HRSC Level4 RGB & pan-sharp

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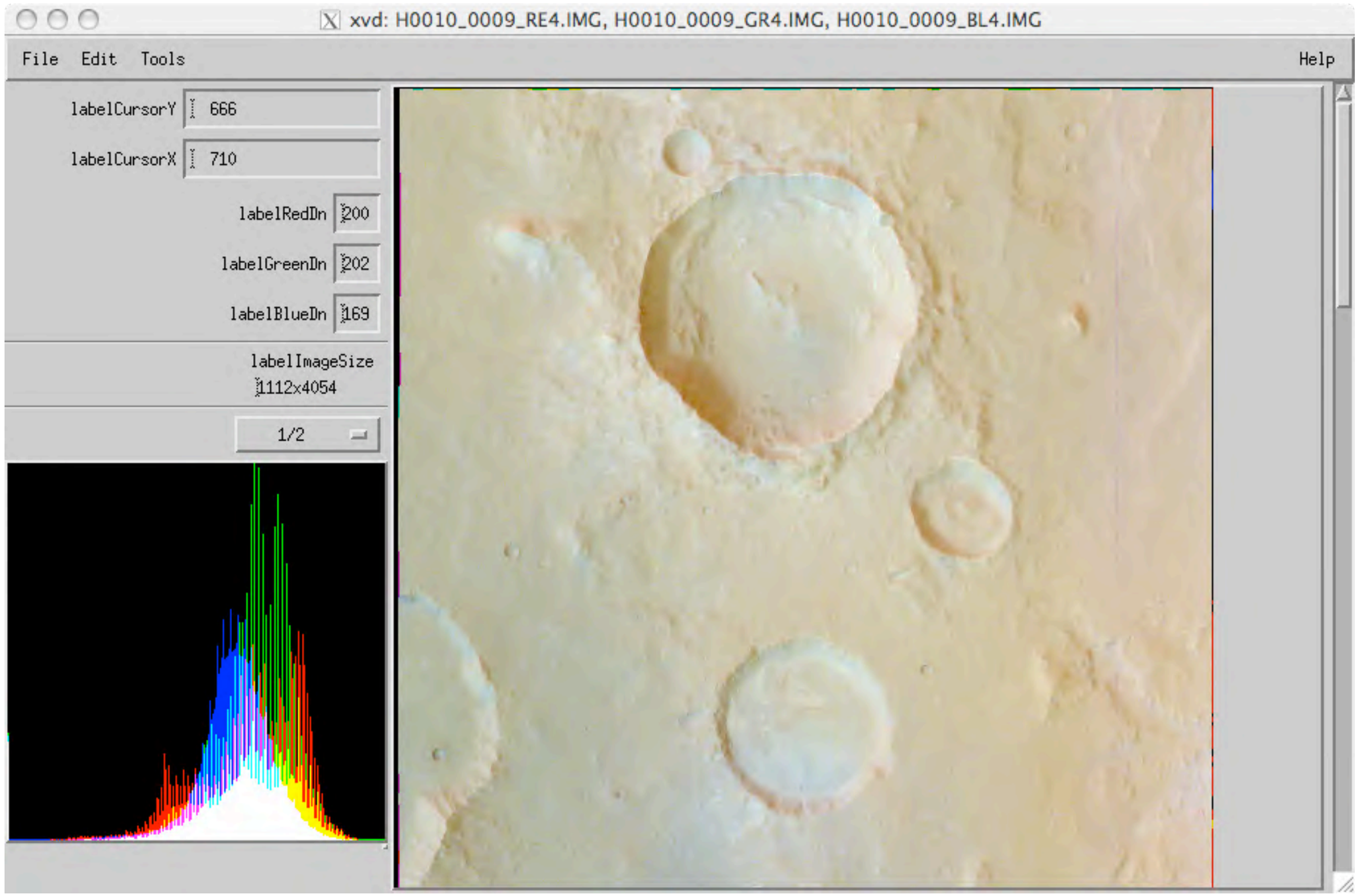
RGB with “xvd”


xvd: H0010_0009_RE4.IMG, H0010_0009_GR4.IMG, H0010_0009_BL4.IMG
File
Edit
Tools
Help
labelCursorY
666
labelCursorX
710
labelRedDn
200
labelGreenDn
202
labelBlueDn
169
labelImageSize
1112x4054
1/2

Pan-sharpening

- What is it?

  Fusion of a color data set with a panchromatic (greyscale) one with higher spatial resolution

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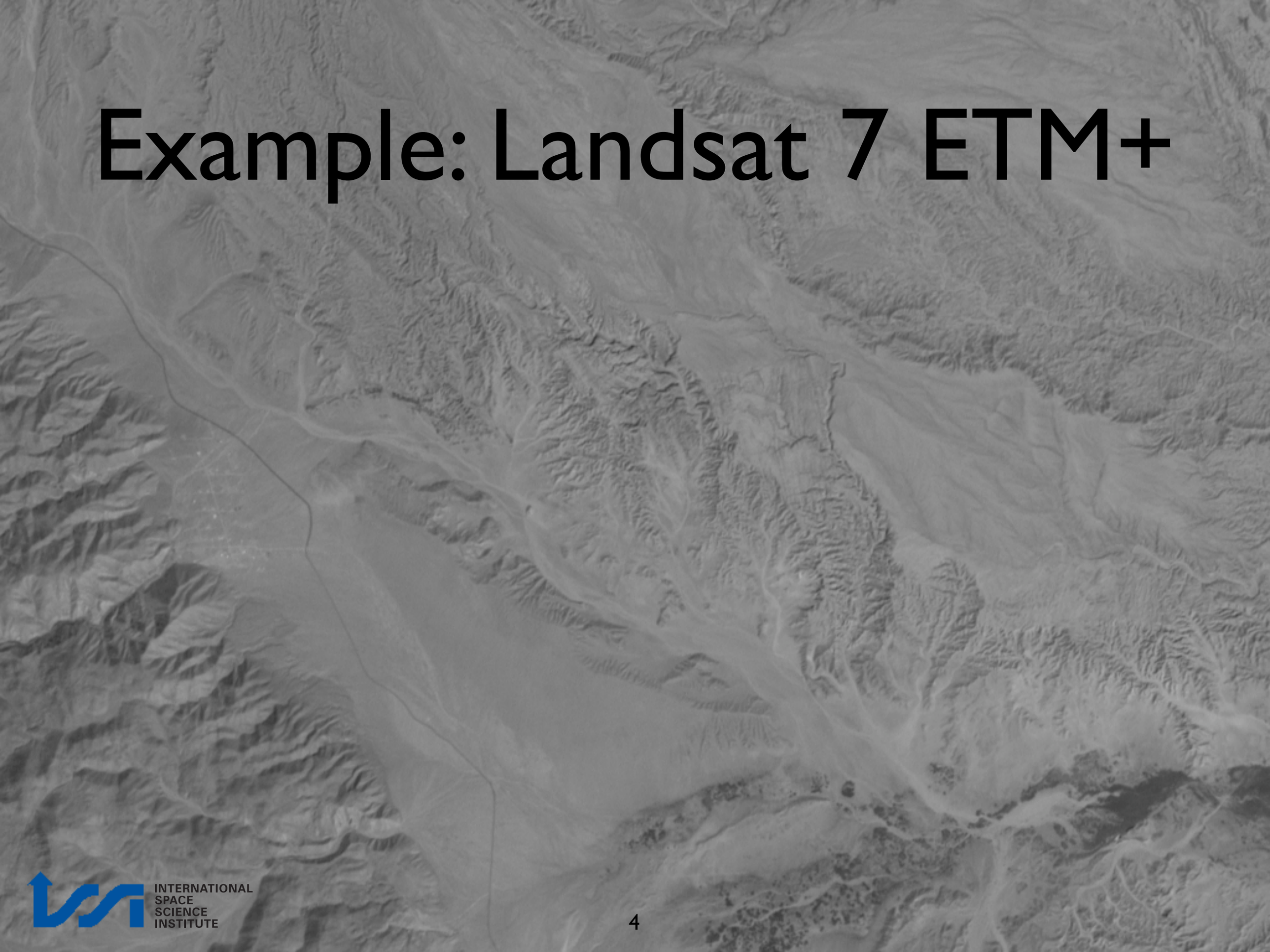
Example: Landsat 7 ETM+



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Example: Landsat 7 ETM+

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Example: Landsat 7 ETM+

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PAN sharpening algorithms

- Multiple algorithms for pan-sharpening
  - IHS
  - Brovey
  - PCA
  - Wavelet
  - .....

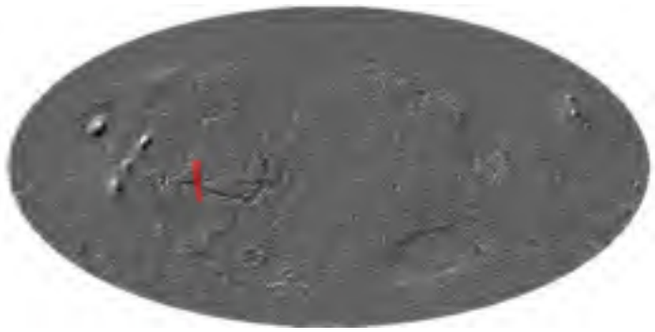
Brovey transformation

$$DN_{fused} = \frac{DN_{b1}}{DN_{b1} + DN_{b2} + DN_{b3}} * DN_{pan}$$

- Multiple tools / software packages available for pan-sharpening:
  - E.g. Envi

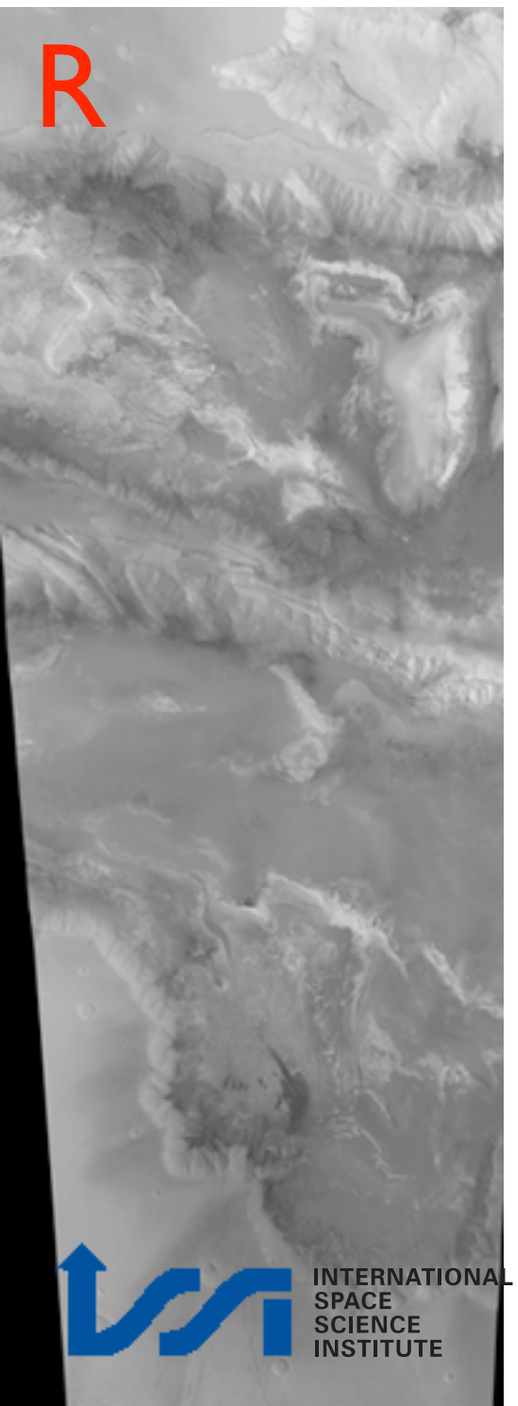
RGB & Pan-sharpening

- HRSC Level4 data in all available color bands (RE, GR, BL, IR, ND) have already the same aspect ratio (no. lines/no. columns)
- RGB color composite is immediate
- Pan-sharpening is easy to perform



RGB: example

H0360_0000



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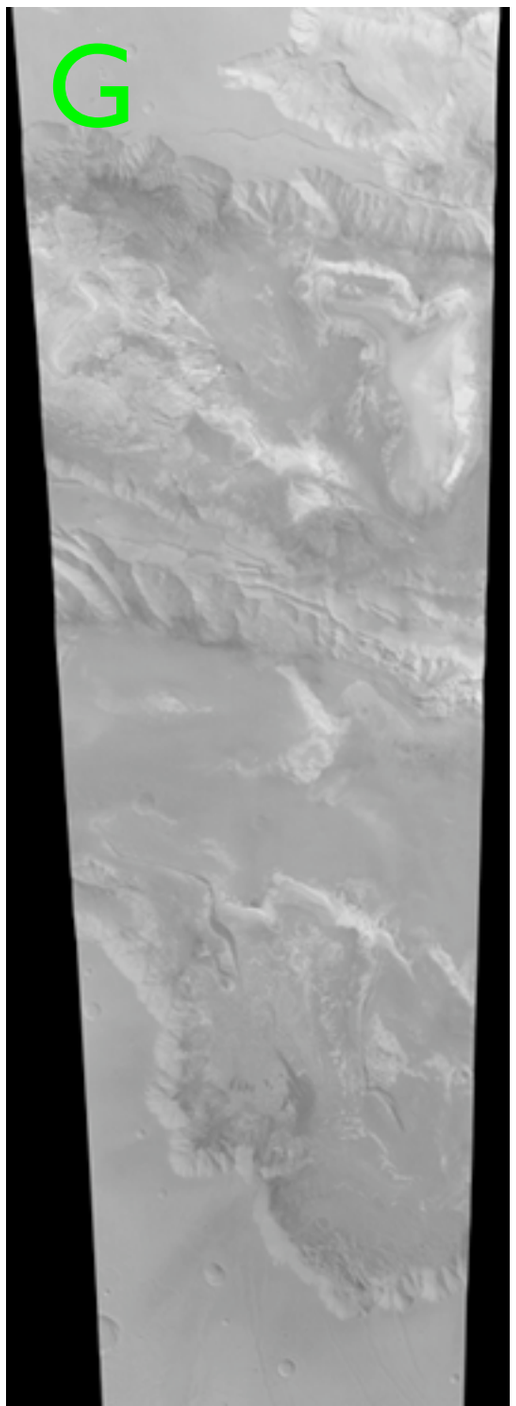

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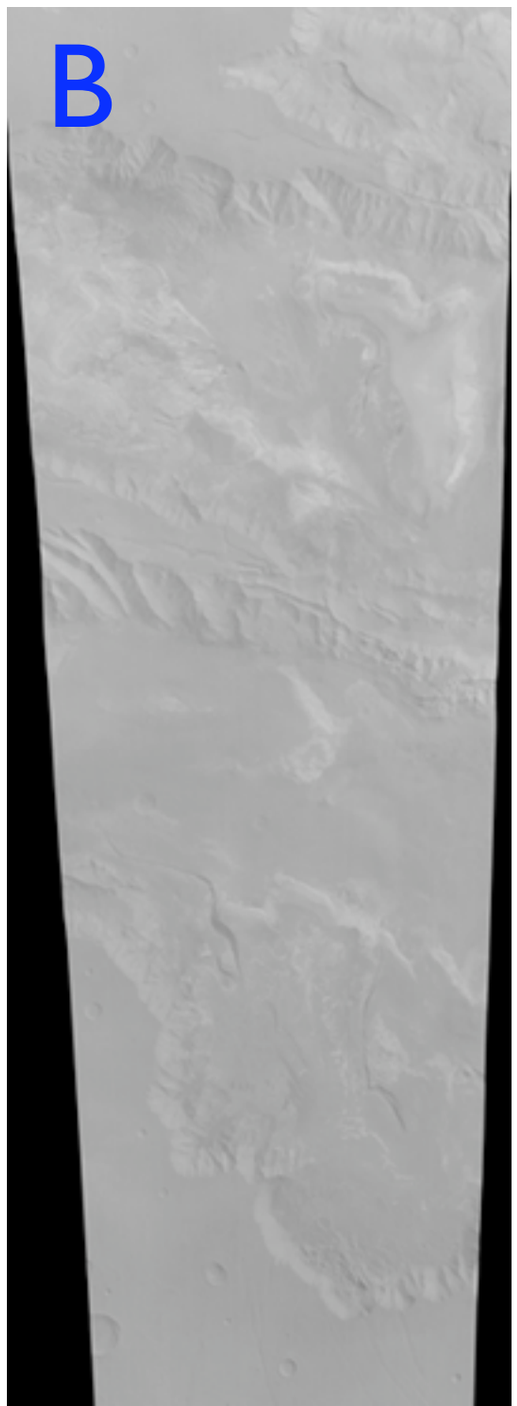

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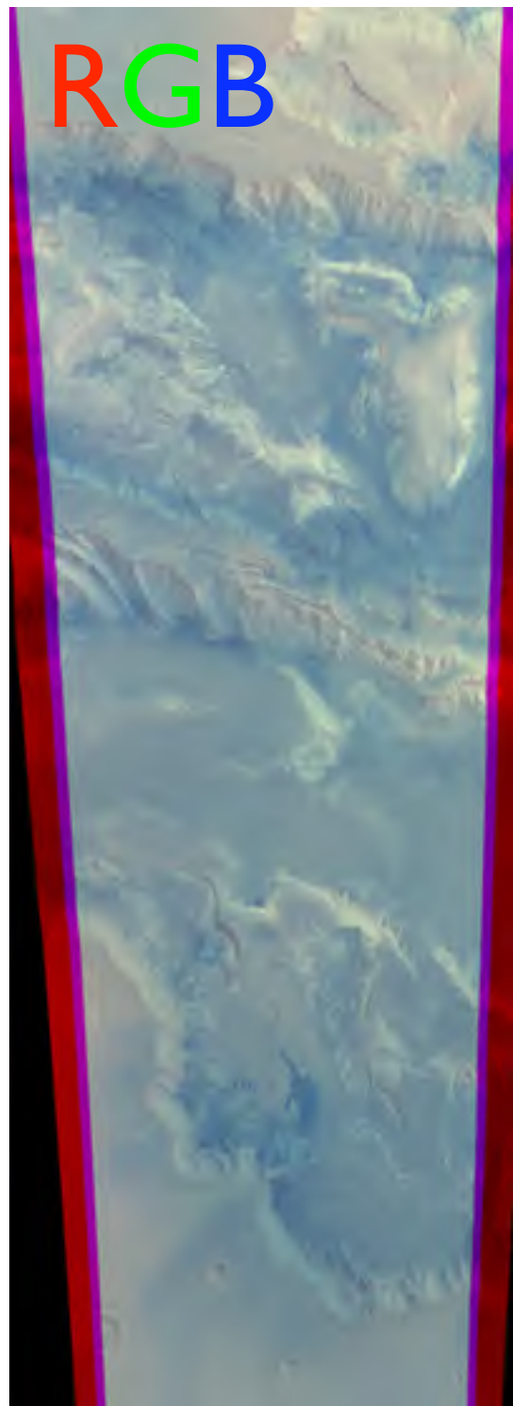

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PAN sharpening

WHAT TO DO:

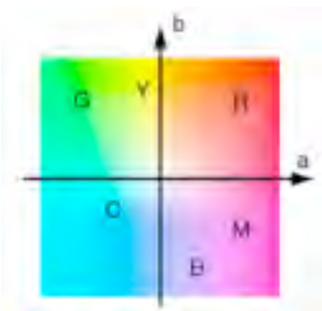
- Nadir at full resolution
- Red, green, blue <u>oversampled</u>, fitting to Nadir (same no. lines,columns)
- RGB to Lab Color
- Nadir pasted into Intensity Channel

Poor man's sharpening

L: Lightness of the color (L=0 black, L*=100 white)

a: Position between magenta and green (a<0 green, a>0 magenta)

b: Position between yellow and blue (b<0 blue, b>0 yellow)



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PAN sharpening

3 2 1 image

Lightness channel from 3 2 1 image

Panchromatic image

Pan-sharpened 321 image

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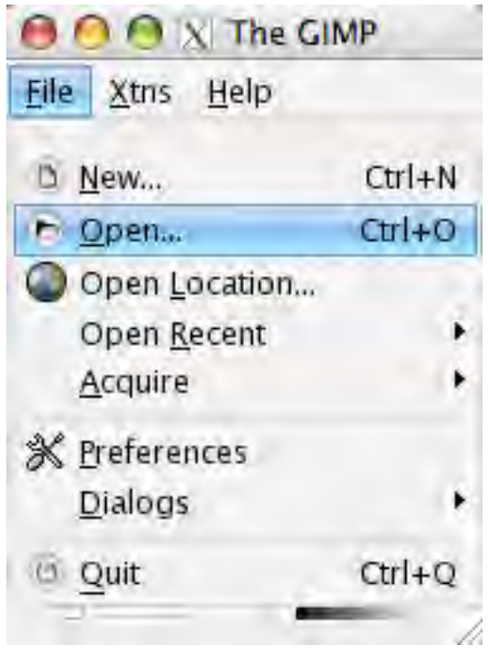
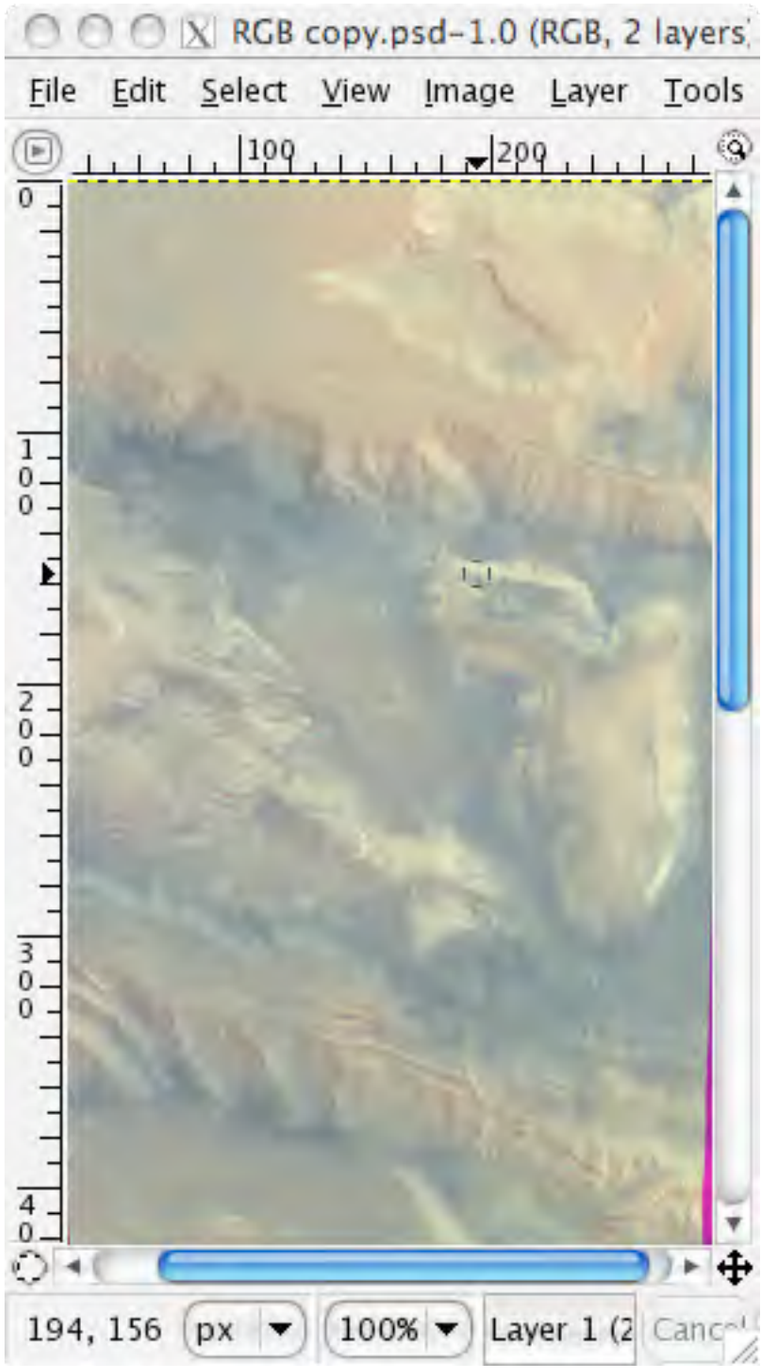
PAN sharpening - How?

- Requirement: Nadir & RGB coregistered, same number of lines & samples
- Build and RGB with Red, Green, Blue bands
- Transform RGB in Lab Color (lightness, a, b)
- Open Nadir
- Paste Nadir into “lightness”
- Transform back Lab Color in RGB

With Gimp

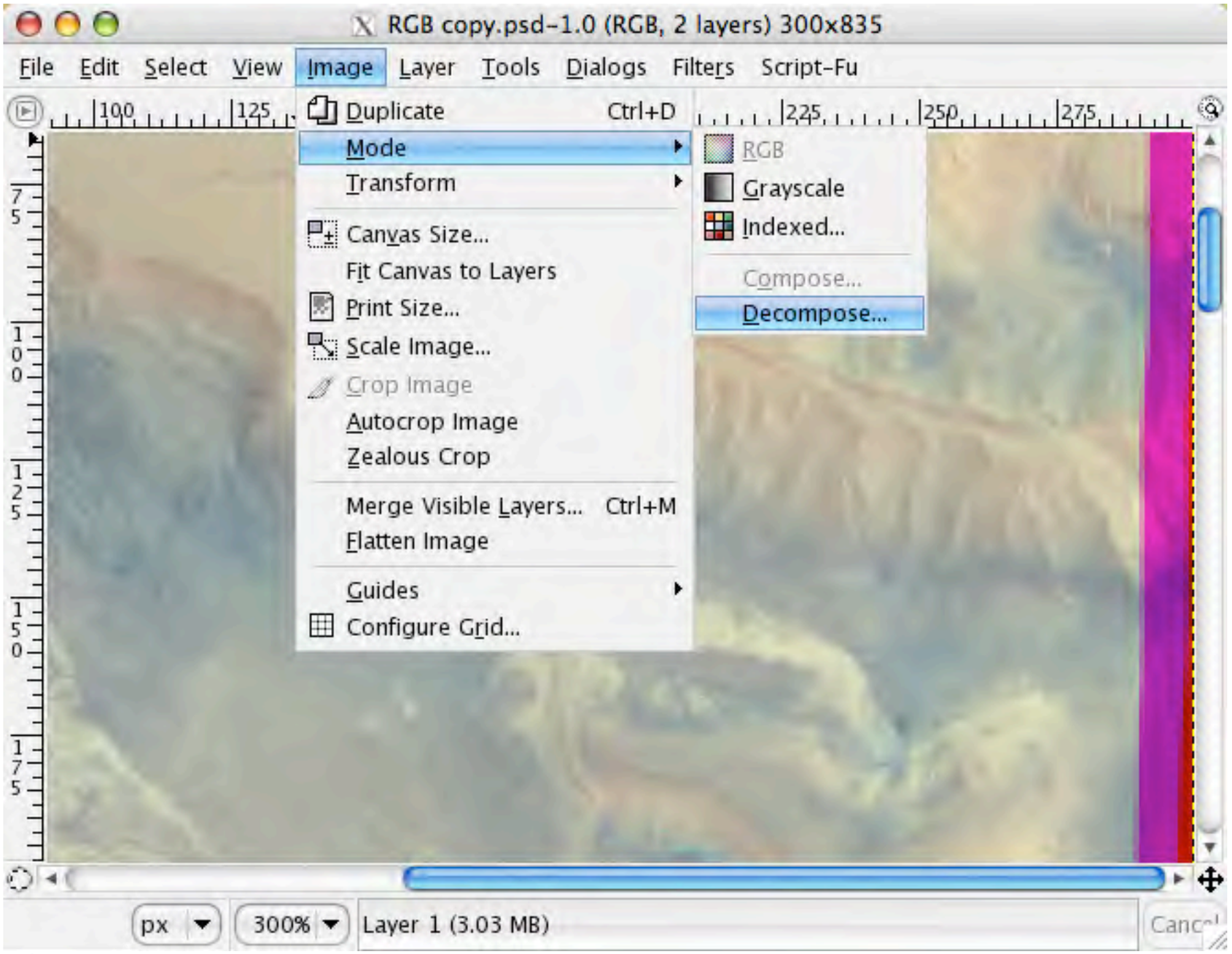
Open RGB image





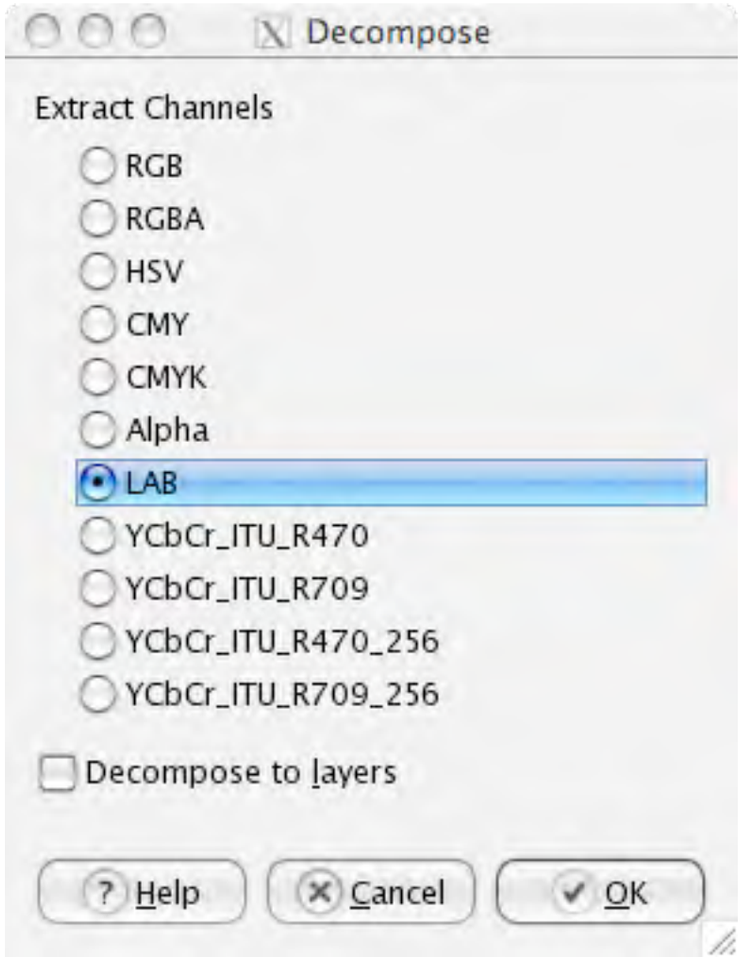
A similar task can be achieved with any image processing software, e.g. Adobe Photoshop

With Gimp



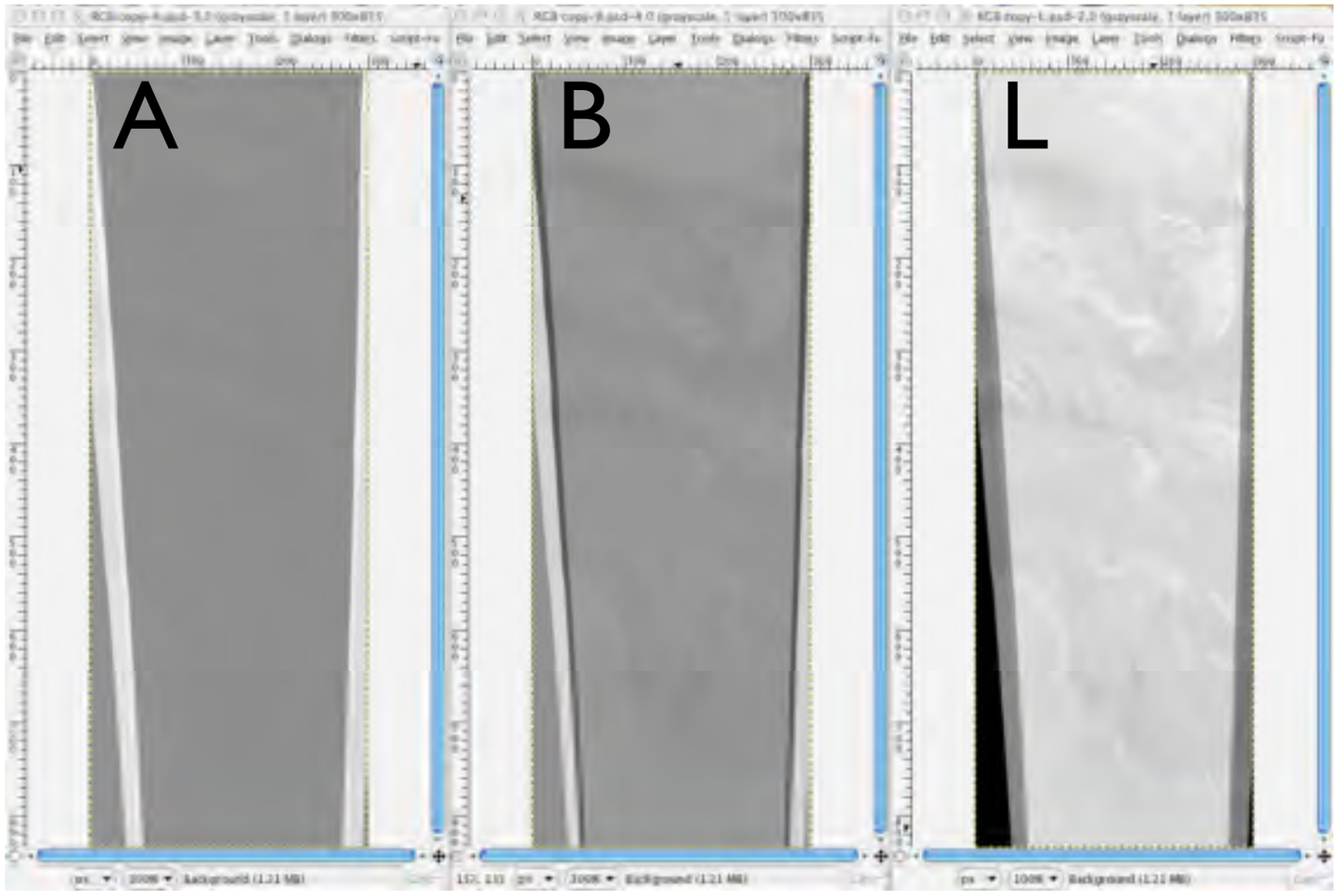
Transform RGB

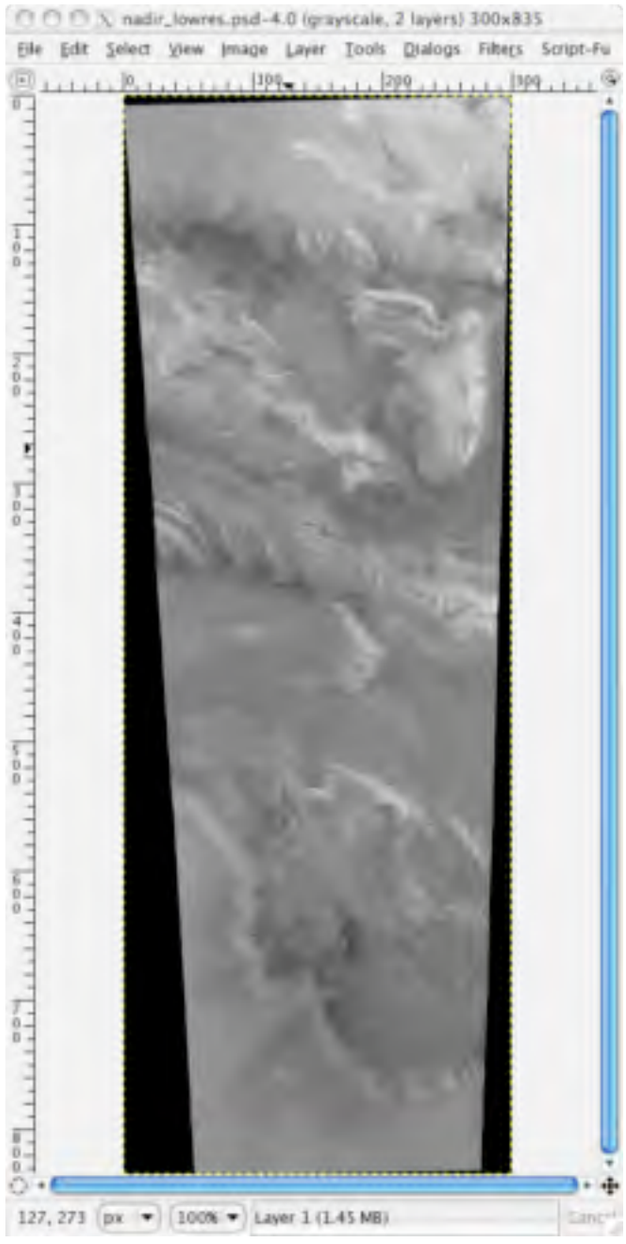
in Lab Color



With Gimp

Lab Color

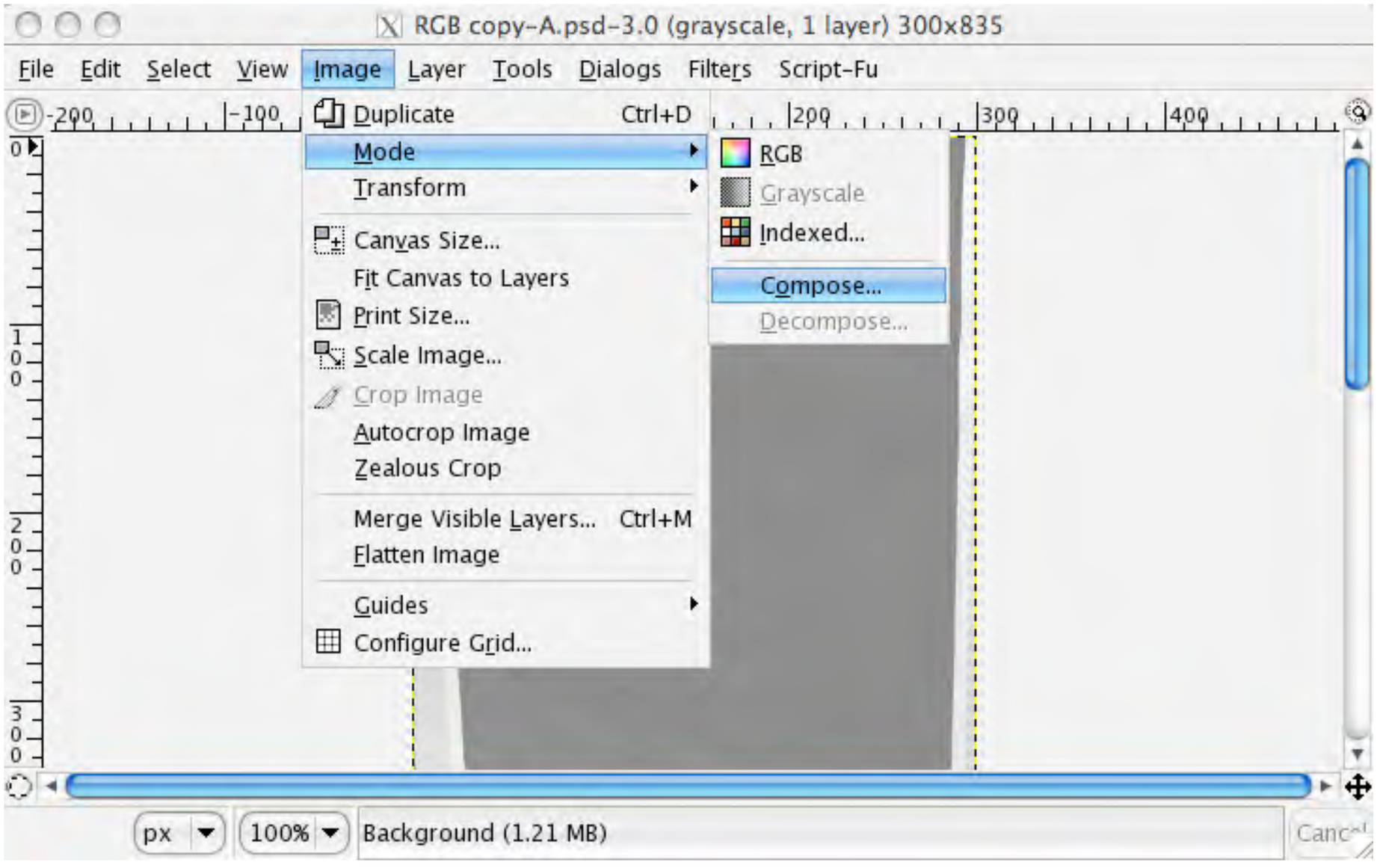




Open Nadir

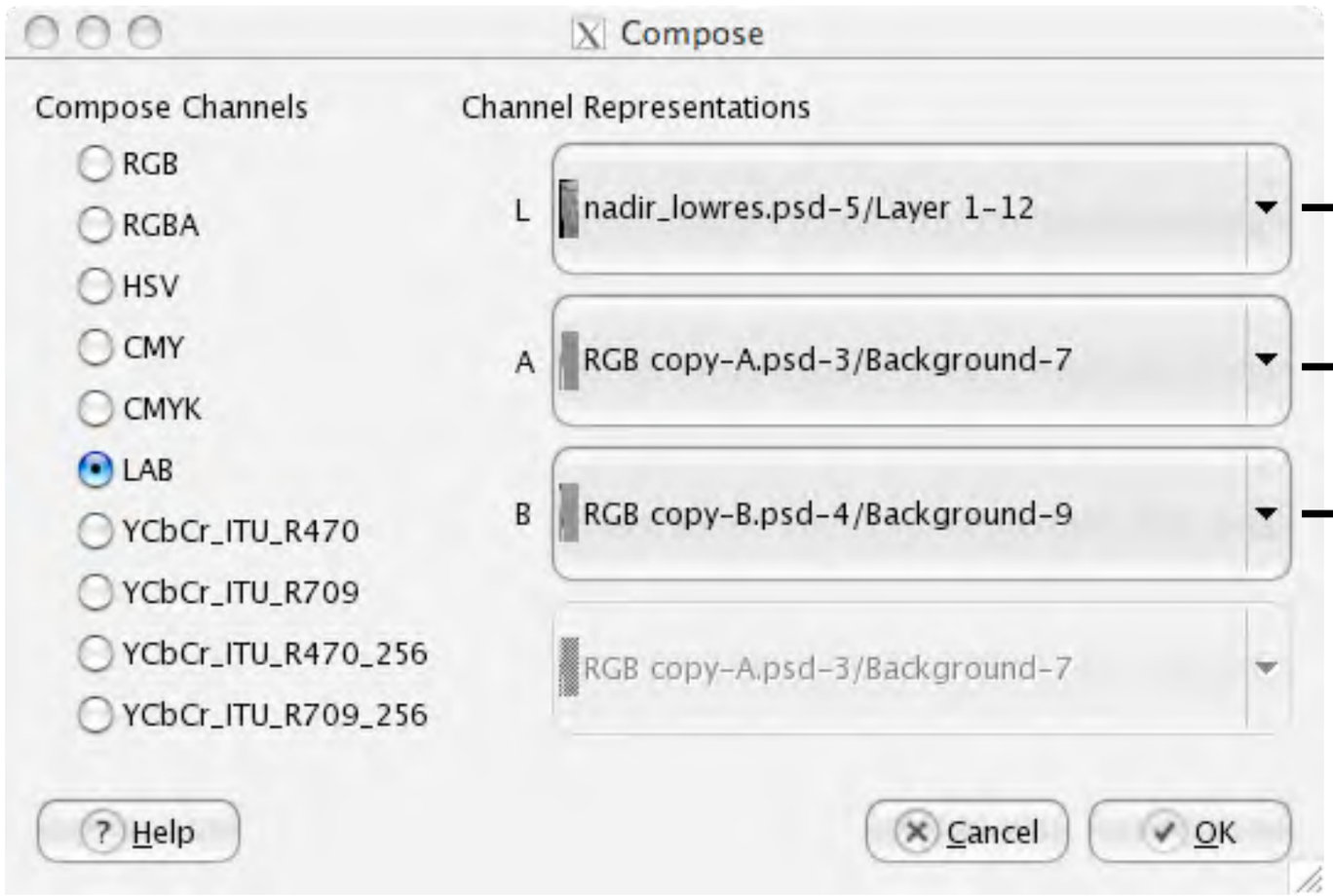
With Gimp

Recompose RGB



With Gimp

Recompose RGB



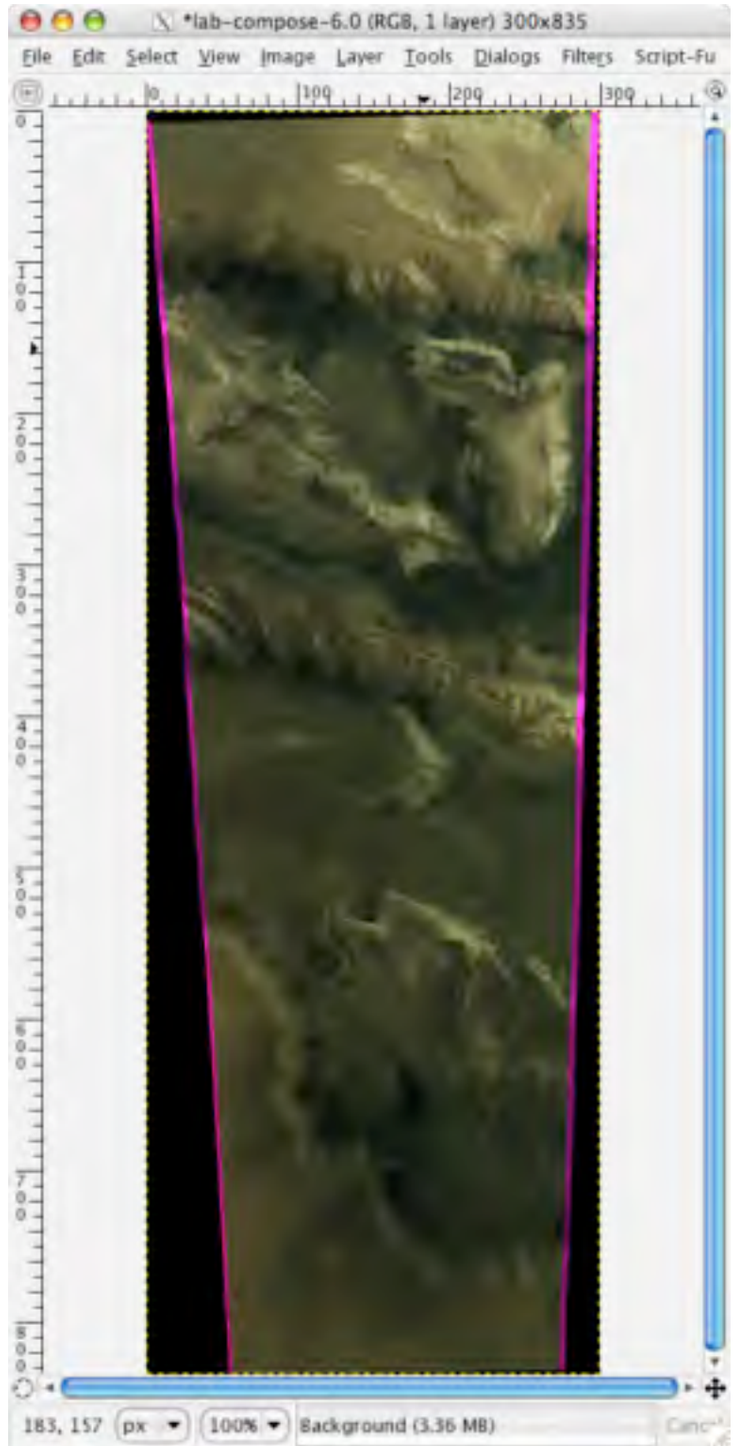
→ Nadir

→ “A” from RGB

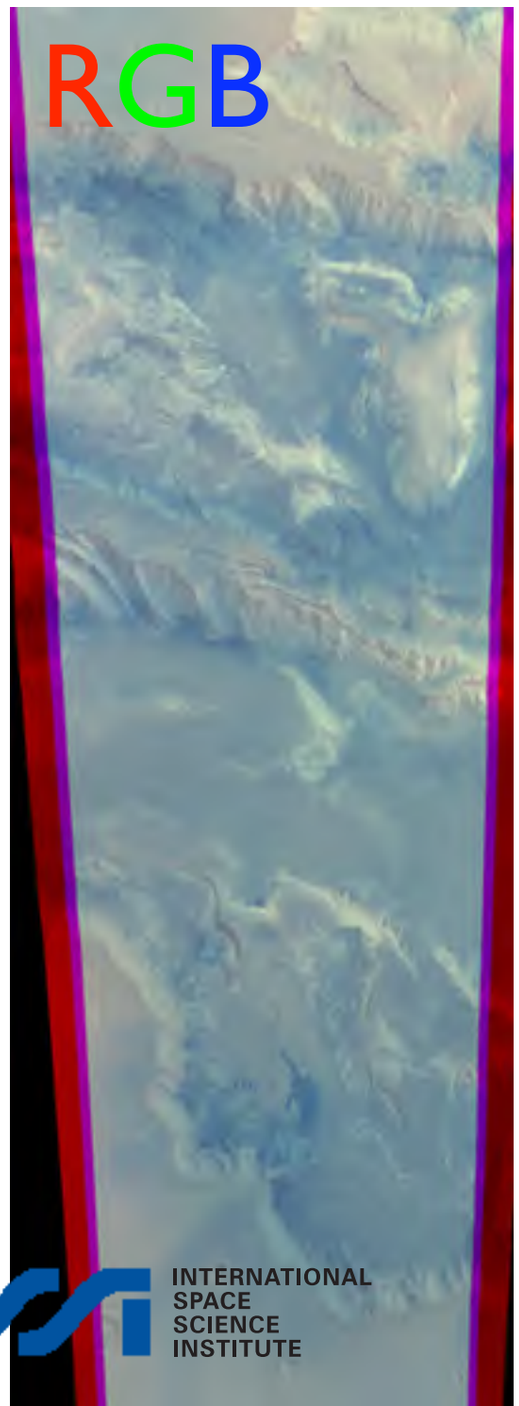
→ “B” from RGB

With Gimp

Recompose RGB



PAN sharpening



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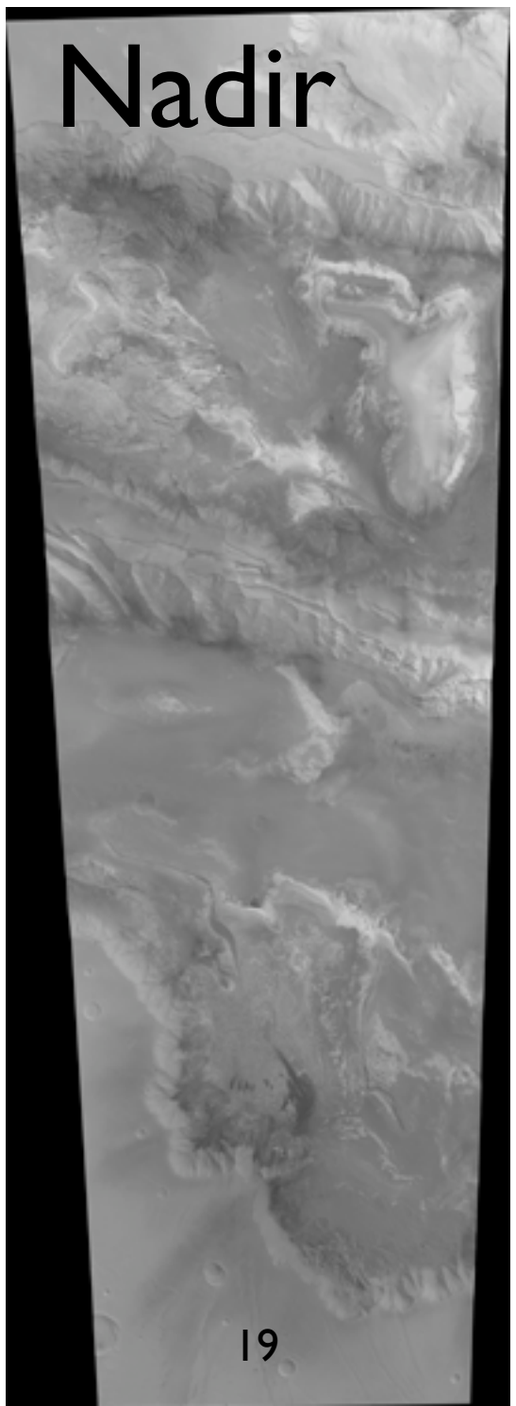

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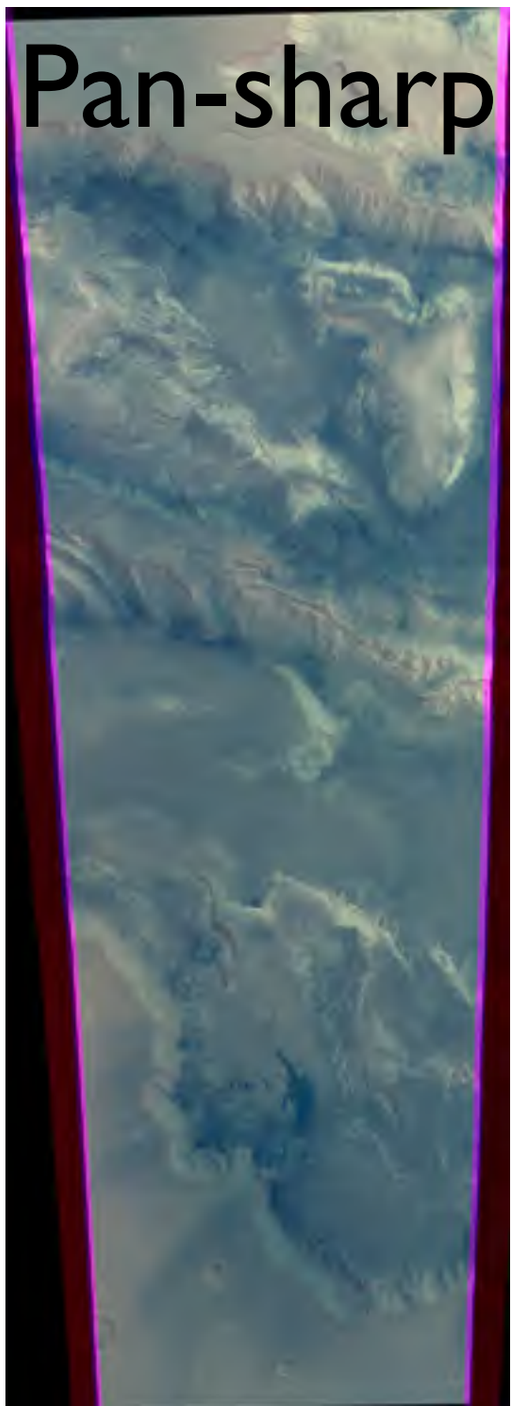

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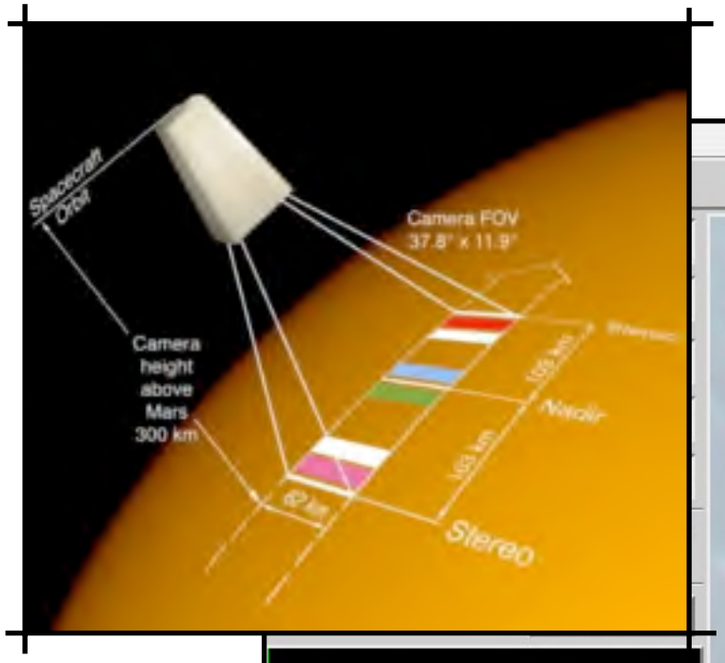
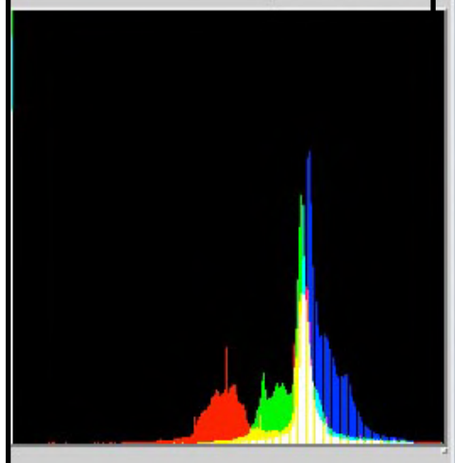
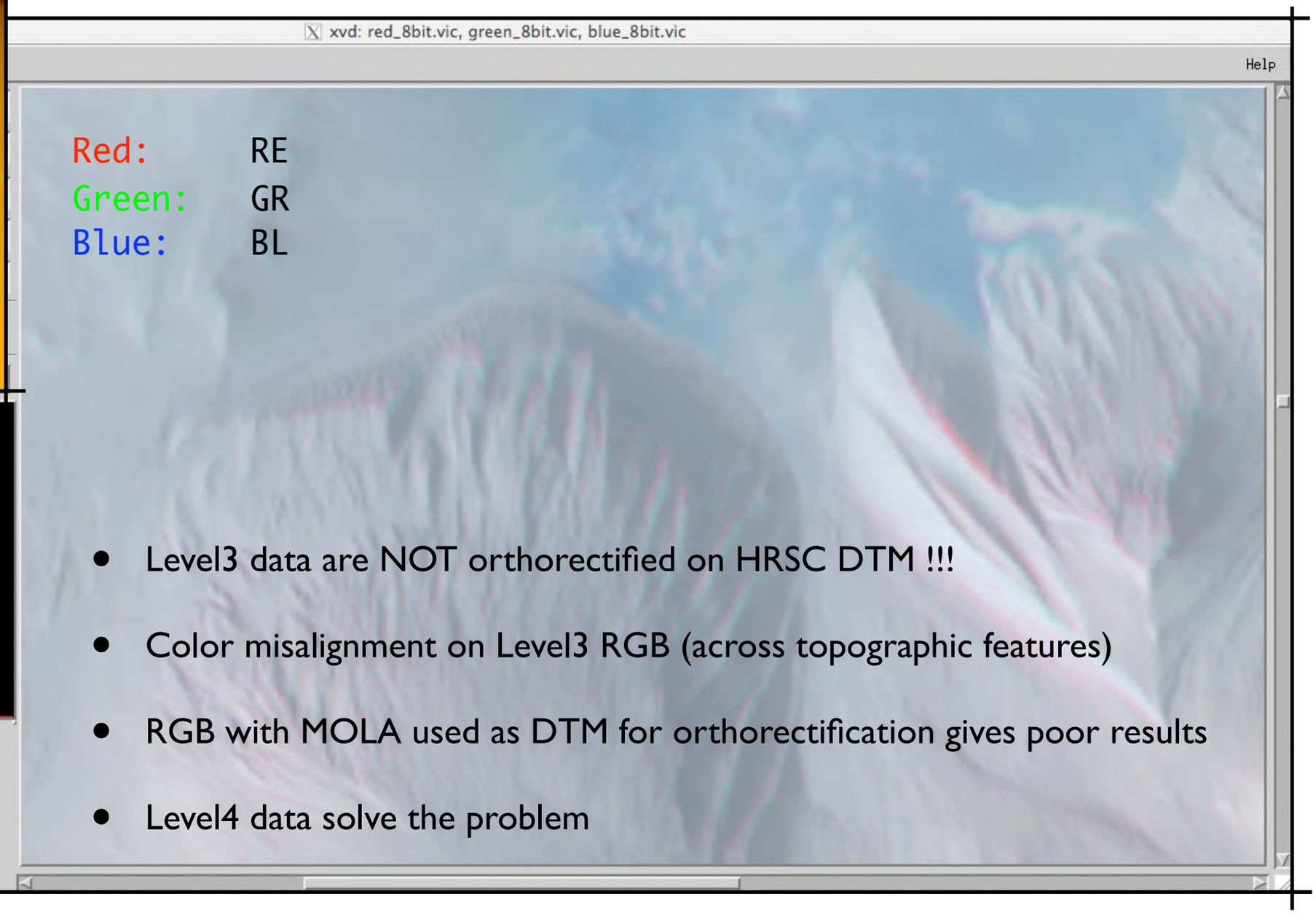
PAN-sharp result

PAN-sharp result

Why not with Level3?







- Level3 data are NOT orthorectified on HRSC DTM !!!
- Color misalignment on Level3 RGB (across topographic features)
- RGB with MOLA used as DTM for orthorectification gives poor results
- Level4 data solve the problem