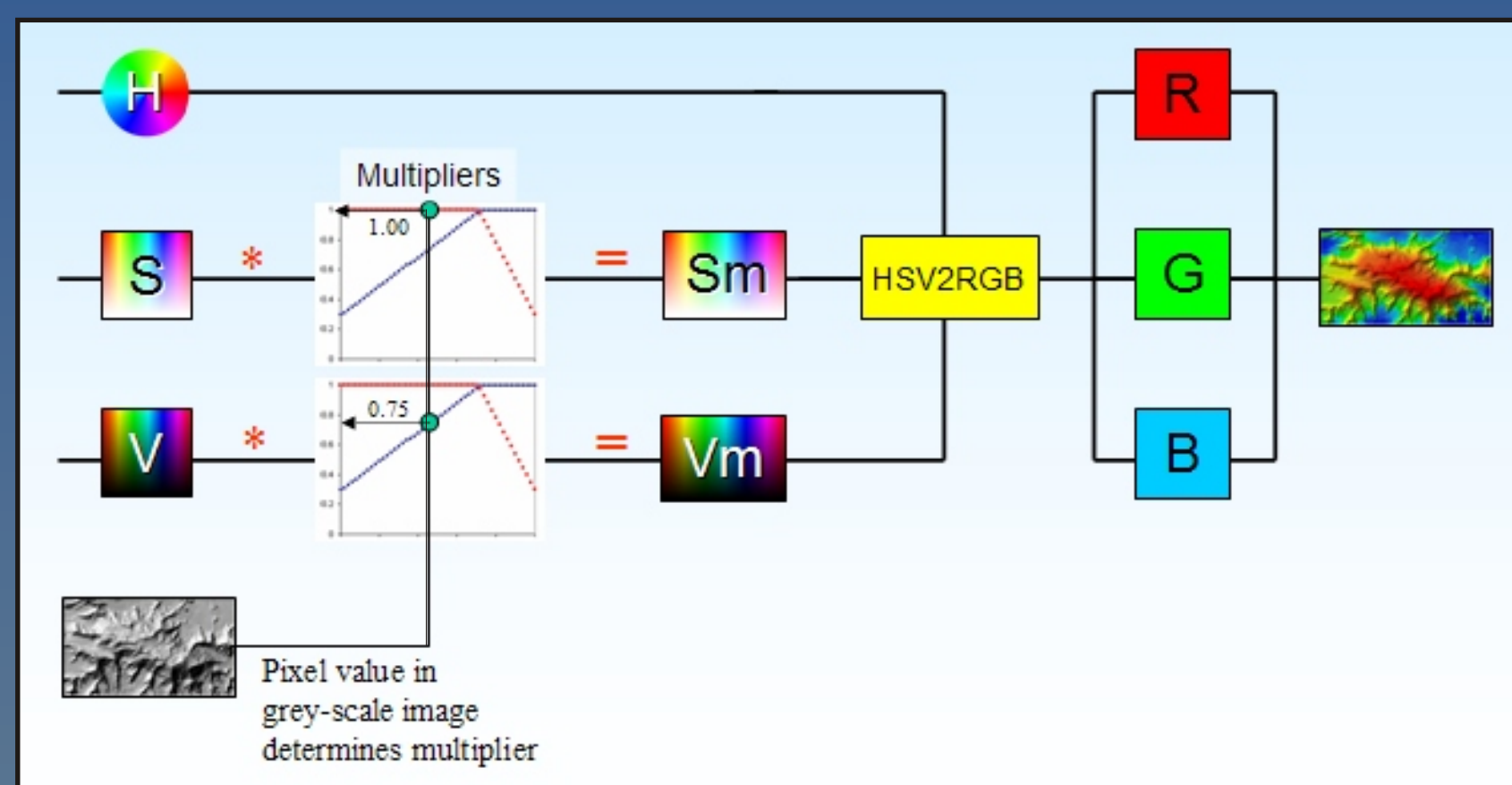# Saturation-Value Modulation vs Conventional Methods
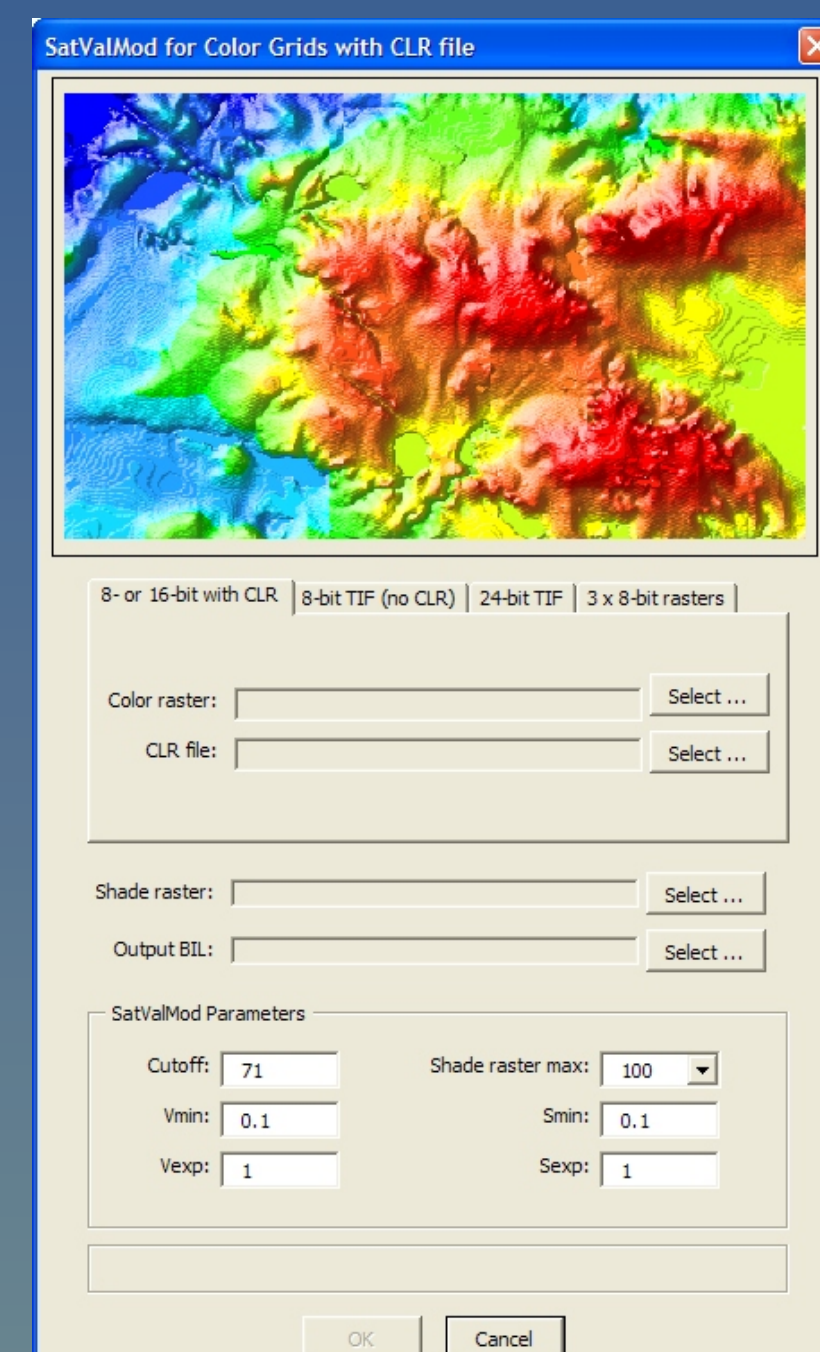
David Viljoen, Geological Survey of Canada, Ottawa
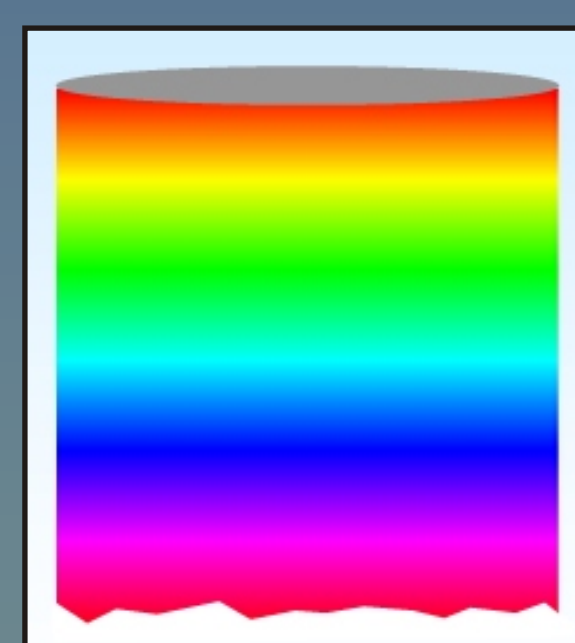
SatValMod

ArcGIS Interface

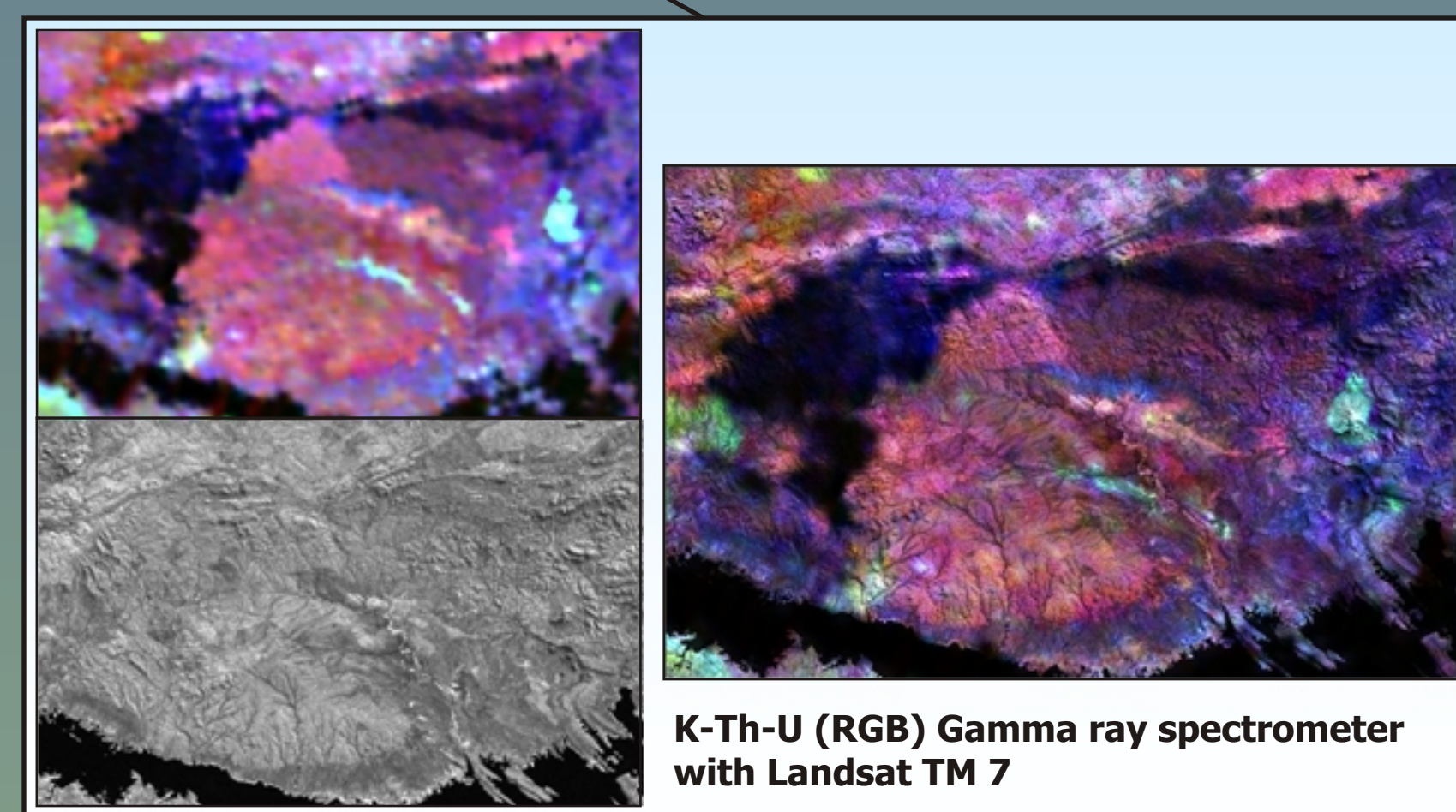SatValMod for Color Grids with CLR file

8- or 16-bit with CLR | 8-bit TIF (no CLR) | 24-bit TIF | 3 x 8-bit rasters

Colour raster: ___ Select ...
CLR file: ___ Select ...

Shade raster: ___ Select ...
Output BIL: ___ Select ...

SatValMod Parameters
Cutoff: 71   Shade raster max: 100
Vmin: 0.1   Smin: 0.1
Vexp: 1   Sexp: 1

OK   Cancel

Pixel value in grey-scale image determines multiplier
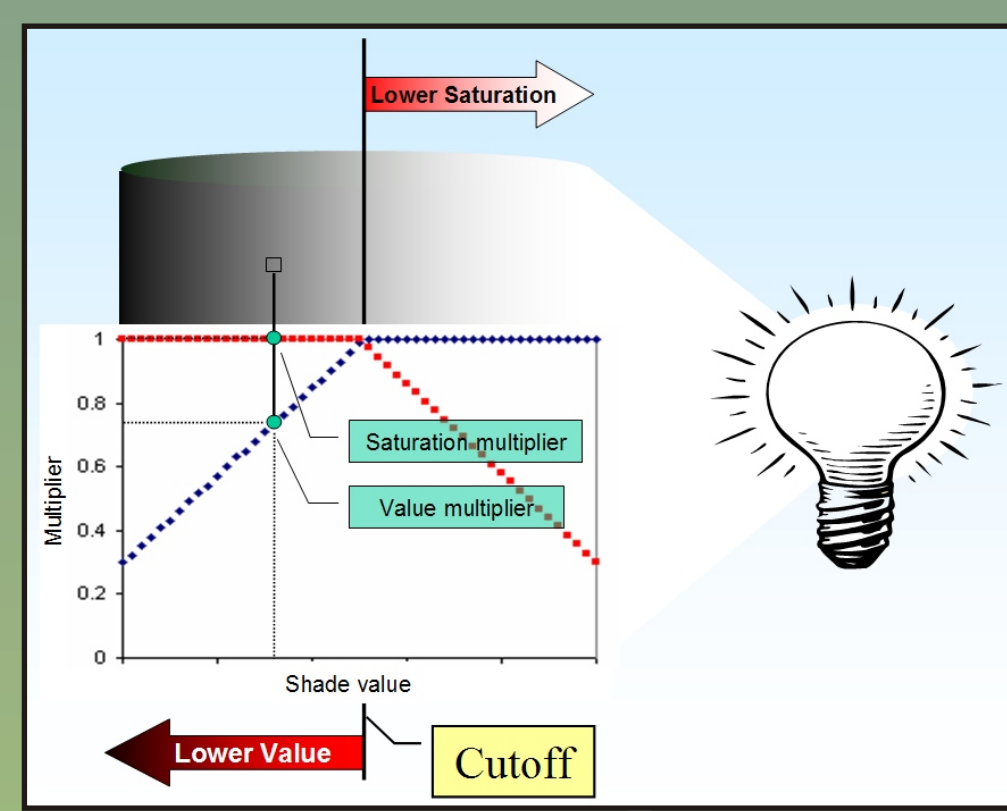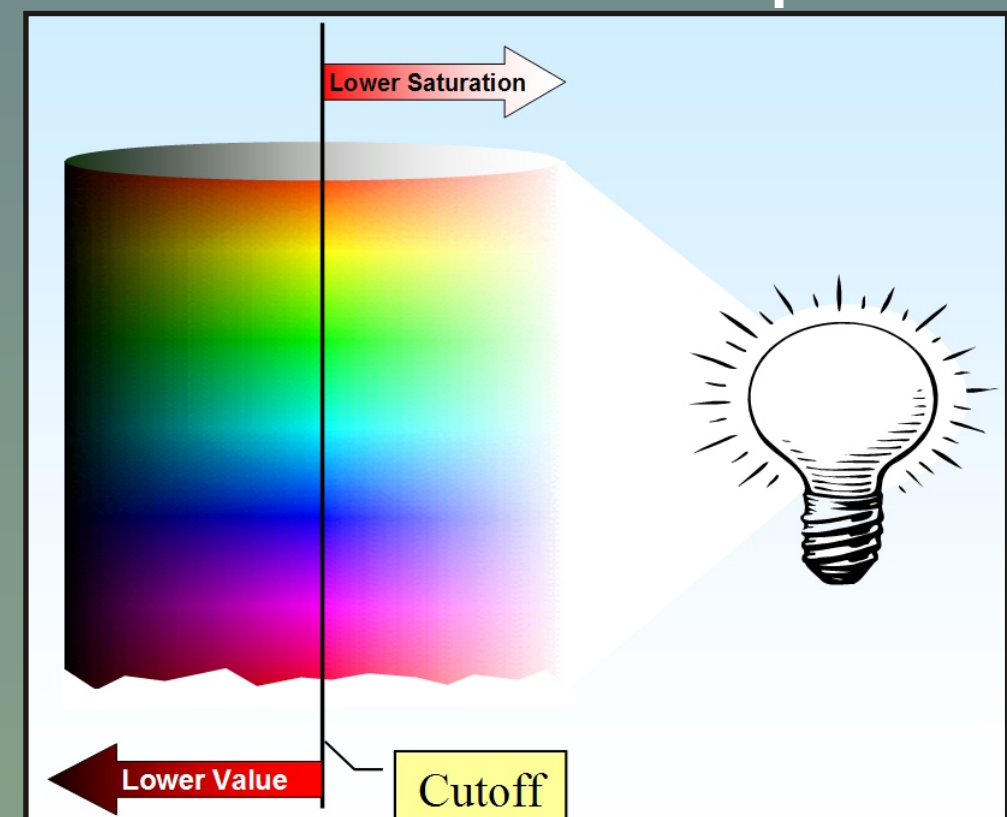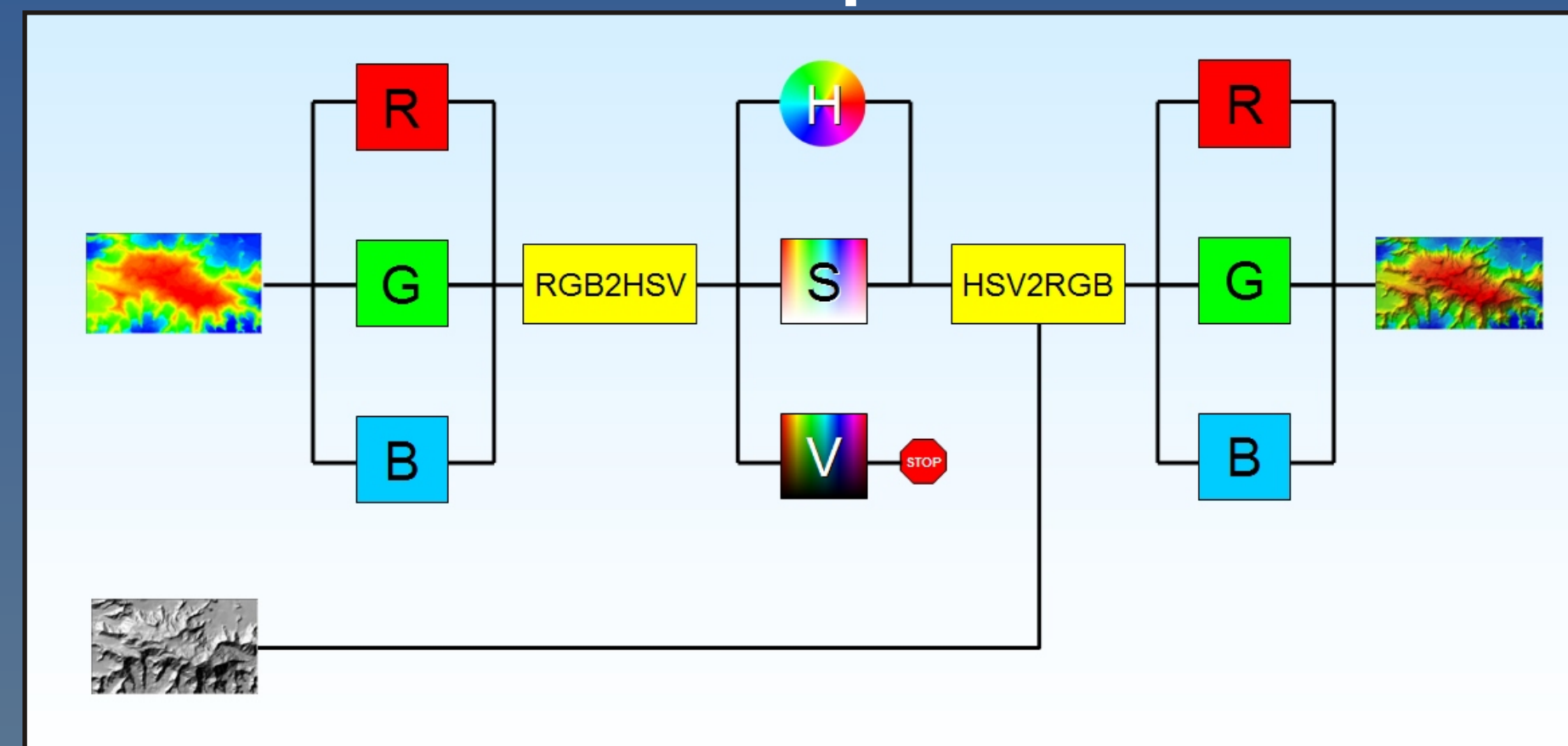
SatValMod method preserves colour better than other methods of image integration.

Shape cannot be conveyed with colour alone.
Modulating the colour's Value & Saturation is required.

Lower Saturation
Lower Value   Cutoff

Lower Saturation
Saturation multiplier
Value multiplier
Lower Value   Cutoff

K-Th-U (RGB) Gamma ray spectrometer with Landsat TM 7

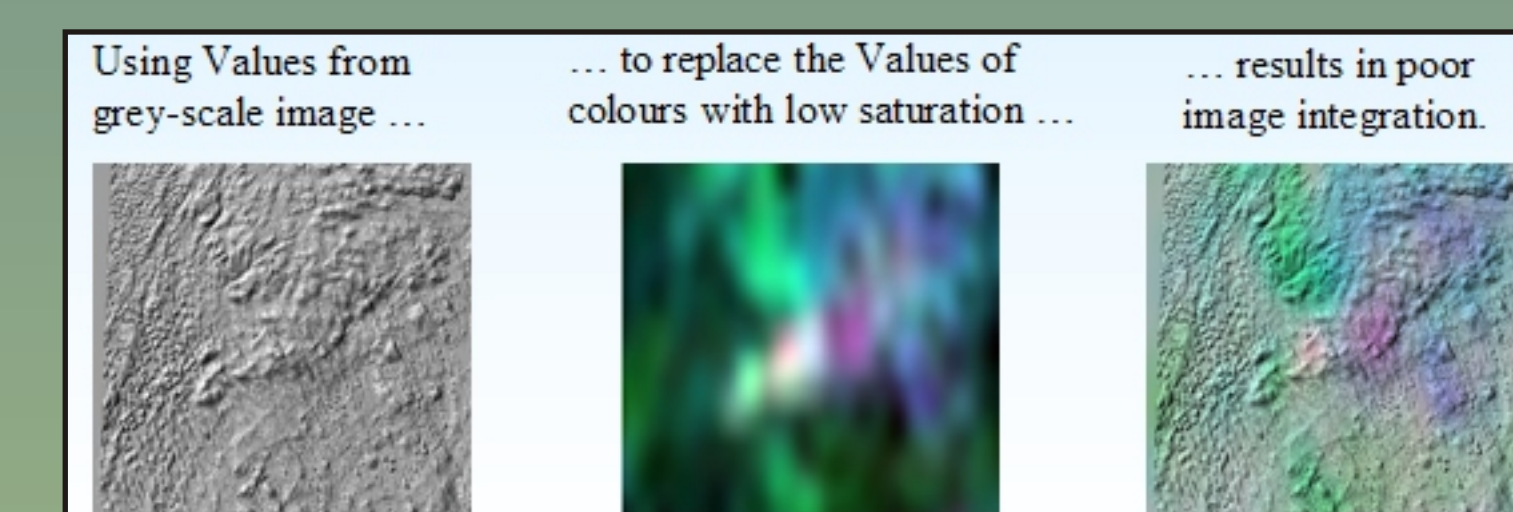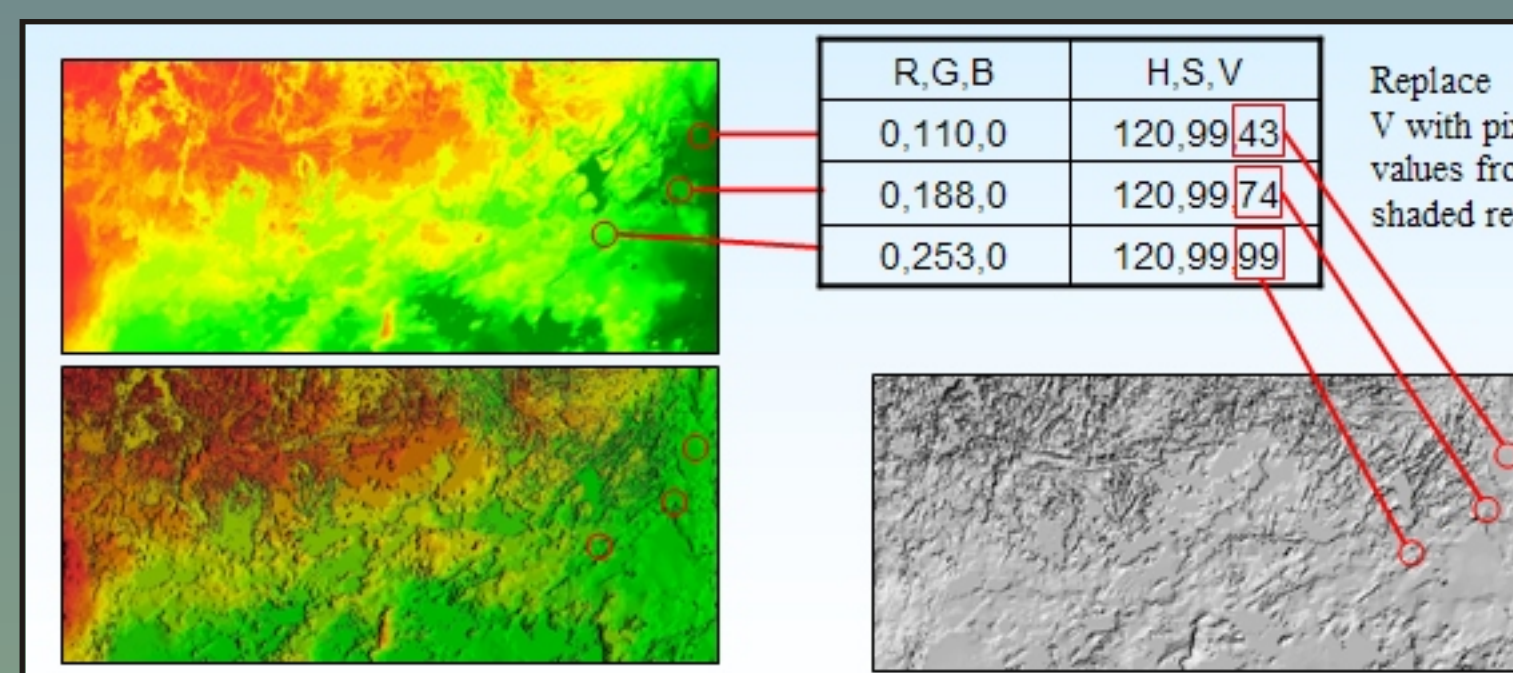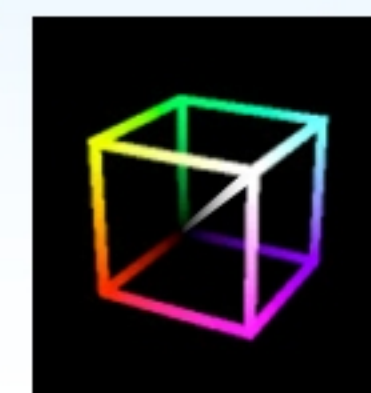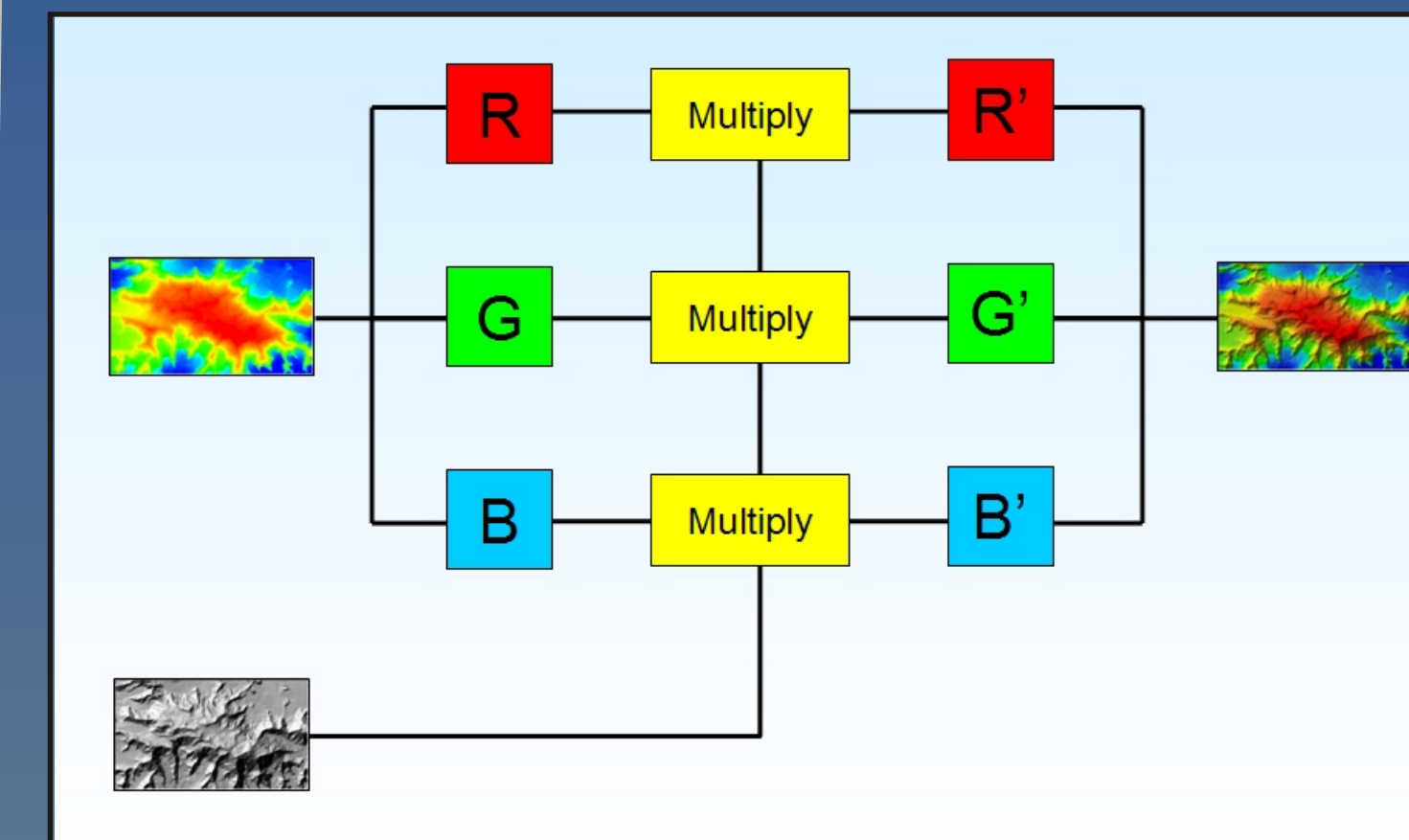Value replacement   SatValMod   RGB Modulation
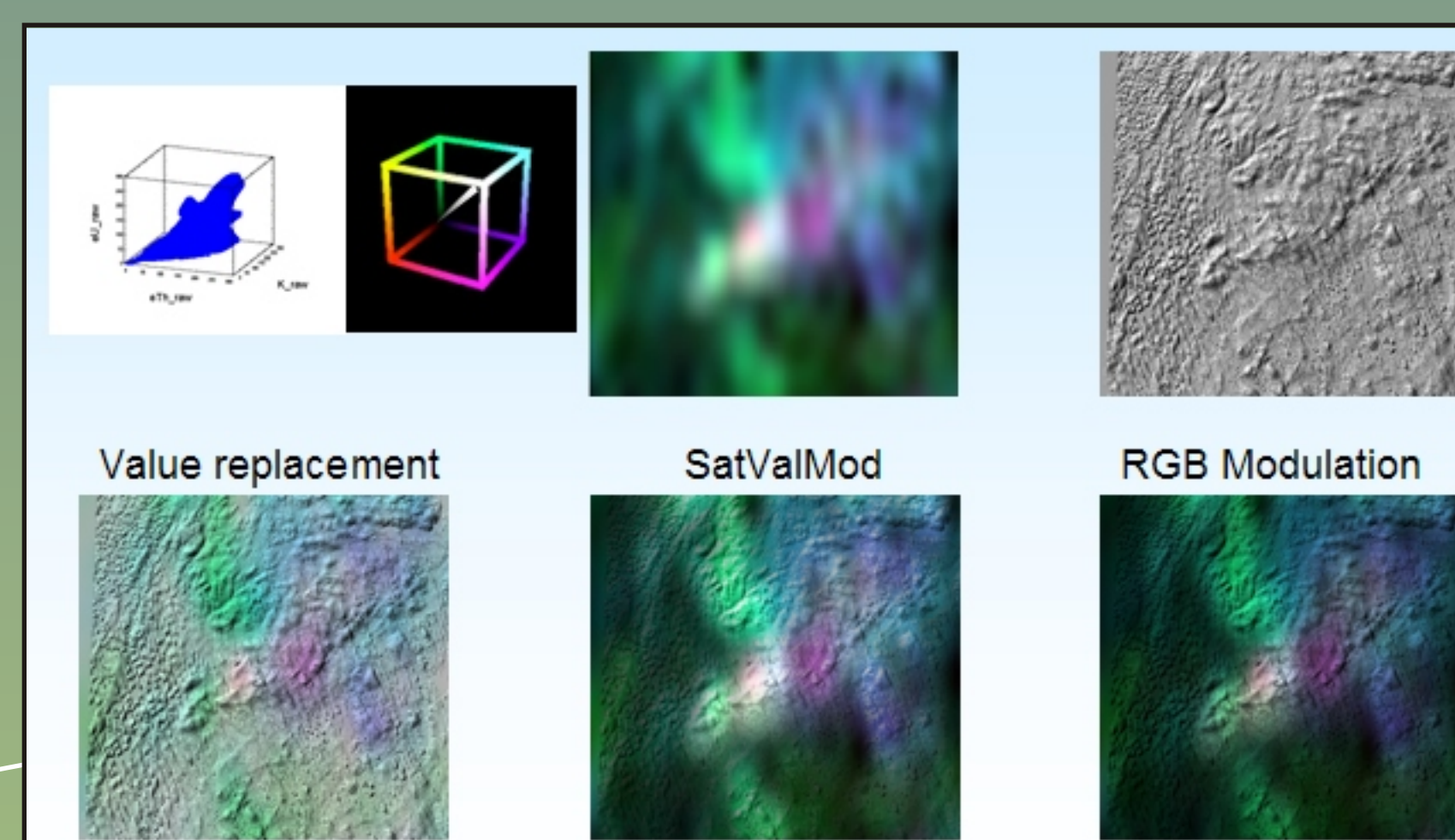
Value Replacement

Loss/corruption of colour where:

1. Pixel colour is differentiated on Value (HSV)

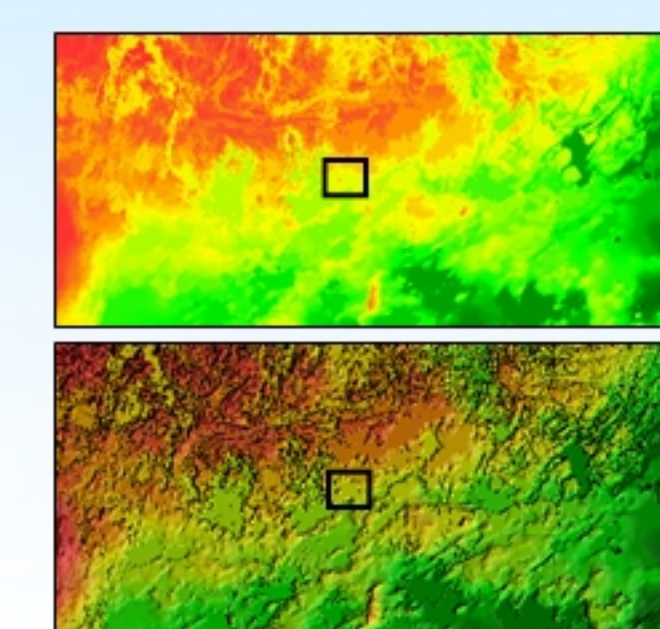2. Pixel colour has low saturation (achromatic axis of RGB cube)

R,G,B	H,S,V	Replace V with pixel values from shaded relief
0,110,0	120,99 43	
0,188,0	120,99 74	
0,253,0	120,99 99	

Using Values from grey-scale image … … to replace the Values of colours with low saturation … … results in poor image integration.
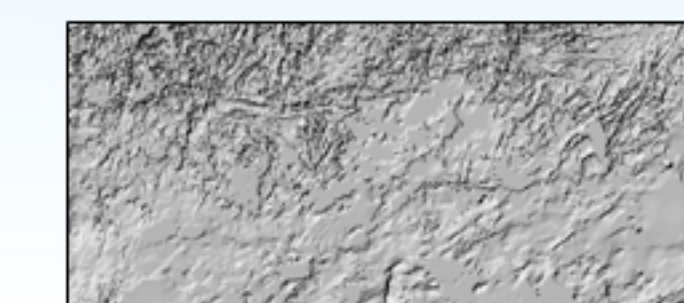
RGB Modulation

Problem with RGB Modulation

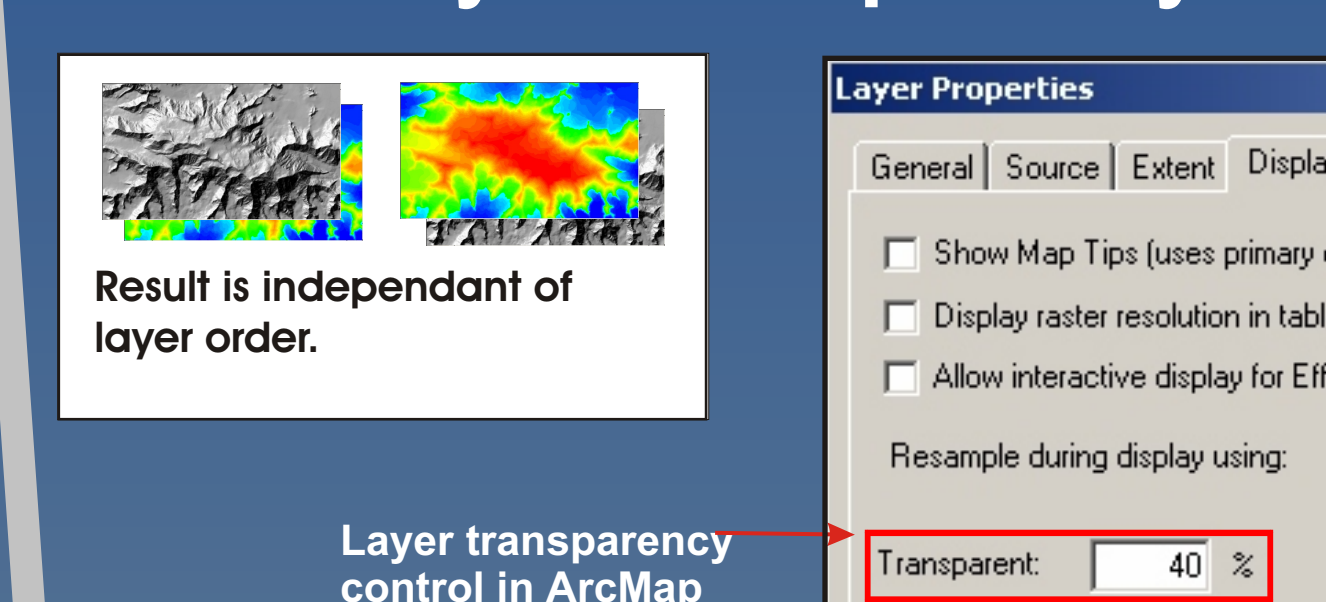Overwhelming majority of pixels in the output raster will have a darker colour than original.
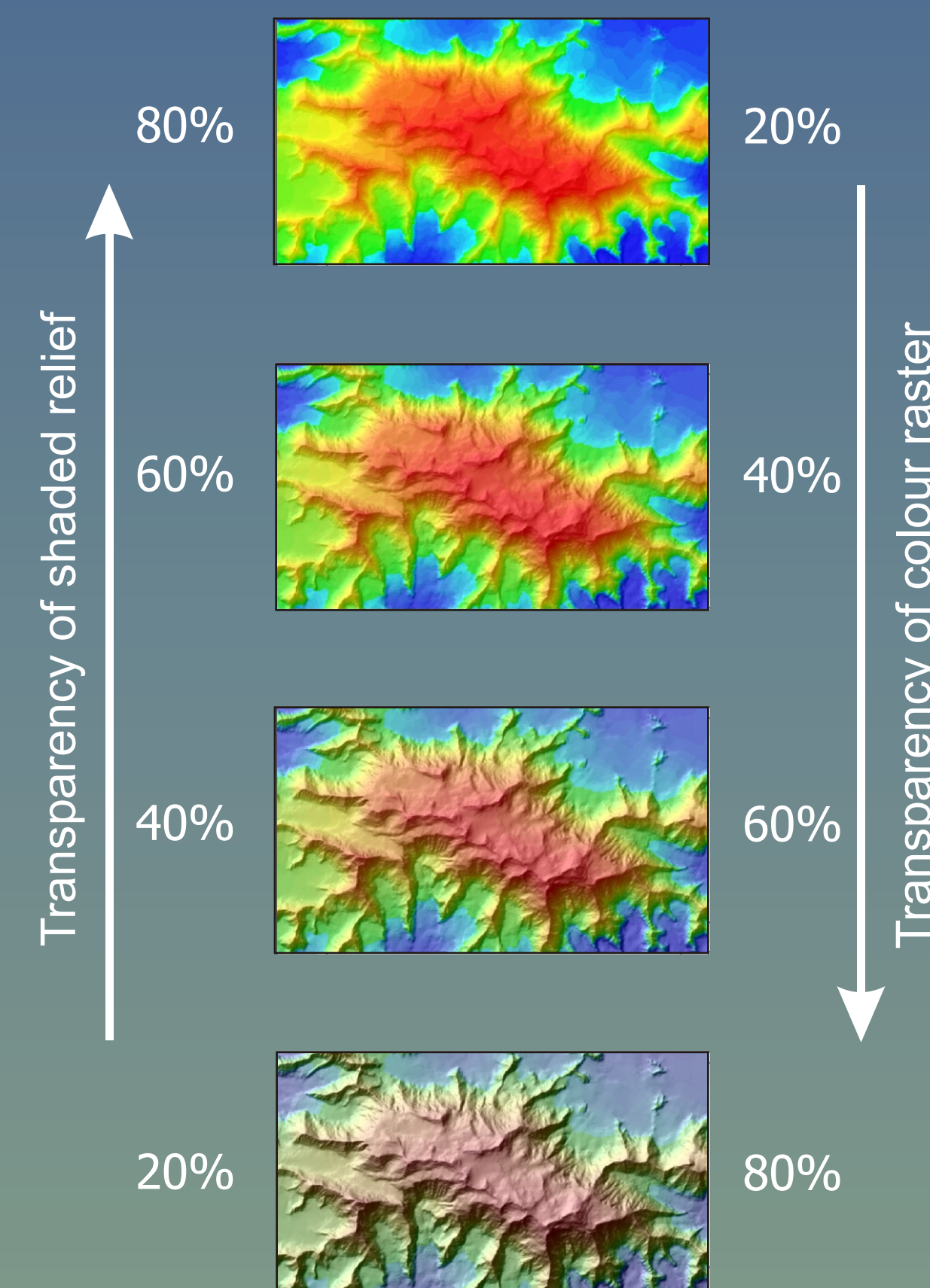
Better than value replacement.

Colours are not "lost" but what happened to the yellow.

SatValMod does not lose or corrupt original colours.

Value replacement   SatValMod   RGB Modulation

Layer Transparency

Layer Properties
General | Source | Extent | Display

Show Map Tips (uses primary dis
Display raster resolution in table o
Allow interactive display for Effec

Resample during display using:

Transparent: 40 %

Result is independant of layer order.

Layer transparency control in ArcMap

Transparency of shaded relief
80%   20%
60%   40%
40%   60%
20%   80%
Transparency of colour raster

Layer transparency is a compromise between shading and colour.

Better colour = less shading
Better shading = less colour

SVM Parameters

CutOff = 255   CutOff = 180   CutOff = 128
CutOff should be the maxima of the shade raster histogram. For shaded relief images, this is $sin(Altitude)$.

Vmin = 0   Vmin = 0.3   Vmin = 0.6
Vmin > 0 is best so shadows are not completely black.

Vexp = 0.3   Vexp = 1   Vexp = 3
Vexp ≤ 1 is recommended so shadows are not too extensive.

Smin = 0   Smin = 0.3   Smin = 0.6
Smin < 0.4 is recommended. Higher values do not provide enough decrease in saturation.

Sexp = 0.3   Sexp = 1   Sexp = 3
Sexp ≥ 1 provides better results