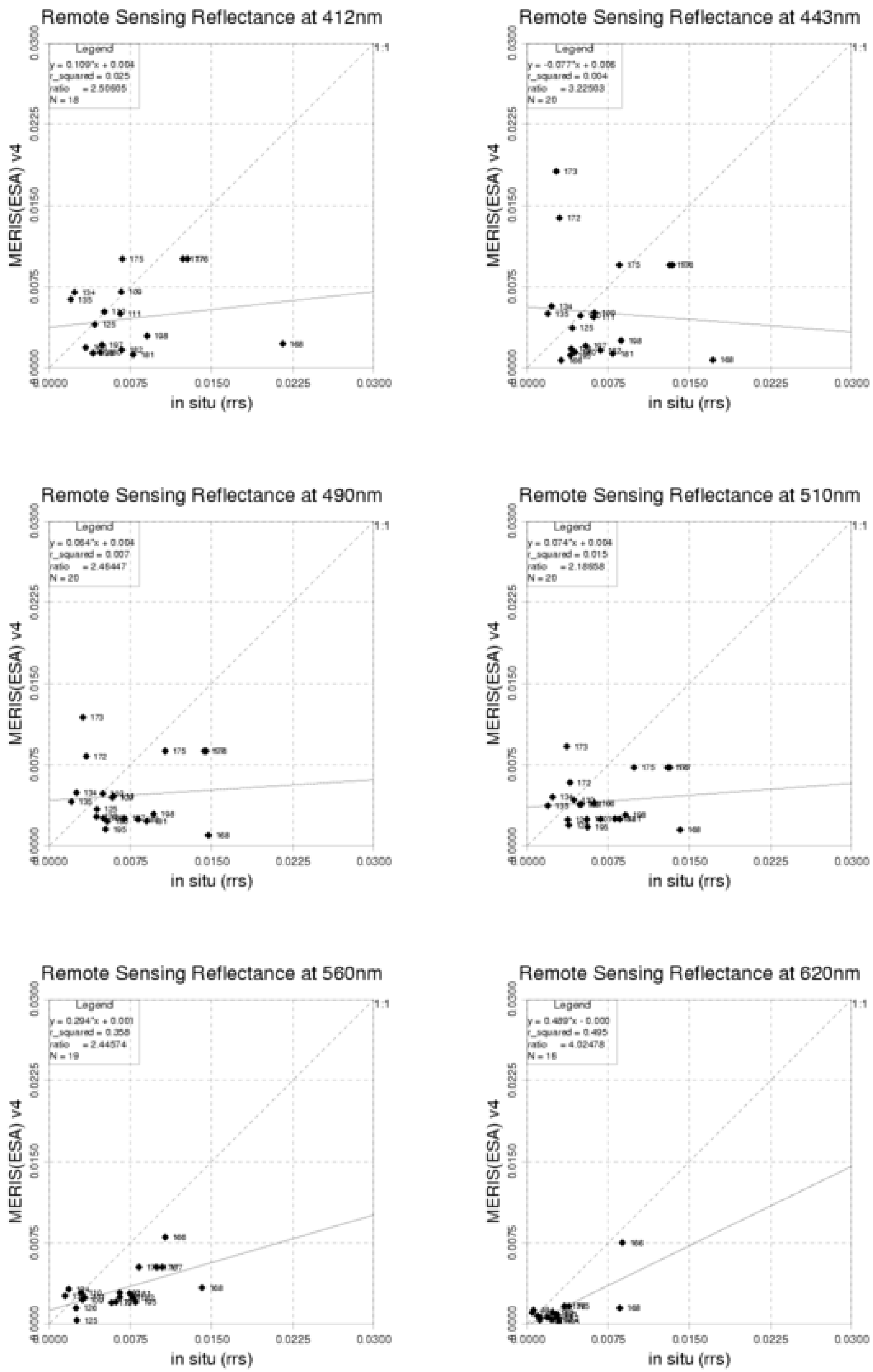
The MERIS Level-1 comparison consisted of 13 MERIS reduced-resolution Level-1 data files in 5 regions of interest. The Level-1 files were generated by ESA, but obtained from the global archive. ESA provided calibration which varied by file. There was no known vicarious calibration performed. Each Level-1 was processed using the standard NRL processing scheme which includes using the Gordon 7/8 Atmospheric Correction with the NIR iteration, where band 7 was 768. This was followed by the Stumpf 412 iteration.

Figure 4.3. MERIS Level-1 derived R_{rs} vs *in situ* R_{rs}



The MERIS Level-2 comparison consisted of processing 13 MERIS reduced-resolution Level-2 data files in 5 regions of interest. The Level-2 files were generated by ESA. The ESA global archive was used to obtain the data sets used. Calibration was provided by ESA and varied by file; There was no known vicarious calibration performed. Each Level-2 was processed using the standard ESA atmospheric correction processing scheme. This is followed by the Stumpf 412 iteration. The MERIS Level-2 data divided into “water”, “land”, and “clouds” classes and provided data flags to determine pixel status information. The MERIS Level-2 data was provided in “normalized reflectance”.

Figure 4.4. MERIS Level-2 derived R_{rs} vs *in situ* R_{rs}



Chapter 5. Command Line Reference

The following pages encompass the program references for the MERIS data processing.

Name

merArea — determines the file extents of MERIS Level-2 data file which covers an image map.

Synopsis

`merArea [options] mapname filename`

Description

Determines the file extents (start/stop pixel/line) of a MERIS Level-2 file (still in sensor projection) that covers a map.

The command **merArea** begins by reading in the map from the mapfile. If the file can not be opened or the named map is not in the file, a diagnostic is printed and the program will exit.

Next, the MERIS file is opened and the navigation information initialized. If unable to open the file or get the navigation information from the file, the program will print a diagnostic and exit.

Once the navigation has been set, **merArea** reads in every scan line and reads the latitude and longitude. For each point that falls within the desired maps, the starting and stopping sample (or column) number of the file is determined. The line extents are also determined by the first line that contains data that falls within the box and the last line that falls outside the box again. The file extents are adjusted to be slightly larger than those found by the above procedure to ensure that no data within the region is missed. These file extents will be printed to the screen. These are printed to stdout: starting pixel, space, ending pixel, space, starting line, space, ending line.

If the entire file covers the image map, then "Complete coverage" will be written to stdout. If no part of the file covers the image map, then "No coverage" will be written to stdout.

Based on the landmask, **merArea** can also determine if any pixels within the region fell over water. If not samples fell over water then the message "No Water Coverage" is added. This can be used to determine if the file is to be processed even when it covers the interested area.

Options

-a angle
: If *angle* is defined then it is used to reduce the swath of the input image. It will reduce the image during calculation of file extents. It can be used to prevent the large pixels from the edge of the swath to be output. If angle is less than 1.1, then it is assumed to be given in radians. Otherwise it is give in degrees. A negative angle will be converted to a positive one.

-d
: Debug output.

-l
: Don't output start/stop line locations

-L file
: Use file as the input land mask file. Defaults to `$APS_DATA/landmask.dat`

-m min
: minimum coverage to be considered (default is 0.0).

-M mapFile
: Use the given map file to find mapName. Defaults to `$APS_DATA/maps.hdf`

-n n
: Set the number of lines to skip to n

-p
: Don't output start/stop pixel locations

-r	Refine search to within plus or minus 5 samples/lines.
-v	Verbose output
--help	Display program help.
--version	Display program name version and time of compilation.

Environmental Variables

APS_DATA The location of the APS data directory.

Examples

The examples below show the same input file run against two different geographical areas. The last examples shows the result of trying to use an invalid input.

Example 5.1. Use of merArea

```
$ merArea GulfOfMexico MER_RR__2PNPDK20070704_151722_000024332059_00326_27935_4807
1 1121 5923 7897
$ merArea -p -M my_maps.hdf GulfOfMexico MER_RR__2PNPDK20070704_151722_00002433205
5923 7897
$ merArea EastSea MER_RR__2PNPDK20070704_151722_000024332059_00326_27935_4807.N1
No coverage
$ merArea Junk MER_RR__2PNPDK20070704_151722_000024332059_00326_27935_4807.N1
-E- map Junk not found in file /home/aps/aps_v3.8.2.3-72-g7b866d/data/maps.hdf
Aborted
$ echo $?
134
```

Name

merInfo — queries information about a ESA MERIS Level-1 and Level-2 file(s).

Synopsis

`merInfo` *`file1`* *`file2`* *`file3`* *`....`*

`merInfo` *`option`* *`file`*

Description

Run without options, **merInfo** will write a report for each input file indicating satellite id, data type, etc. It may also be run with a single option and print the input file(s) value for that option. The first method is intended for interactive use at the shell prompt and the second method is intended for use within a shell program.

Options

-year	4-digit year of input file.
-doy	3-digit day of year of input file.
-month	3-character month of input file. Months are \`jan', \`feb', \`mar', \`apr', \`may', \`jun', \`jul', \`aug', \`sep', \`oct', \`nov', \`dec'
-time	6-digit time (HHMMSS) of input file.
-hour	2-digit hour (HHMMSS) of input file.
-min	2-digit min (MM) of input file.
-sec	2-digit second (SS) of input file.
-start_time	start time of input file.
-end_time	end time of input file.
--help	Display program help.
--version	Display program name version and time of compilation.

Examples

Here is how a Bourne shell script function might use **merInfo** to set the name of the output filenames:

Example 5.2. Use of merInfo within shell

```
set_name()
{
    yr=`merInfo -year $1`
    jday=`merInfo -doy $1`
    time=`merInfo -time $1`
    file=envi.$yr$jday.$time.l1b
}
```

Here is an interactive use of **merInfo**:

Example 5.3. Interactive use of merInfo

```
$ merInfo MER_RR__2PNPDK20070704_151722_000024332059_00326_27935_4807.N1
Filename:         MER_RR__2PNPDK20070704_151722_000024332059_00326_27935_4807.N1
Starting Time:    07/04/2007 15:17, 185
Ending Time:      07/04/2007 15:58, 185
Satellite:        envisat-1
File Type:        UNKNOWN
Datatype:         N1
Total Scans:      13824
Total Samples:    1121
```