LAB #1 — REPORT

30 points possible

All materials must be uploaded to Gradescope by 10 am on Thursday, January 27 2022 (check Brightspace for updates on due date)

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First part: CG/67P, 27 km 2014 OSIRIS Wide Angle, Rosetta.

2048x2048

At the end of the lab, you should have created the following files in your working directory:

- This report, edited and filled out

- Copies of your journal files

- cgimg\_log.tif

- cgimg\_linear.tif

- hst\_mars\_false\_color.tif

- hst\_mars\_true\_color.tif

- hst\_mars\_false\_color\_auto.tif

- hst\_mars\_true\_color\_auto.tif

- write\_true\_color.pro

- write\_false\_color.pro

1. (a) What is the range of data values in the image? (1 pts)

(image was pre-calibrated, so in the right values)

Minimum (W/m^2/steradian/nm): -6.22343e-08

Maximum (W/m^2/steradian/nm): 0.000543932

(b) Paste “cgimg\_log.tif” below (1 pt)



(c) Based on your plot, in which part of the x-axis does the log curve change most rapidly?   
(1 pt)

Below ~30 bytes

(d) Based on your answer, does the log stretch emphasize variability in the dark or bright parts of the image? Explain how you reached this conclusion. (2 pts)

Log stretch emphasizes low bytes.

(e) Paste “cgimg\_linear.tif” below (1 pt)



(f) For this observation, which image do you prefer - linear or log - and why? Does one allow you to see features that the other does not? (2 pts)

Linear, easier to tell surface structures. Log shows (when values are adjusted) the coma (very diffuse) in a way that the linear stretch cant show.

2. (a) Which of the redimg, grnimg, and bluing arrays has the biggest range in data values, and what is the maximum value? (2 pts)

Red – 0 – 0.38864

Green 0-0.204125

Blue – 0-0.148593

Array:

Max value:

Cant do an asinh stretch – not an option.

(b) If this was a similar image of Earth, which image would have the highest value and why would it be different? (2 pts)

(c) Paste “hst\_mars\_truecolor.tif” below. (1 pt)



3. (a) What stretch limits did you use to create your false color image showing clouds and ice on Mars? (3 pts)

Red: Min = 0 Max = 0.4

Green: Min = 0 Max = 0.204

Blue: Min = 0 Max = 0.1

(b) Paste “hst\_mars\_falsecolor.tif” below. (1 pt)



4. (a) Why is your code to write out an image written as a program and not a function? (1 pt)

A function is made to output new data, that it not necessary for this method of plotting as no new data is made or recorded, so we write this as a program.

(b) Paste your code in **write\_true\_color.pro** below (4 pts)

(c) Paste “hst\_mars\_true\_color\_auto.tif” below. (1 pt)



4. (a) What type of stretch will you use to create your false color image, noting that we’ll use this same program for images of a variety of targets (not just Hubble Mars), and why? (1 pt)

I used the square root stretch, but wrote the program to be able to handle linear, 2% linear, and square root. The log function did not work because it caused infinities in the values, so I think I miss understood the instructions. The resulting image from this stretch is similar to the real color, but better emphasizes the ice at the poles and in clouds. It also reduces the color overall to be darker.

(b) Paste your code in **write\_false\_color.pro** below (4 pts)

|  |
| --- |
| PRO write\_false\_color, red, grn, blu, filename, KEY1 = linear, KEY2 = linear2, KEY3 = squareroot, KEY4 = log |
|  |  |
|  | ; write\_color\_tiff.pro |
|  | ; |
|  | ; Created by Kris Laferriere on Jan 20, 2022 |
|  | ; |
|  | ; Purpose: To output a color tiff image from a set of RGB images |
|  | ; |
|  | ; Inputs: red, grn, blu = names of images to be combined (requires all three). |
|  | ; filename = string containing desired filename for output |
|  | ; KEYW = names of the method, either linear, linear 2%, square root or logarithmic |
|  | ; |
|  | ; Outputs: writes image file to working directory with the provided filename |
|  | ; |
|  |  |
|  | ; need to restore, 'mars\_colorimg.sav' |
|  |  |
|  | IF KEYWORD\_SET(linear) THEN BEGIN |
|  | mr = bytscl(red, min=min(red), max=max(red)) |
|  | mg = bytscl(grn, min=min(grn), max=max(grn)) |
|  | mb = bytscl(blu, min=min(blu), max=max(blu)) |
|  | END |
|  |  |
|  | IF KEYWORD\_SET(linear2) THEN BEGIN |
|  | mr = bytscl(red, min=0.02\*max(red), max=0.98\*max(red)) |
|  | mg = bytscl(grn, min=0.02\*max(grn), max=0.98\*max(grn)) |
|  | mb = bytscl(blu, min=0.02\*max(blu), max=0.98\*max(blu)) |
|  | END |
|  |  |
|  | IF KEYWORD\_SET(squareroot) THEN BEGIN |
|  | mr = bytscl(red, min=min(sqrt(red)), max=max(sqrt(red))) |
|  | mg = bytscl(grn, min=min(sqrt(grn)), max=max(sqrt(grn))) |
|  | mb = bytscl(blu, min=min(sqrt(blu)), max=max(sqrt(blu))) |
|  | END |
|  |  |
|  | IF KEYWORD\_SET(log) THEN BEGIN |
|  | mr = bytscl(red, min=min(alog(red)), max=max(alog(red))) |
|  | mg = bytscl(grn, min=min(alog(grn)), max=max(alog(grn))) |
|  | mb = bytscl(blu, min=min(alog(blu)), max=max(alog(blu))) |
|  | END |
|  |  |
|  | window, 0, xsize=460, ysize=460, title='HST Mars 2001/05/13' |
|  | tv, mr, channel=1 |
|  | tv, mg, channel=2 |
|  | tv, mb, channel=3 |
|  | erase |
|  |  |
|  | tv, [[[mr]], [[mg]], [[mb]]], true=3 |
|  | tiff\_write, filename+'.tif', red=mr, green=mg, blue=mb, planarconfig=2 |
|  | print, 'Created RGB image: ' + filename |
|  | END |

(c) Paste “hst\_mars\_false\_color\_auto.tif” below. (1 pt)



(d) Are you happy with your stretch? What does it do well vs. poorly? How does it compare to the custom stretches above? (1 pt)

Not great. A custom stretch better handles the data as to not just make it darker overall. It does accentuate the white details without having to think about changing the values.