

# Corrupted 128 pixels OMEGA cubes (version 1, 16/05/13).

## I. Orbits $\geq 513$ to orbits $\leq 2123$ :

### A. Typical case

- Columns **80:95** with idl numbering (i.e., columns # 81 to 96) are corrupted for **specific wavelengths** only.

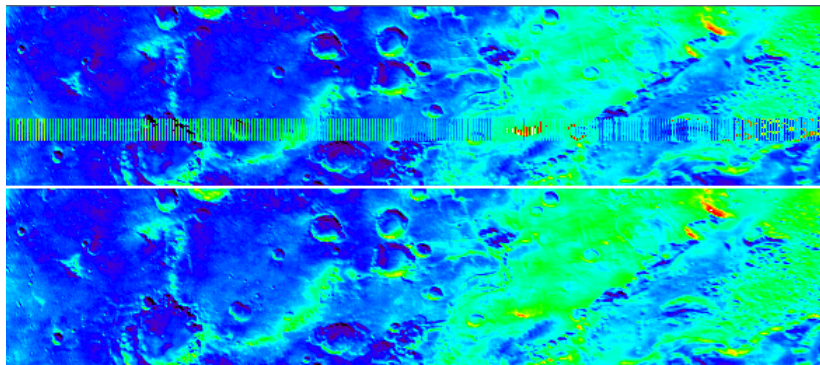


Figure 1 : Cube 0544\_2, spectel 12 (top) and 11 (bottom). Lines/Columns reversed.

- Perturbation consists of high or low value of reflectance compared to surrounding wavelengths.

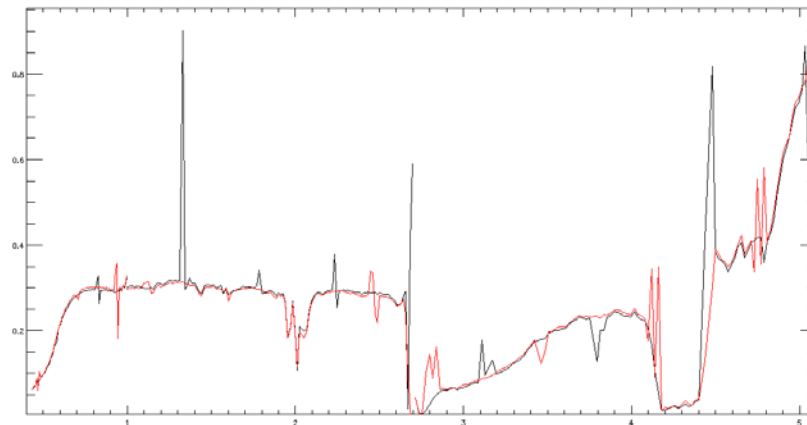


Figure 2 : cube 1590\_2, spectrum at x=88 and y=200 (black) and y=201 (red).

- Perturbed wavelengths: groups of 4 contiguous spectels every 32 spectels interval, starting from either 12 or 28 (idl numbering). Example: 12,13,14,15,44,45,46,47 etc...
- Starting position alternate every line.
- Starting position of first line can be either 12 or 28, without apparent rule. Thus, **2 types of parity exists**:
  - Parity “#1”: odd lines are perturbed starting spectel 12, even lines starting spectel 28.
  - Parity “#2”: reversed (12 is perturbed in even lines, 28 in odd lines).

## B. Specific cases

- Cubes of orbit 511 (\_2, \_3, \_4) are sometimes included in the range while not corrupted.
- Orbit **576 is specific**: cube 0576\_2 is **corrupted for all columns and all wavelengths**; cube 0576\_4 is **not corrupted** ; in-between cube 0576\_3 is half whole corrupted, half not corrupted.

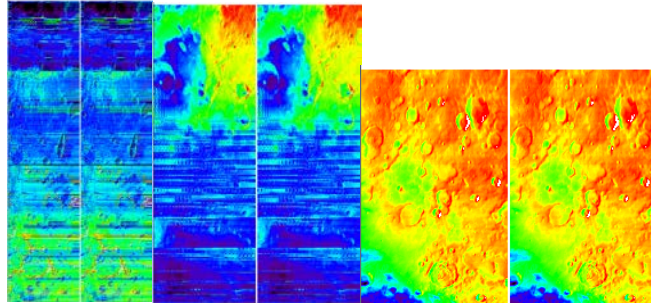


Figure 3 : Orbit 576, Cubes 2, 3, 4 (from left to right). Spectels 12 and 11 are shown for each cube.

- Columns **64:\*** (idl numbering) are sometimes also **slightly perturbed**. An example: cube 1765\_1 (issue discernible while comparing a ratio of adjacent wavelengths).

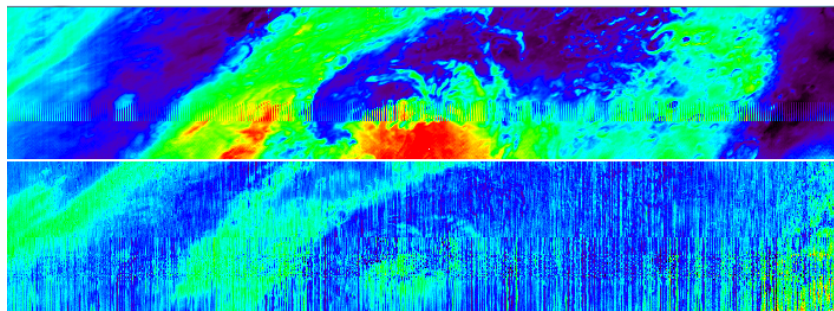


Figure 4 : cube 1765\_1, spectel 12 (top, usual perturbation on columns 80:95) and ratio of spectels 10 over 11 (bottom; slight perturbation of columns 64:\*). Lines/Columns reversed.

- Other wavelengths can also be slightly perturbed over 80:95, issue discernible with ratio (e.g., cube 1306\_4)

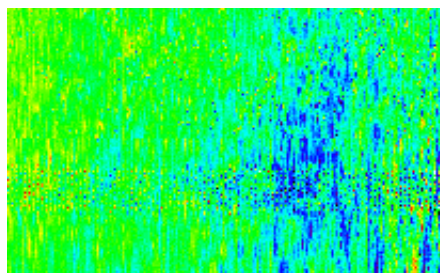


Figure 5 : Cube 1306\_4,  $jdat(10)/jdat(11)$ . Color scaling between 0.975 and 1.005. Data are slightly perturbed, in relative terms, over 80:95, even outside the usual [12 : 16] wavelength subset. Lines/Columns reversed.

- Parity change within a few cubes for which there are lines containing “0” data (e.g., 1958\_2). However some cubes with “0” lines do not see parity change (e.g., 2010\_3).

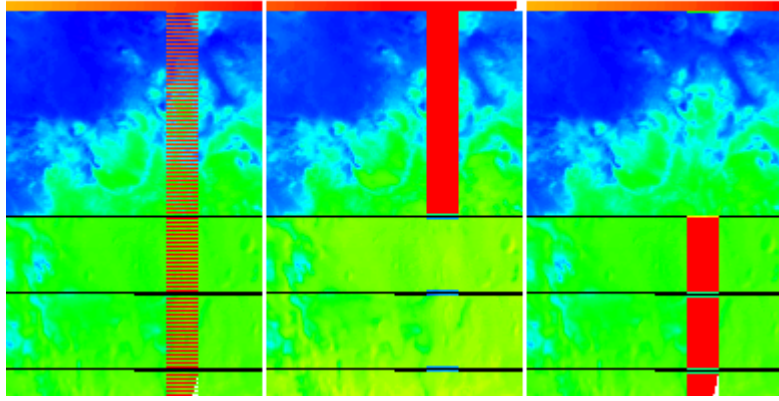


Figure 6 : Cube 1958\_2, spectel 28. Left, no correction. Middle, parity #1 spatial interpolation; Right, parity #2 spatial interpolation.

## II. Orbits $\geq 2124$ to orbits $\leq 3283$ :

- Same issue + systematic significant perturbation of columns 64:\* (id numbering) for most wavelengths.

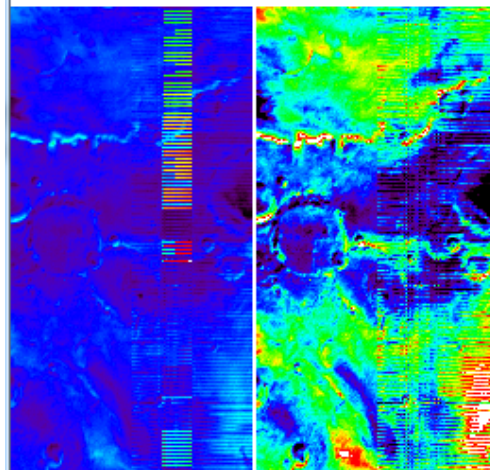


Figure 7 : Cube 2124\_1, spectel 12 (left) and 11 (right). Two perturbations are combined, the “80:95” observed for cubes  $\geq 513$  and the “64:\*” significantly observed for cubes  $\geq 2124$  (but already slightly present earlier, e.g. Figure 4).

- Perturbation intensity and regularity change with wavelengths and with orbit number.

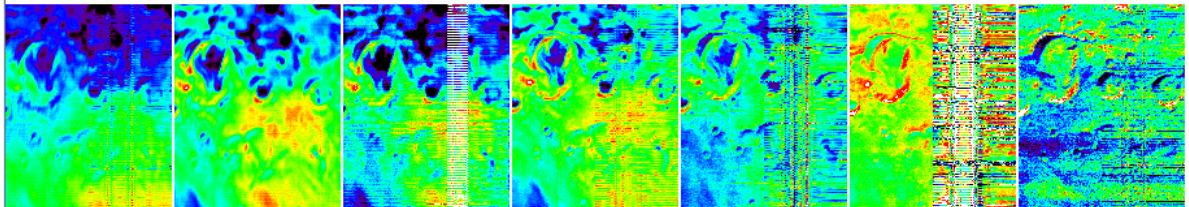


Figure 8 : Cube 2141\_1, from right to left spectels 280,305 and 335 (Vis),11 and 120 (C),190, and 240 (L). Some wavelength (305) are not perturbed.

- Perturbation is sometimes line dependent with parity similar to the “80:95” effect.

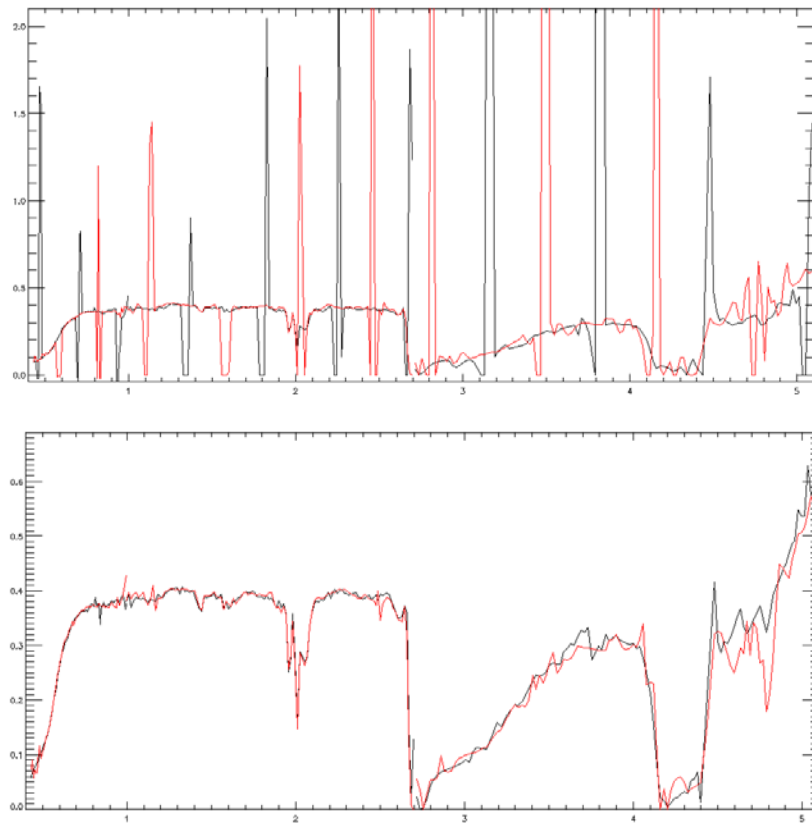


Figure 9 : Example of corrupted spectra within (top,  $x=88$ ) and outside (bottom,  $x=70$ ) the 80:95 area. Cube 2318\_6,  $y = 200$  (black) / 201 (red). The intensity of the “80:95” effect is usually larger.

### III. Correction

#### A. Possible correction

- The “80:95” effect:
  - Is regular, **except for the parity type which is random and must be estimated for each orbit**
  - Is **stronger in intensity** for orbits greater than 2124 compared to the “64:\*” effect.
  - It can be corrected by **spatial interpolation** (mix of upper and lower lines).
  - Or it can be accounted for by removing perturbed spectels from the “ic” list of good spectels provided by readomega.pro.
- The “64:\*” effect:
  - Is irregular
  - Is of low amplitude for several wavelengths and orbits.
  - It can be sometimes partly corrected by spatial interpolation for wavelength for which the 64:\* issue has the same odd/even regularity as the “80:95” issue (see [Figure 10](#), [Figure 11](#)).



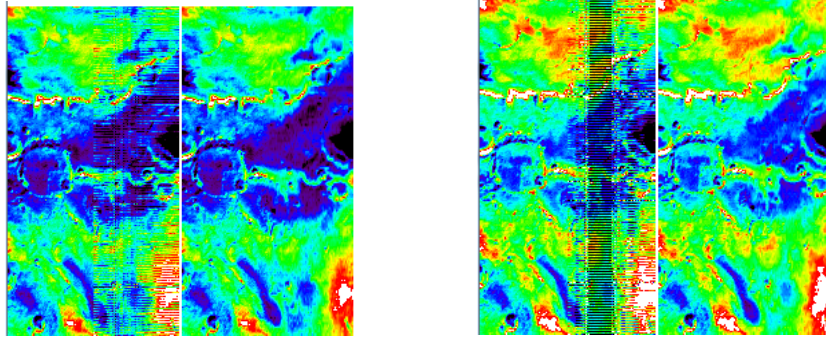


Figure 10 : Cube 2124\_1. Right, spectel 11 ("64:\*)" only); Left, spectel 28 (similar "80:95" and "64:\*" regularity). Original image and corrected image with a spatial interpolation "Even lines = average of surrounding odd lines" are shown for each spectel.

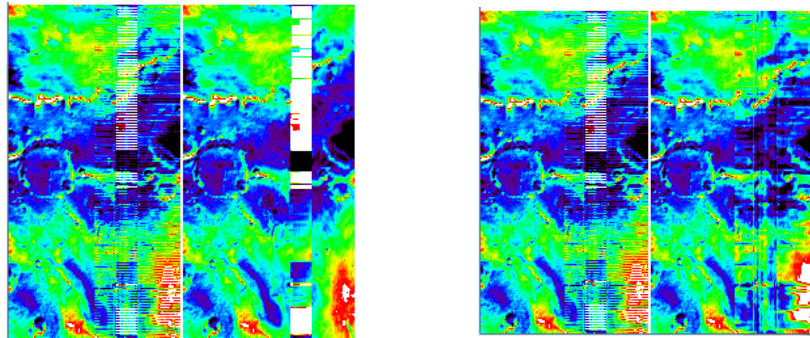


Figure 11 : Cube 2124\_1. Same as Figure 10 for spectel 12 and two different spatial interpolation types (even line replaced on right, odd lines replaced on left). Only columns outside "80:95" can be properly corrected.

- For the "64:\*" effect, typical example of recoverable or improvable wavelengths range with corresponding parity (test cubes: #1 = 2141\_1, #2 = 2188\_7, #3 = 2197\_7 and #4 = 2382\_6, #5 = 2593\_1, #6 = 3040\_2):
  - with parity #1 (odd good) :
    - 0-63 except 12:15 and 44:47 (reverse parity for cube #3, 6 ; weakly affected in cube #5)
    - 192-255 except 204:207 and 236:239 (not valid for cube #3 ; reverse parity for cube #5)
    - 304 - ~ 320-340 except 316:319
  - With parity #2 (even good)
    - 64 – 71 (75 for #4)
    - 256-303 except 268:271 (weakly affected for cube #5)

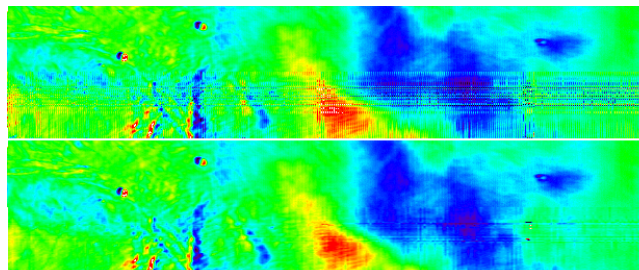


Figure 12 : Example of non-perfect improvements that can be obtained with "64 :\*" issue. Spectel 310: original (top) and corrected (bottom) with spatial interpolation #1 (even lines replaced).

## B. Correction tools

- ***omega128\_ic.pro***
  - Exclude all perturbed wavelengths of the “80:95” issue, regardless of line parity, from the “ic” list of good spectels provided by readomega.pro

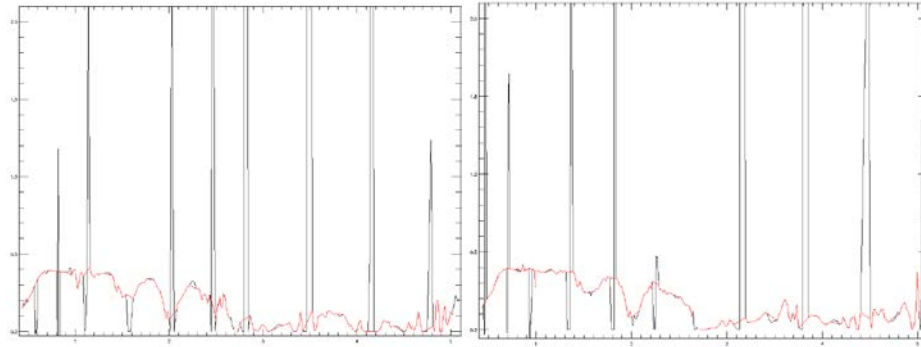


Figure 13 : Cube 3000\_1, spectrum of line 201 (left) and 202 (right) for x=86. With original ic (black) and modified ic (red).

- ***omega128\_interpol.pro***
  - Perform a spatial interpolation of columns 80:95 for perturbed wavelength only.
  - Use ***omega128\_interpol.sav***, a pre-calculated list of parity type for each cube. List elaborated with an automatic routine, and validated by visual inspection of each cubes. List contains cubes for which parity cannot be determined (cubes with changing parity due to empty lines, corrupted cubes, dark cubes etc....).
  - Remove all artifacts for orbits  $\leq 2123$ .

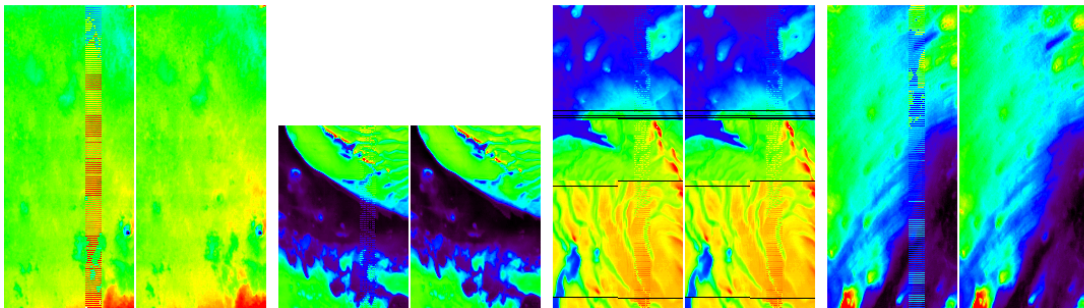


Figure 14 : Examples of automatic application of the routine to 4 cubes in the  $\geq 513 \leq 2123$  range. Cube #3 is not corrected as parity change within cube due to empty lines.

- Remove the “80:95” effect only for orbits  $\geq 2124$ .

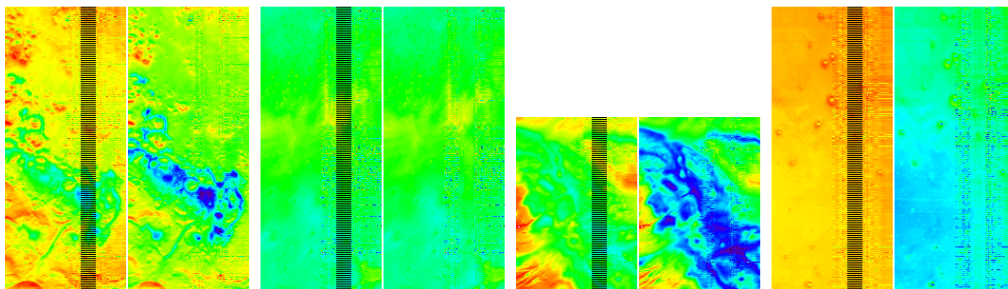


Figure 15 : Idem for 4 cubes in the  $\geq 2124$  range (only 80:95 columns corrected).