

PDS review rosetta/virtis

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Documentation

Dataset.cat

ABSTRACT_DESC = "This release contains the calibrated data of the VIRTIS instrument on board of the spacecraft Rosetta. This volume contains data from the ESCORT<>4 MTP024 phase, which occurred from 2015-12-16 to 2016-01-13"

Documentation

-In document/virtis_pds_idl_sw_manual.pdf there is written

“In the VIRTIS Rosetta and Venus-Express archives, the software is provided as a ZIP archive located in the DOCUMENT directory” (page 5)

However, the software is in extras/code/virtispds.zip

Documentation

In aareadme.txt

“3. Applicable Software

VIRTIS qubes can be read and managed with an IDL package written and maintained by S. Erard that can be found in the directory DOCUMENT. In the same directory can be found a manual explaining how to use this package (VIRTIS_PDS_IDL_SW_MANUAL). “

However, the software is in extras/code/virtispds.zip

Documentation

In aareadme.txt:

```
| ----- CALIB  
  
|   | ----- VIRTIS_H_TRANSFERT_FCT_V1.LBL  
  
|   | ----- VIRTIS_RESAMPLED_IR_HIGH.LBL  
  
|   | ----- VIRTIS_RESAMPLED_VIS_HIGH.LBL  
  
|   | ----- VIRTIS_RESAMPLED_IR_NOM.LBL  
  
|   | ----- VIRTIS_RESAMPLED_VIS_NOM.LBL  
  
|   | ----- HSOLEILROS2014.LBL  
  
|   | ----- CALIBINFO.TXT “
```

The file is called CALINFO.txt

Documentation

In /calib/calinfo.txt

``HSOLEILROS2014.TAB = Solar irradiance from 1 AU
resampled at ROSETTA VIRTIS_H
sampling and resolution).
Solar irradiance expressed in
(W/m²/micron)''

It is not clear the source of the solar irradiance. Is this Kurucz solar irradiance? Please specify

Data/virtispds

I read the data using virtispds following the instructions in the manual document/virtis_pds_idl_sw_manual.pdf

```
result = virtispds('file_name')
```

I have

```
% VIRTISPDS: File in use: /Users/silviaprotopapa/Documents/FOLDERS_ChronoSync/r
```

```
    eview/PDS_20181008/ro-c-virtis-3-esc4-mtp024-v3.0/data/stp087/ca
```

```
    l/virtis_h/t1_00409432776.cal
```

```
** Structure <30f8608>, 9 tags, length=38104976, data length=38104976, refs=1:
```

```
LABEL      STRING  Array[200]
```

```
COLUMN_NAMES  STRING  Array[3]
```

```
TABLE       FLOAT  Array[3, 3456]
```

```
QUBE_NAME    STRING  Array[2]
```

```
QUBE_DIM     LONG    Array[2]
```

```
QUBE        FLOAT  Array[3456, 2752]
```

```
SUF_NAME     STRING  Array[3]
```

```
SUF_DIM      LONG    Array[2]
```

```
SUFFIX       UINT    Array[3, 2752]
```

Documentation/virtispds

This is in agreement with what reported in the manual (page 6 and 7)

``For H calibrated cubes all spectra are grouped in a single dimension, whatever the acquisition mode is (ie, data in backup and nominal mode are equally formatted as 2D cubes in output of virtispds — notice that the file itself contains a 3D PDS qube object with second dimension = 1). The output structure is such that:

result.label: label of the PDS file

result.column_names: names of following vectors

result.table: a 2D array containing the spectral table for every channel:

result.table(0,*) = wavelength

result.table(1,*) = bandwidth (FWHM)

result.table(2,*) = radiance uncertainty estimate (1-sigma)

Documentation/virtispds

result.qube_name: a 2-strings array providing the cube stored quantity and unit
result.qube_dim: a 2-elt array providing the cube dimensions
result.qube: 2D data core of the qube (floats). Size=(# of bands, # of spectra)
result.suf_name: names of suffix parameters (SCET components)
result.suf_dim: a 2-elt array providing the suffix dimensions

result.suffix: reconstructed SCET. Size=(3, # of spectra) “

Documentation/virtispds

Note: The data are NOT extracted spectra. In fact according to the manual:

``TABLE data

The output structure to virtispds is such that:

result.label: label of the PDS file

result.column_names: a string array providing the names of the table columns
result.table: a 2D array containing the table

In particular, for calibrated spectrum (H individual spectra), the output structure is such that:

result.table: a 2D array containing the spectrum:

result.table(0,*) = wavelength

result.table(1,*) = intensity (radiance)

result.table(2,*) = uncertainty “

This is NOT our case

Data/virtispds

In our case we are analyzing stp087/cal/virtis_h

t1_00409432776

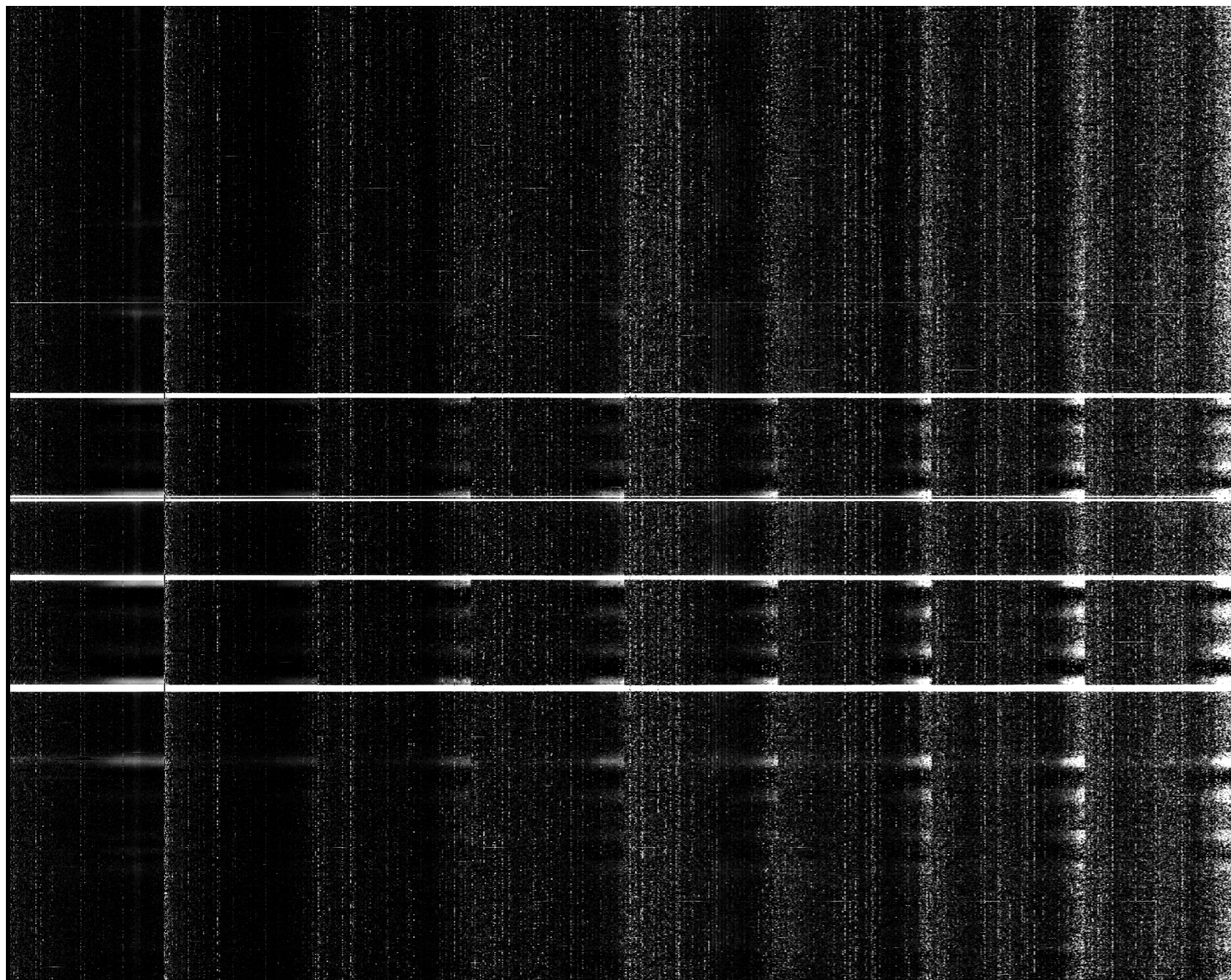
QUBE_NAME

RADIANCE "W/m**2/sr/micron"

QUBE

<Expression> FLOAT = Array[3456, 2752]

Data/virtispds



Array [3456,2752]

Data/readpds

result = readpds(filename)

Now reading header:

/Users/silviaprotopapa/Documents/FOLDERS_ChronoSync/review/PDS_20181008/ro-c-virtis-3-esc4-mtp024-v3.0/data/stp087/cal/virtis_h/t1_00409432776.cal

Now reading HISTORY object.

Warning: empty or malformed HISTORY object.



Now reading table with 3 Columns and 3456 Rows

Warning: invalid SUFFIX_BYTES keyword value found: 2 (must = 4)



CORE Items: IEEE_REAL 4

Order: 2

Now reading 3456 by 1 by 2752 qube array, 3 by 0 by 0 suffix items.

** Structure <151db68>, 4 tags, length=38101704, data length=38101698, refs=1:

OBJECTS INT 3

HISTORY STRING "

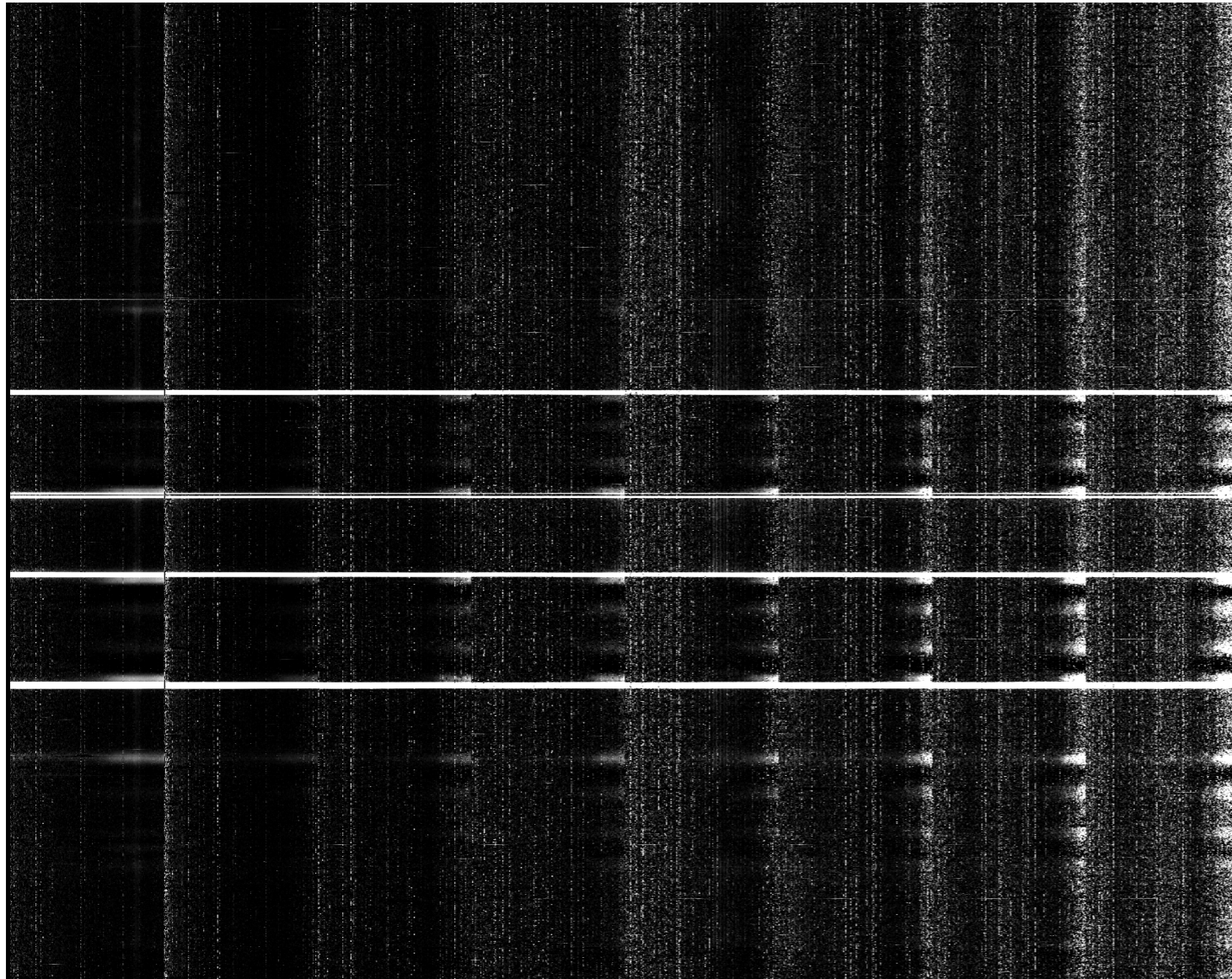
TABLE STRUCT -> <Anonymous> Array[1]

QUBE STRUCT -> <Anonymous> Array[1]

Data/VIRTIS-H

stp087/cal/virtis_h/t1_00409432776.cal

Array [3456,2752]



Data/VIRTIS-H

VIRTIS-H is a high resolution spectrometer and does not perform imaging; the H-IR detector is used to acquire spectra spread over its surface, thus only a portion of the pixels contains useful scientific data. The 8 spectral orders are spread over the entire surface matrix. In each spectral order the spectrum covers 432x5 pixels (where 5 pixels represent the image of the slit size when imaged on the detector).

Thus overall only 15% of the 438x270 pixels matrix surface is used.

A H_Spectrum can be defined as a composition of the 8 orders imaged on the H-IR detector; the H_Spectrum is extracted from the two-dimensional detector by using a map of the lighted pixels based on 8 spectral orders of 432 elements and a width of 5 pixel for each order. The 5 pixels are reduced to 1 pixel by averaging. The H_Spectrum is composed of 3456 pixels.

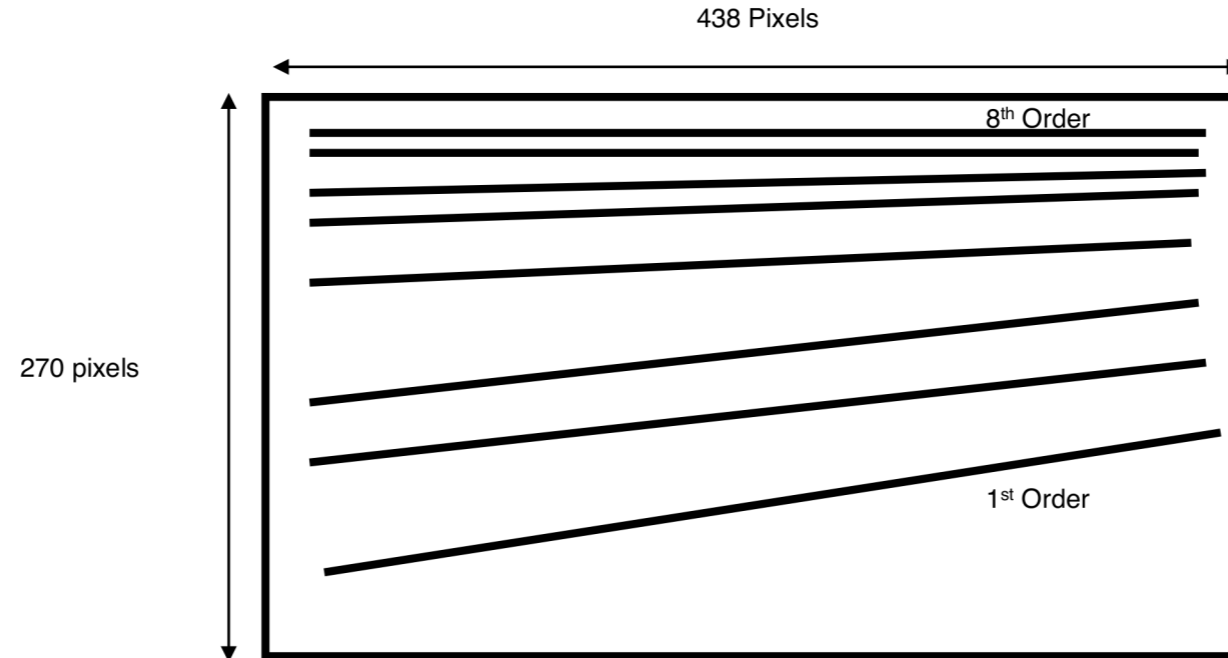
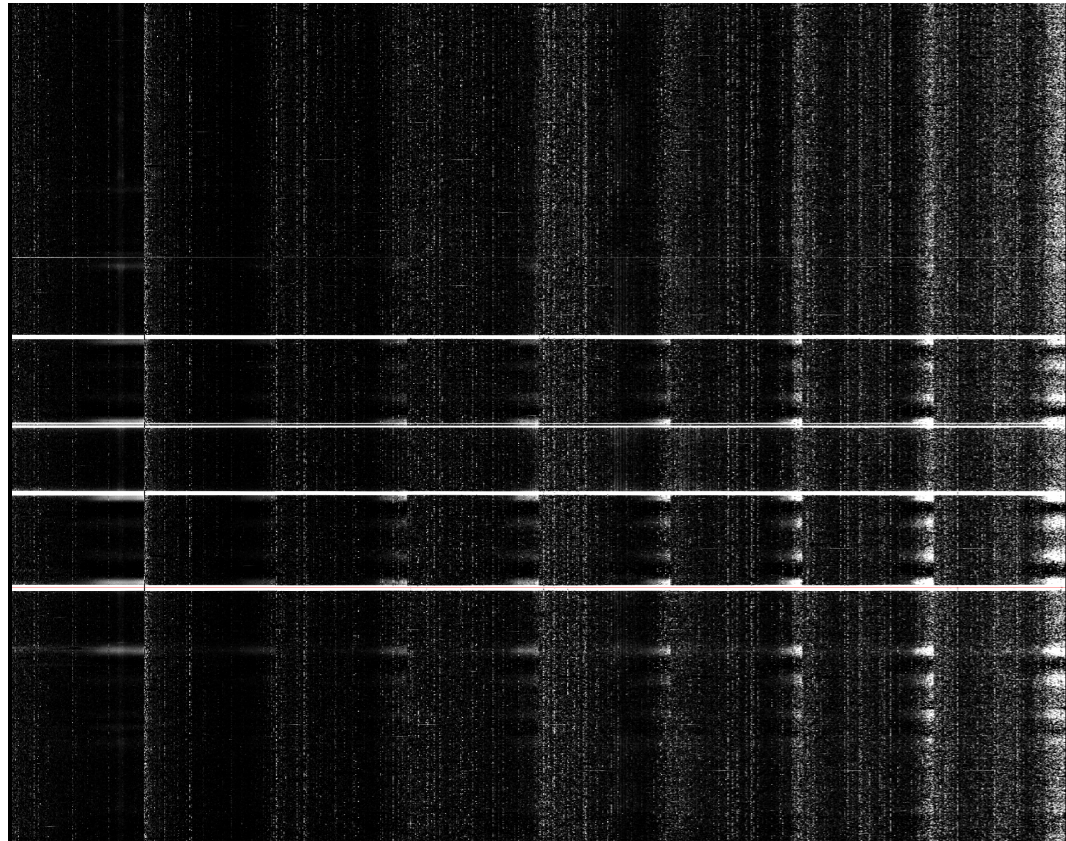
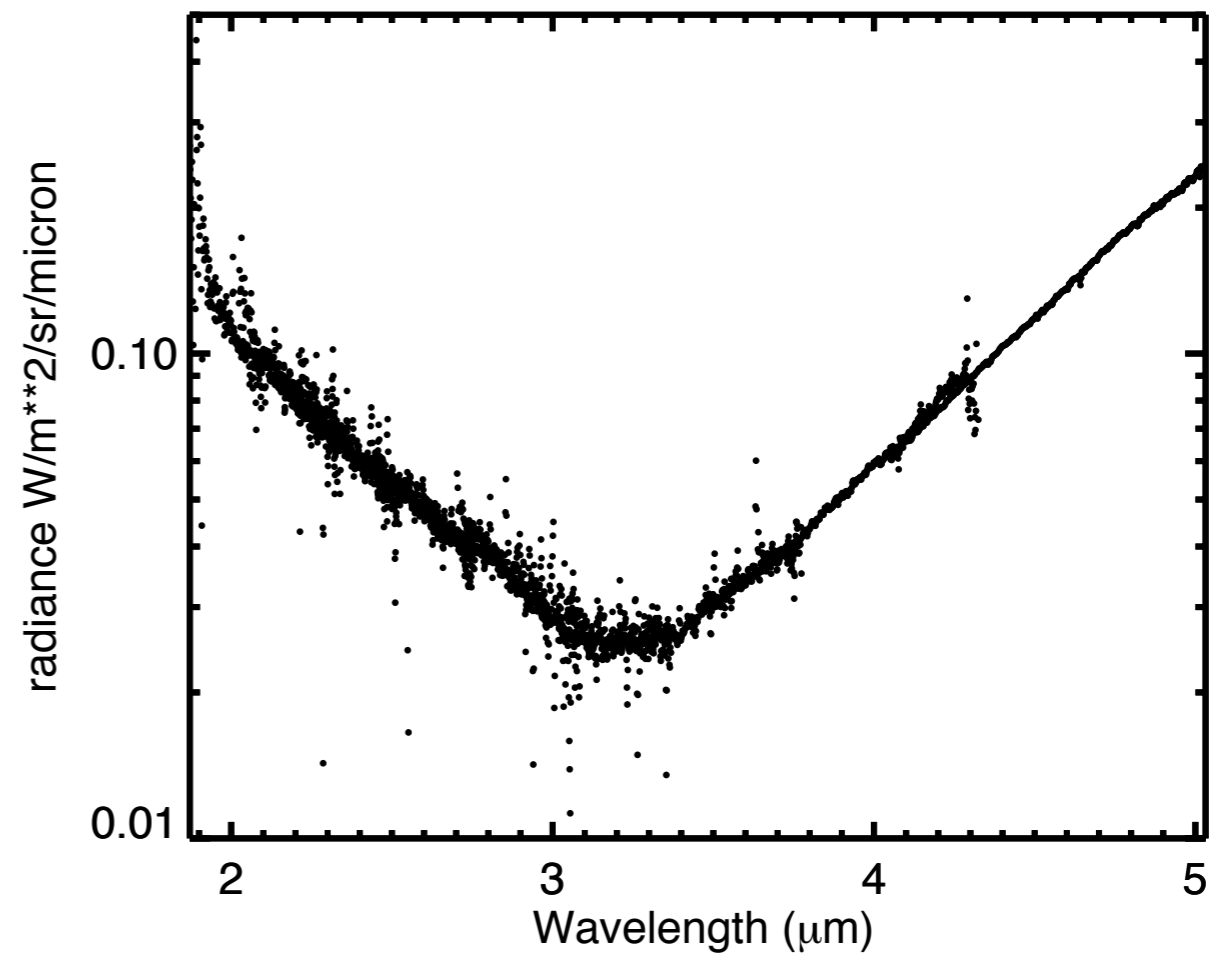


Figure 2-3: Spectral orders distributed over the IR FPA area. Only 15% of the matrix contains scientific data.

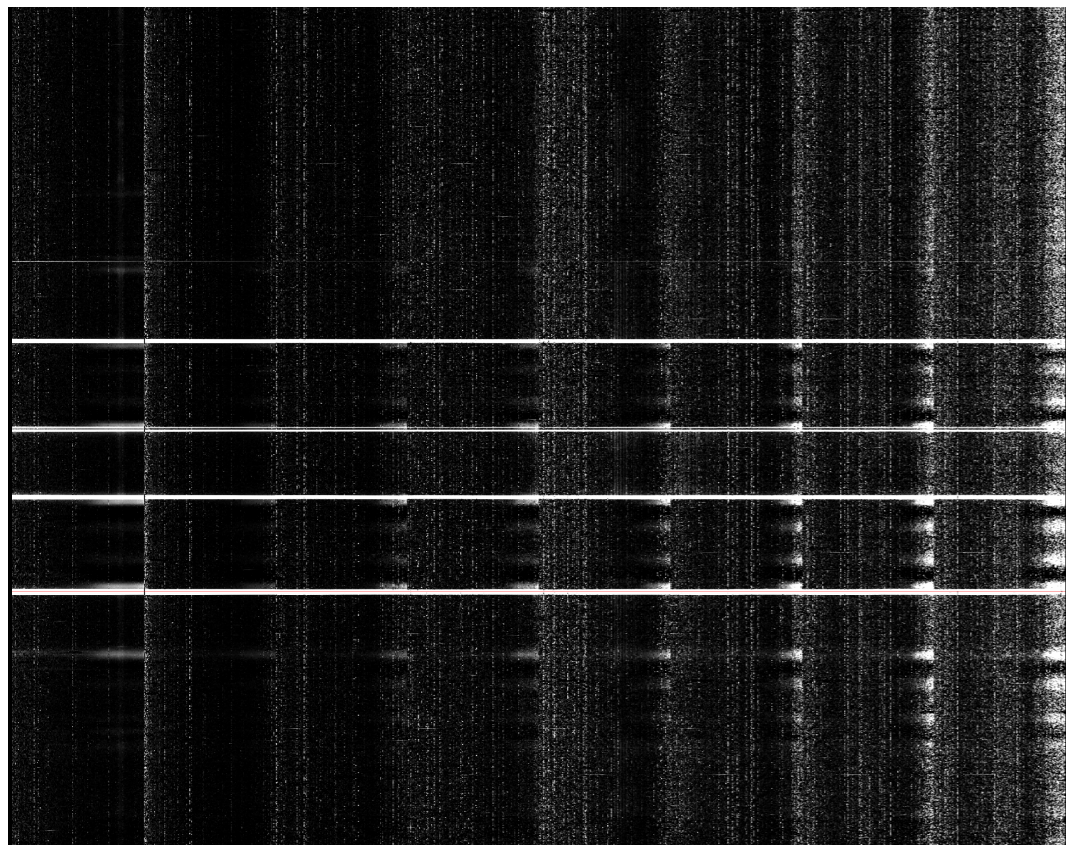
Data/VIRTIS-H



Row 831, idl convention

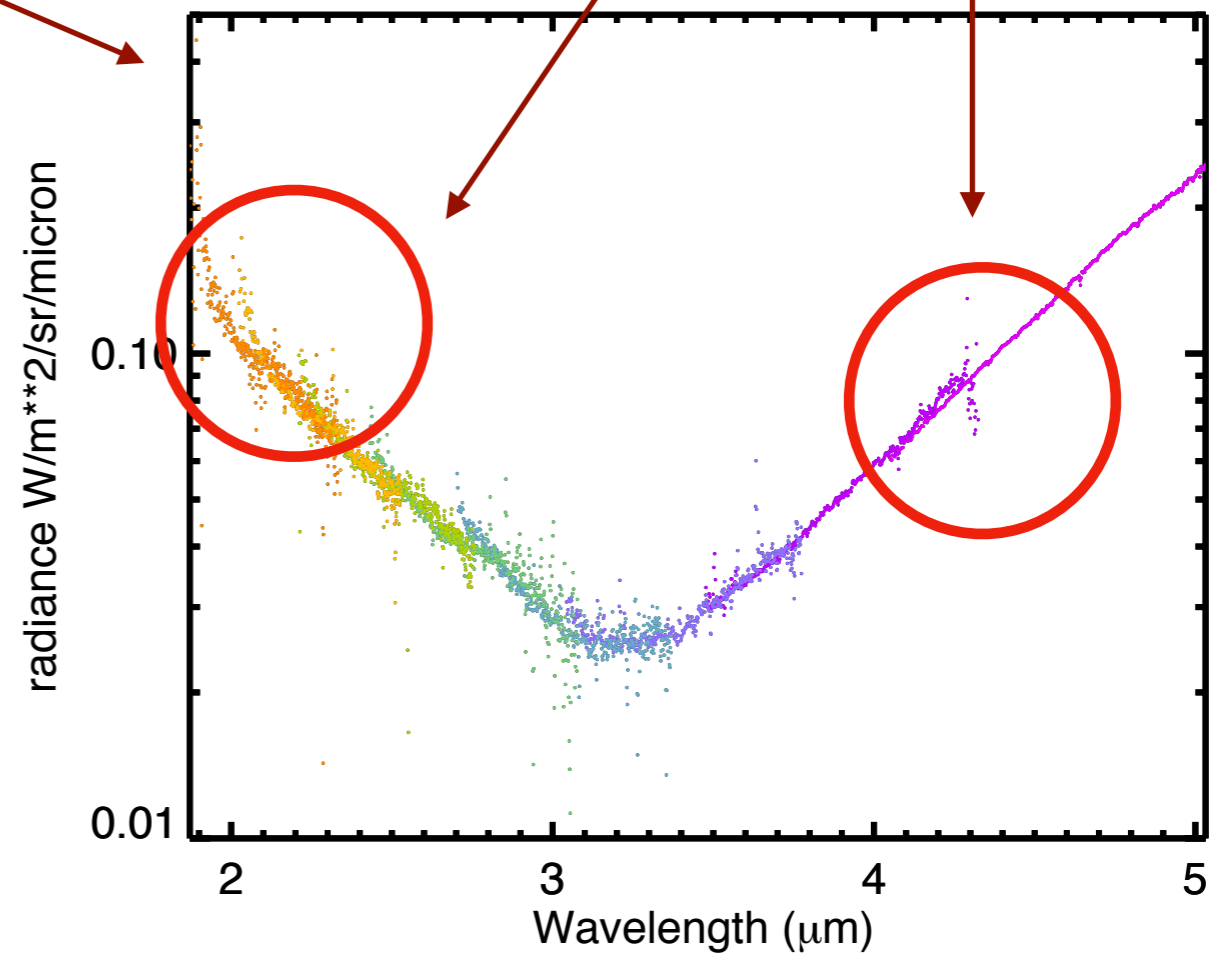


Data/VIRTIS-H



Problems with overlapping orders

Row 831, idl convention



In our case we are analyzing stp087/cal/virtis_h

t1_00409432776

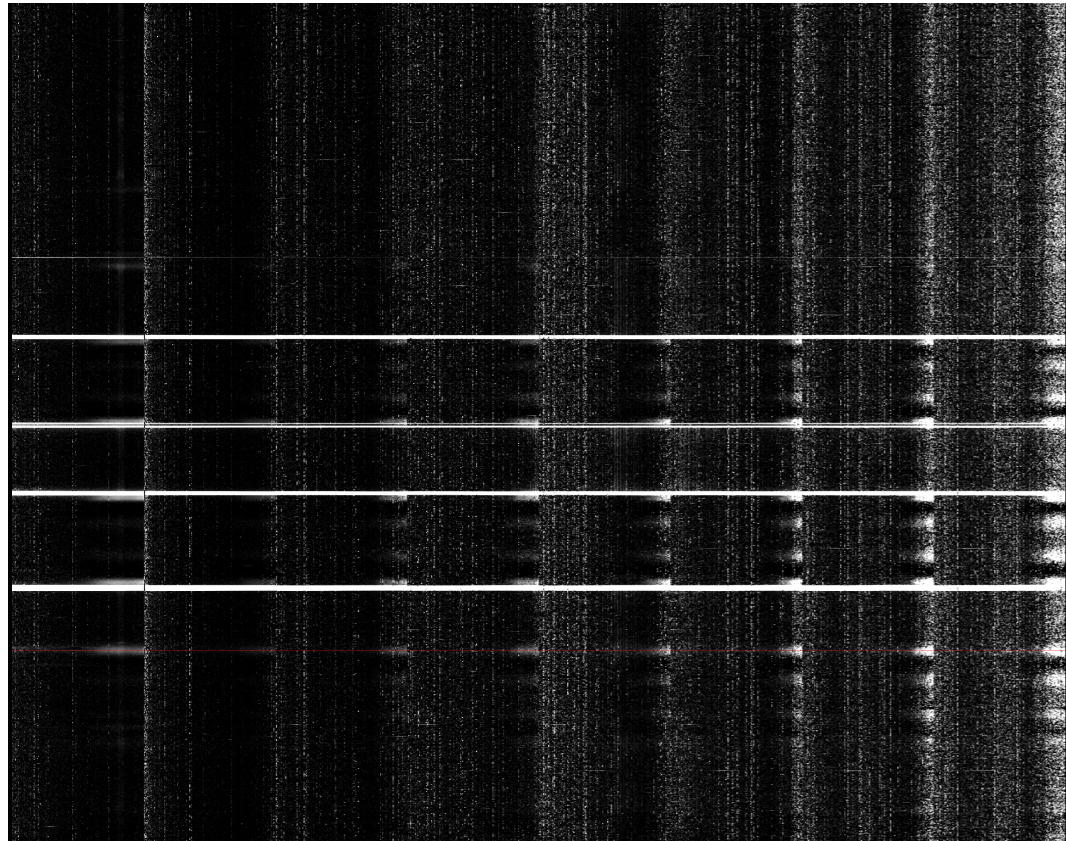
QUBE_NAME

RADIANCE "W/m**2/sr/micron"

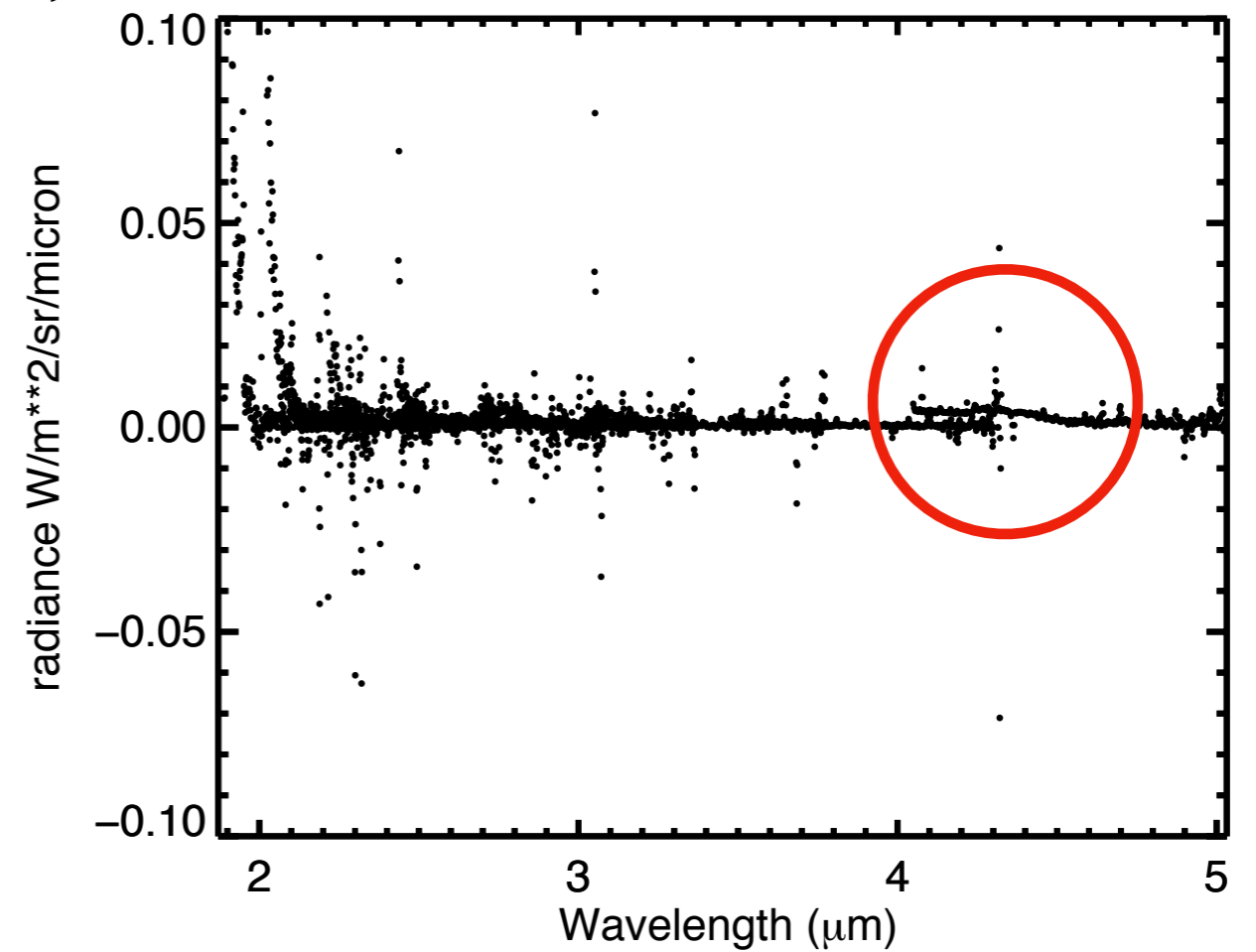
QUBE

<Expression> FLOAT = Array[3456, 2752]

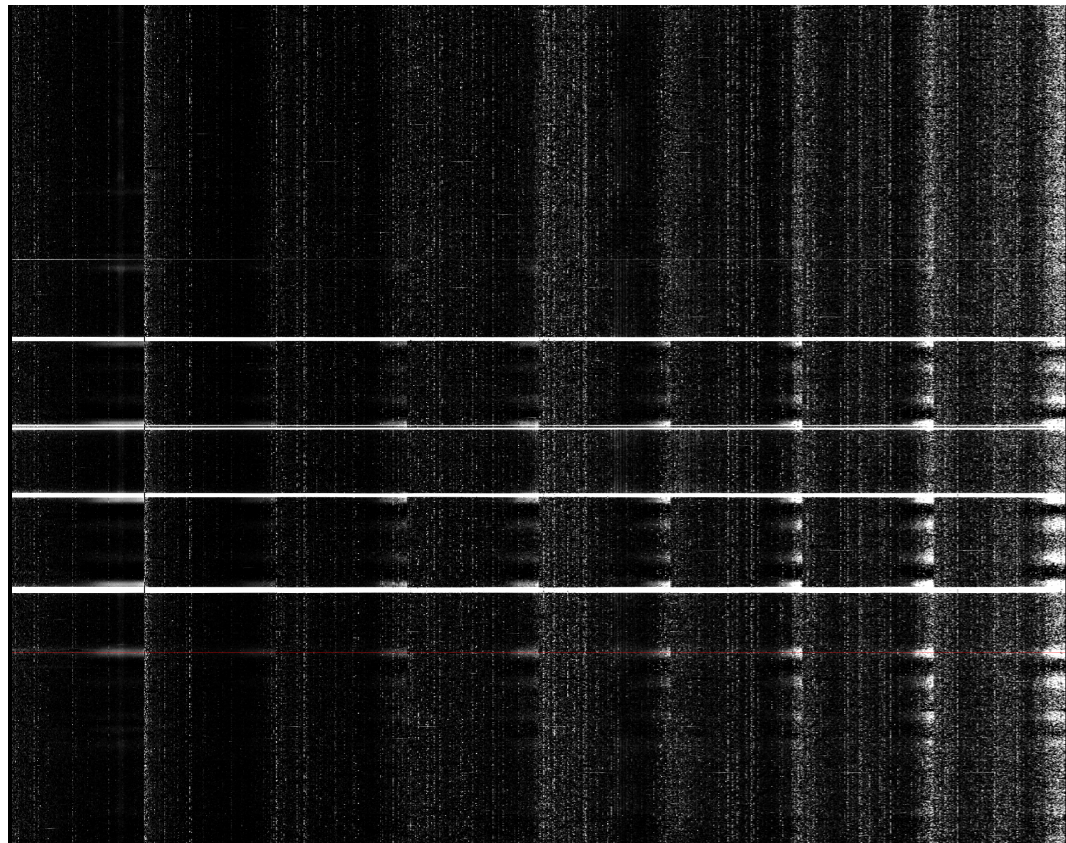
Data/VIRTIS-H



Row 625, idl convention

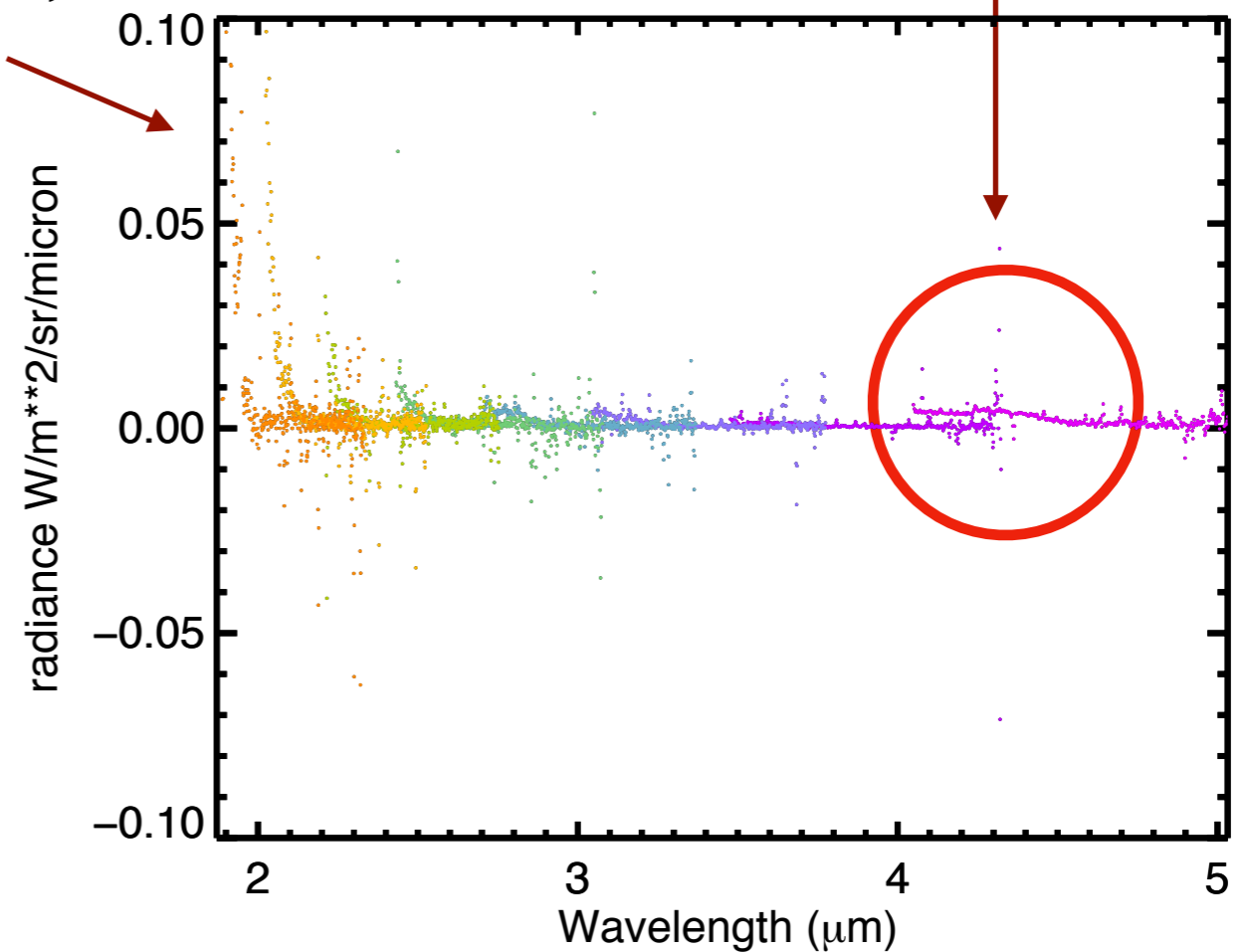


Data/VIRTIS-H



Problems with overlapping orders

Row 625, idl convention



In our case we are analyzing stp087/cal/virtis_h

t1_00409432776

QUBE_NAME

RADIANCE "W/m**2/sr/micron"

QUBE

<Expression> FLOAT = Array[3456, 2752]

Data/VIRTIS-H

```
result = virtispds('/Users/silviaprotopapa/Documents/FOLDERS_ChronoSync/review/  
PDS_20181008/ro-c-virtis-3-esc4-mtp024-v3.0/data/stp087/cal/virtis_h/  
t1_00409432776.cal')
```

```
result.table(0,*) = wavelength
```

```
result.table(1,*) = bandwidth (FWHM)
```

```
result.table(2,*) = radiance uncertainty estimate (1-sigma)
```

```
result.table[2,*] = -999
```

usgs-isis

I would suggest to provide an ISIS_TUTORIAL as was done for DAWN VIR. However, I could not use isis for this data set.

Documentation/minor editorial comment

From aareadme.txt:

“In general, the

PDS label is an object-oriented structure consisting of sets of 'keyword

= value' declarations; the object which the label refers is denoted by

a statement of the form:

\wedge object = location

in which the carat character (\wedge , also called a pointer in this context)

indicates where to find the object. “

I am not sure carat is correct

Documentation/minor editorial comment

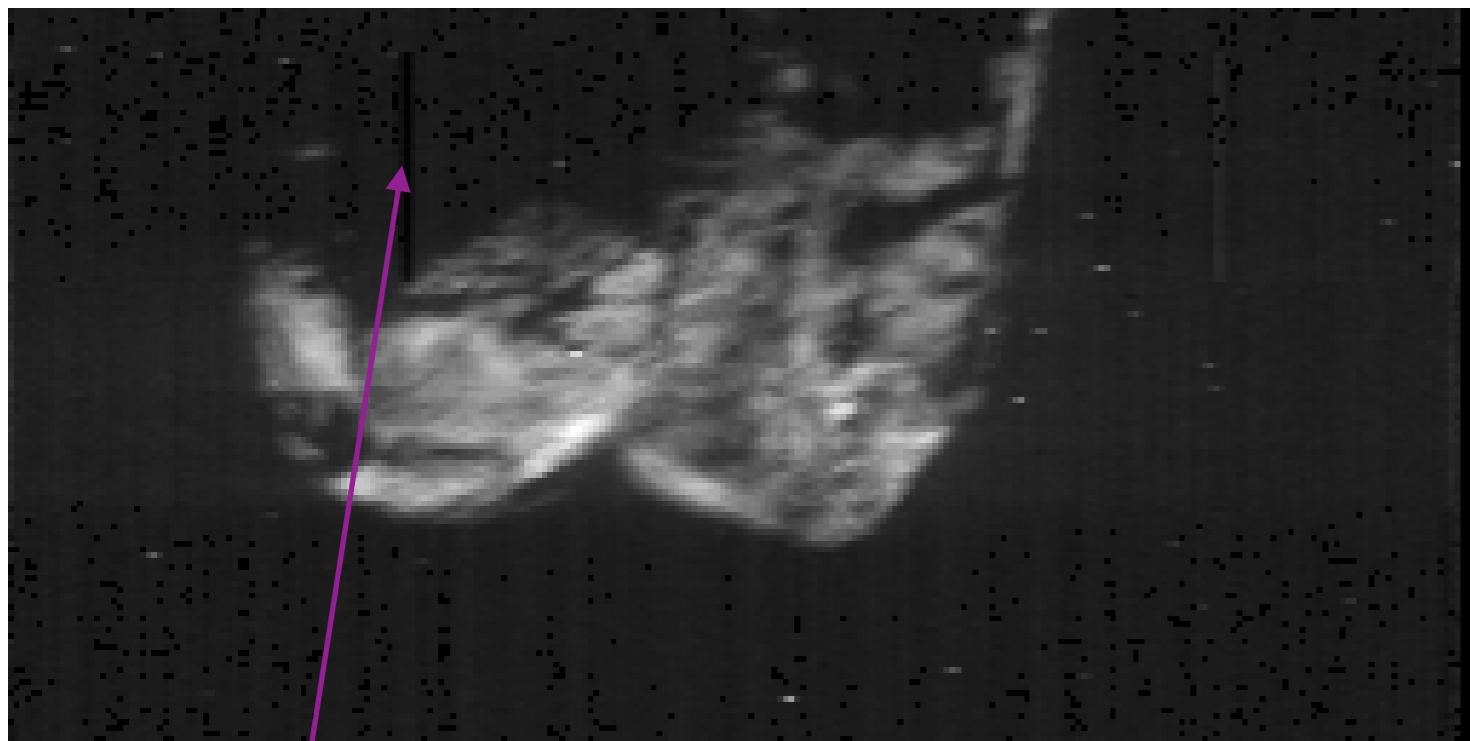
In catalog/dataset.cat

``Confidence Level Overview

=====

Data confidence is nominal, meaning that for all data have been validated by the VIRTIS team and found as expected. Any exceptions are noted by the DATA_QUALITY field in the label files. “—>” meaning that all data have been”

VIRTIS-M-VIS



stp087/virtis_m_vis/v1_00408883885

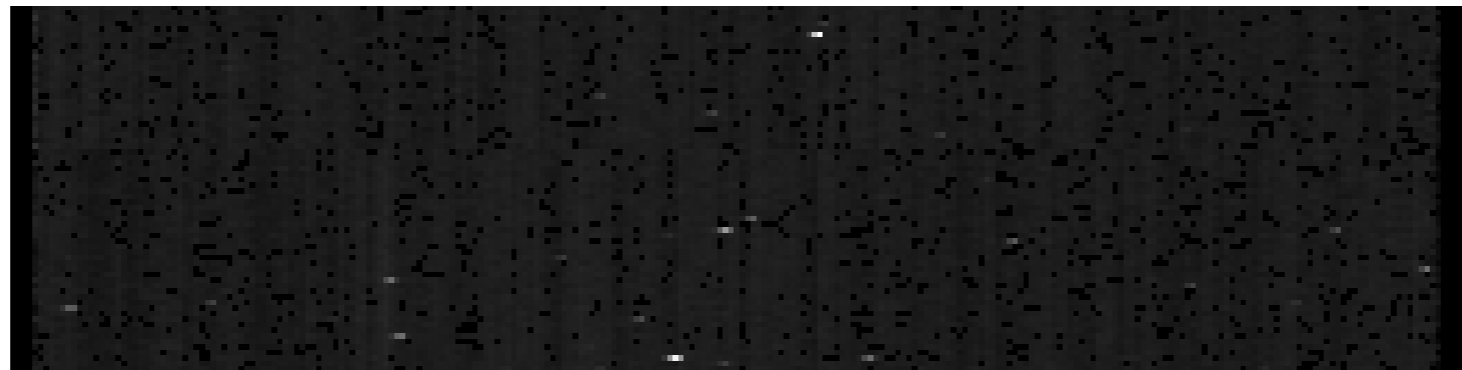
stp087/virtis_m_vis/v1_00408873815

Bad pixels



VIRTIS-M-VIS

stp087/virtis_m_vis/v1_00408877715



No comet in spite the label is reported

TARGET_NAME = "67P/CHURYUMOV-GERASIMENKO 1 (1969 R1)"

VIRTIS-M-IR

I considered as test case

STP046/cal/virtis_M_IR/I1_00384361376.CAL

```
file = virtispds('~\R0-C-VIRTIS-3-ESC1-MTP013-V3.0/DATA/STP046/CAL/VIRTIS_M_IR/I1_00384361376.CAL')
```

```
Reading label  
~\R0-C-VIRTIS-3-ESC1-MTP013-V3.0/DATA/STP046/CAL/VIRTIS_M_IR/I1_00384361376.CAL
```

```
Number of objects found:          2
```

```
% VIRTISPDS: File in use: /Users/silviaprotopapa/Documents/FOLDERS_ChronoSync/r  
view/PDS_20181008/step3/R0-C-VIRTIS-3-ESC1-MTP013-V3.0/DATA/STP  
046/CAL/VIRTIS_M_IR/I1_00384361376.CAL
```

```
** Structure <220de08>, 8 tags, length=68128440, data length=68128430, refs=1:  
 LABEL      STRING      Array[172]  
 TABLE     FLOAT       Array[432, 256, 3]  
 QUBE_NAME  STRING       Array[2]  
 QUBE_DIM   LONG          Array[3]  
 QUBE       FLOAT       Array[432, 256, 151]  
 SUF_NAME   STRING       Array[3]  
 SUF_DIM    LONG          Array[2]  
 SUFFIX     UINT          Array[3, 151]
```

VIRTIS-M-IR

file.table is Array[432, 256, 3]

LINE_SUFFIX_NAME = ("WAVELENGTH","FWHM","UNCERTAINTY")

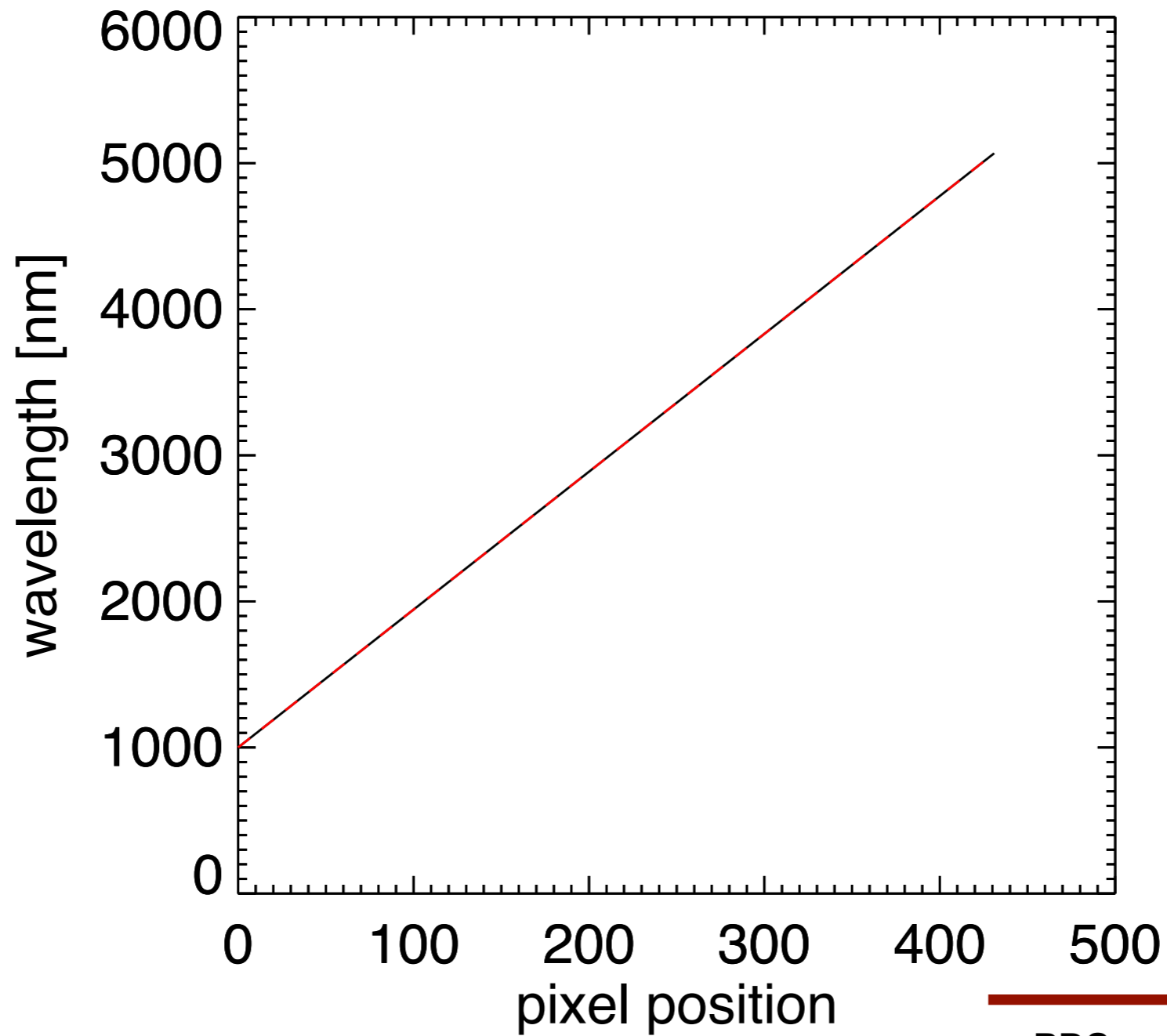
I compared

file.table[* ,10,0] (black line)

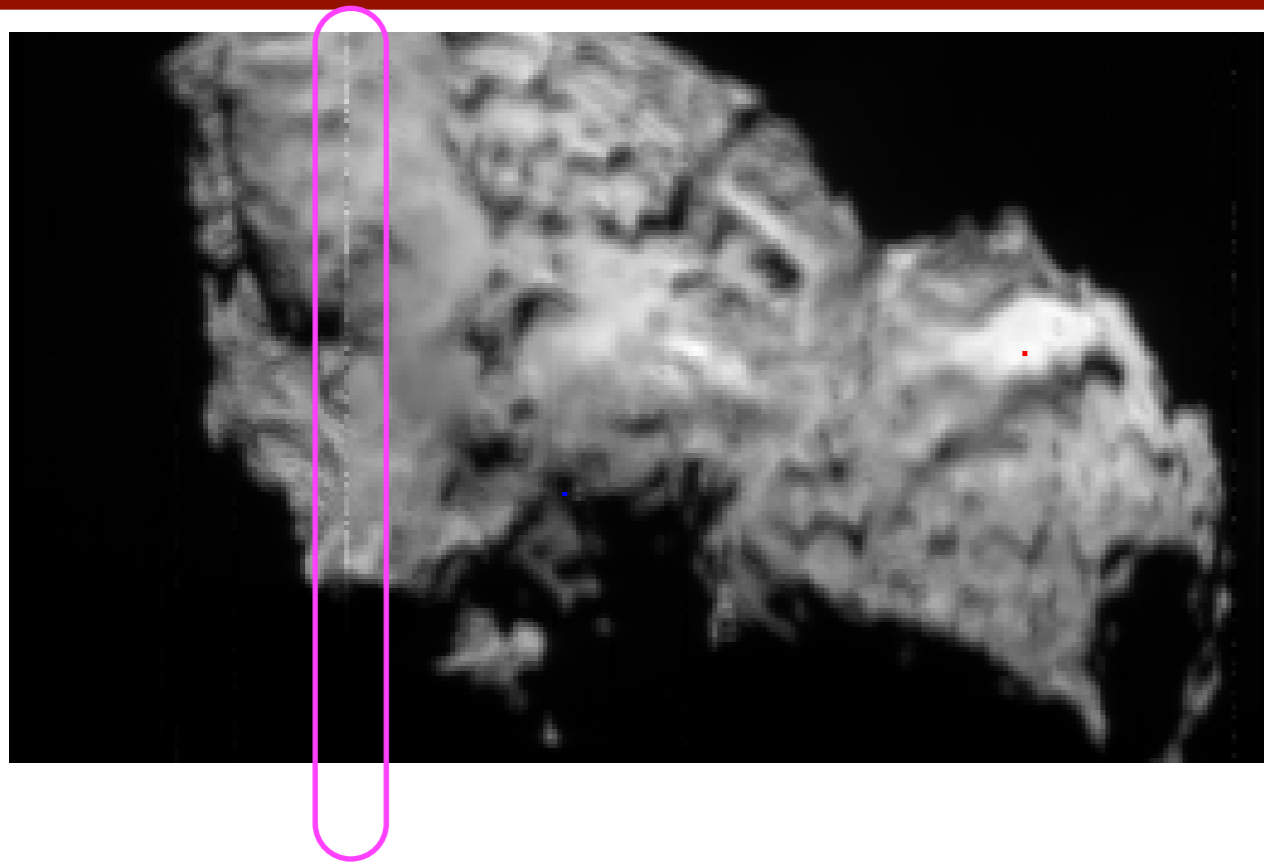
to the wavelength array extracted from the calibration file
VIRTIS_M_HRES_SPECAL_10_V1.TAB: 432 row ASCII table containing the
wavelengths of the VIS and IR channels in High Resolution Mode (red line, for
the IR channel).

As shown in the plot in the next slide, the results are consistent.

VIRTIS-M-IR



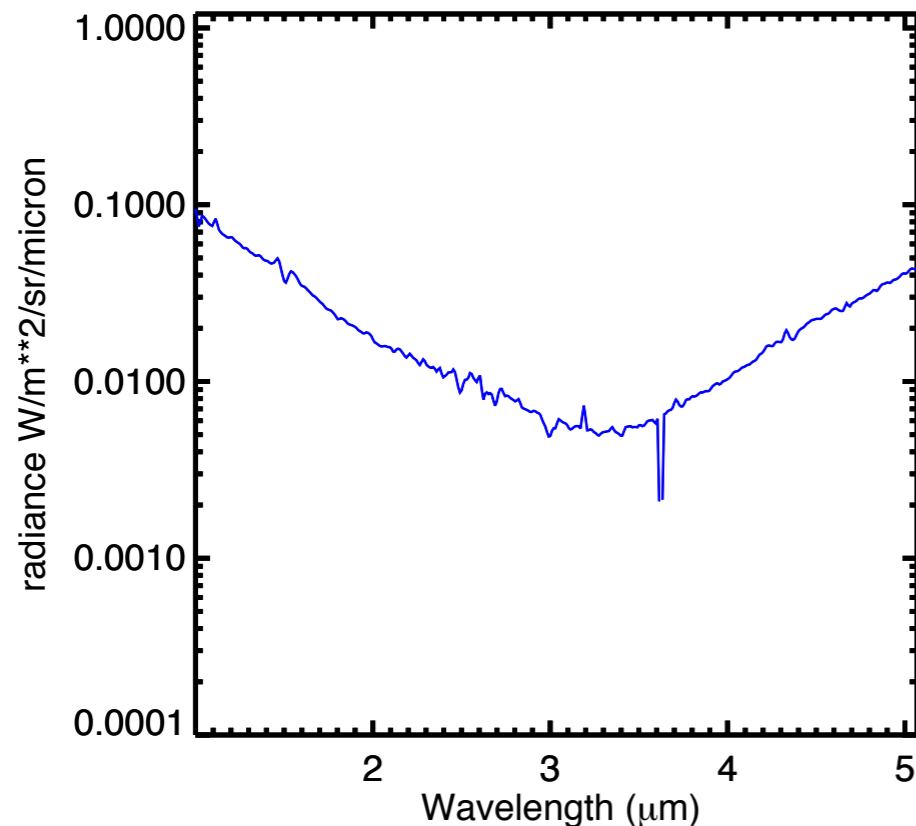
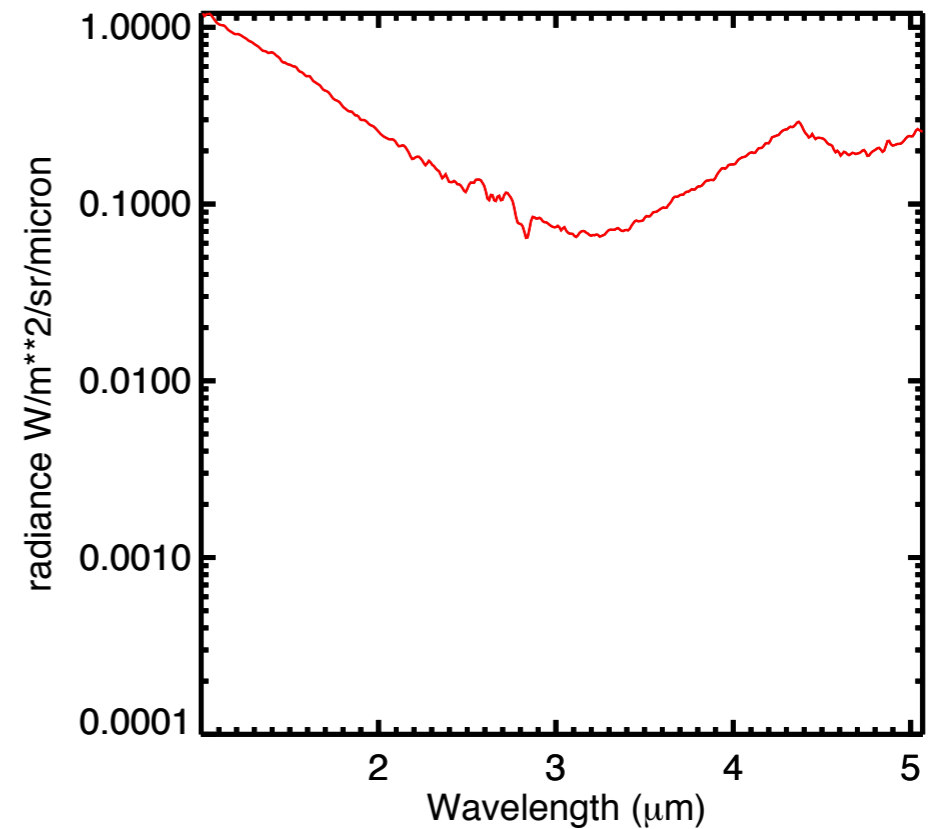
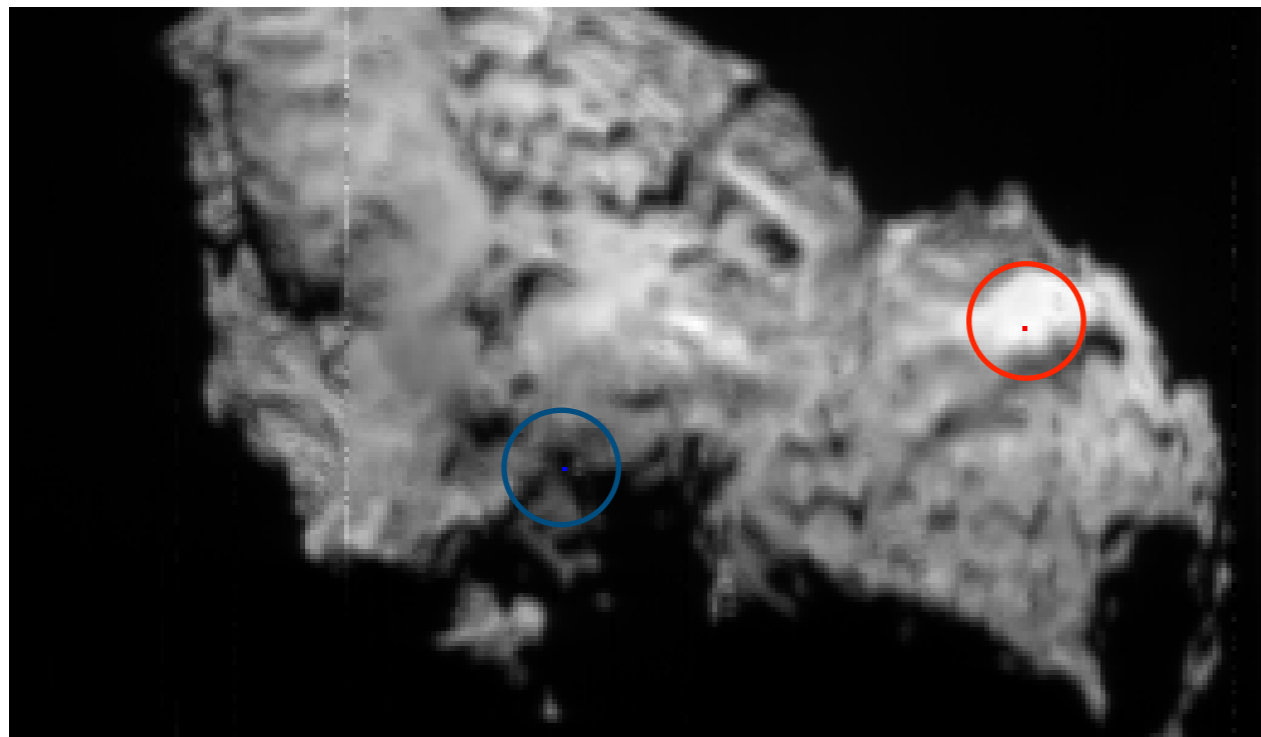
VIRTIS-M-IR



The figure shows the spectral cube in the wavelength channel 76. Bad pixels are highlighted within the magenta circle.

RID: The bad pixels should be flagged

VIRTIS-M-IR



The figure shows the comparison between spectra extracted in two different location. The red spectrum, extracted in correspondence of a bright region, shows a strange behavior beyond 4.3 micron possibly due to saturation. If that is the case, the spectra should be flagged as NaN or masked. RID: explain reason for strange behavior of the red spectrum. The data should be flagged when they are not reliable.