2012 ICA Mountain Cartography Workshop
New Zealand
September 2012

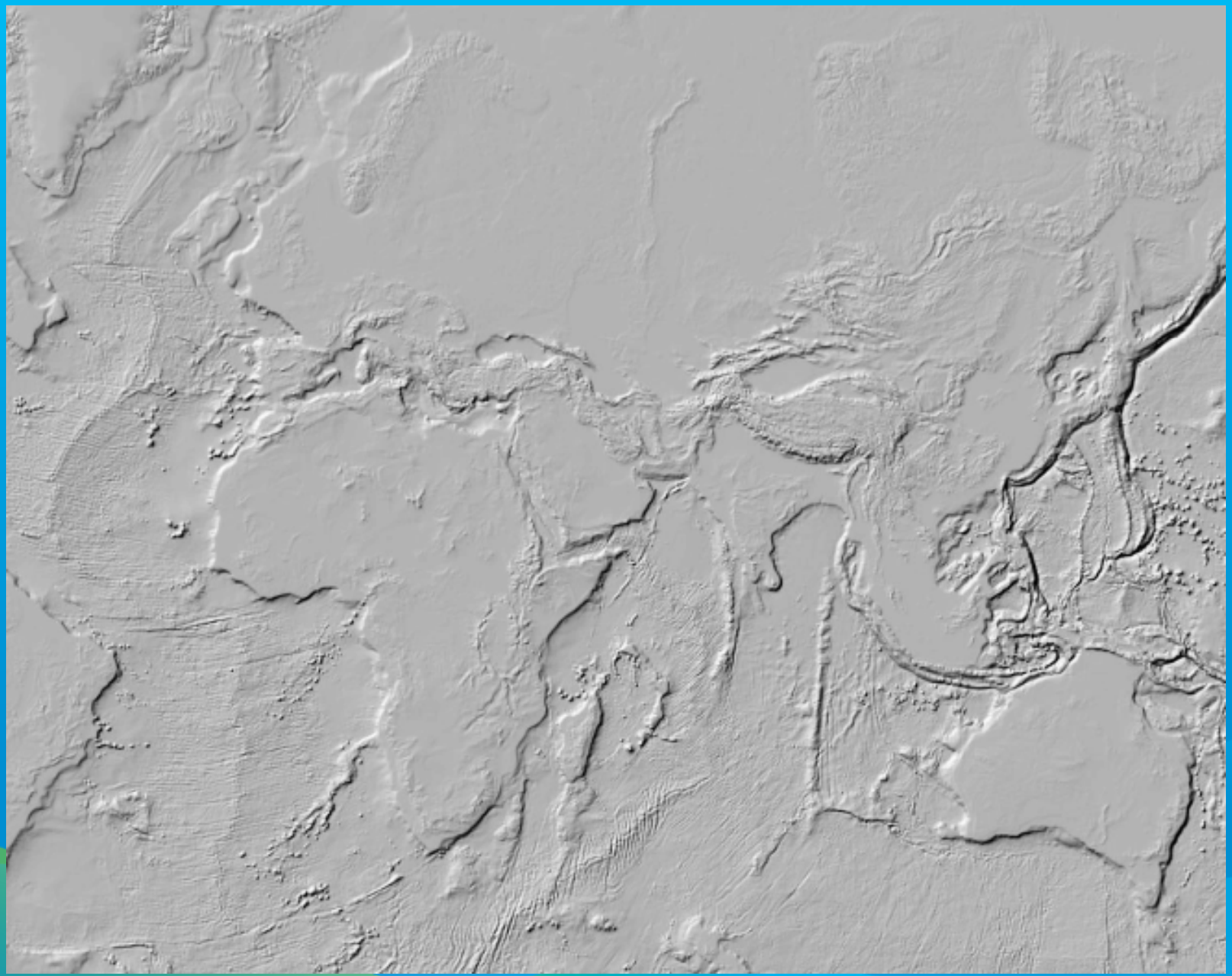
NAGI Fusion Method

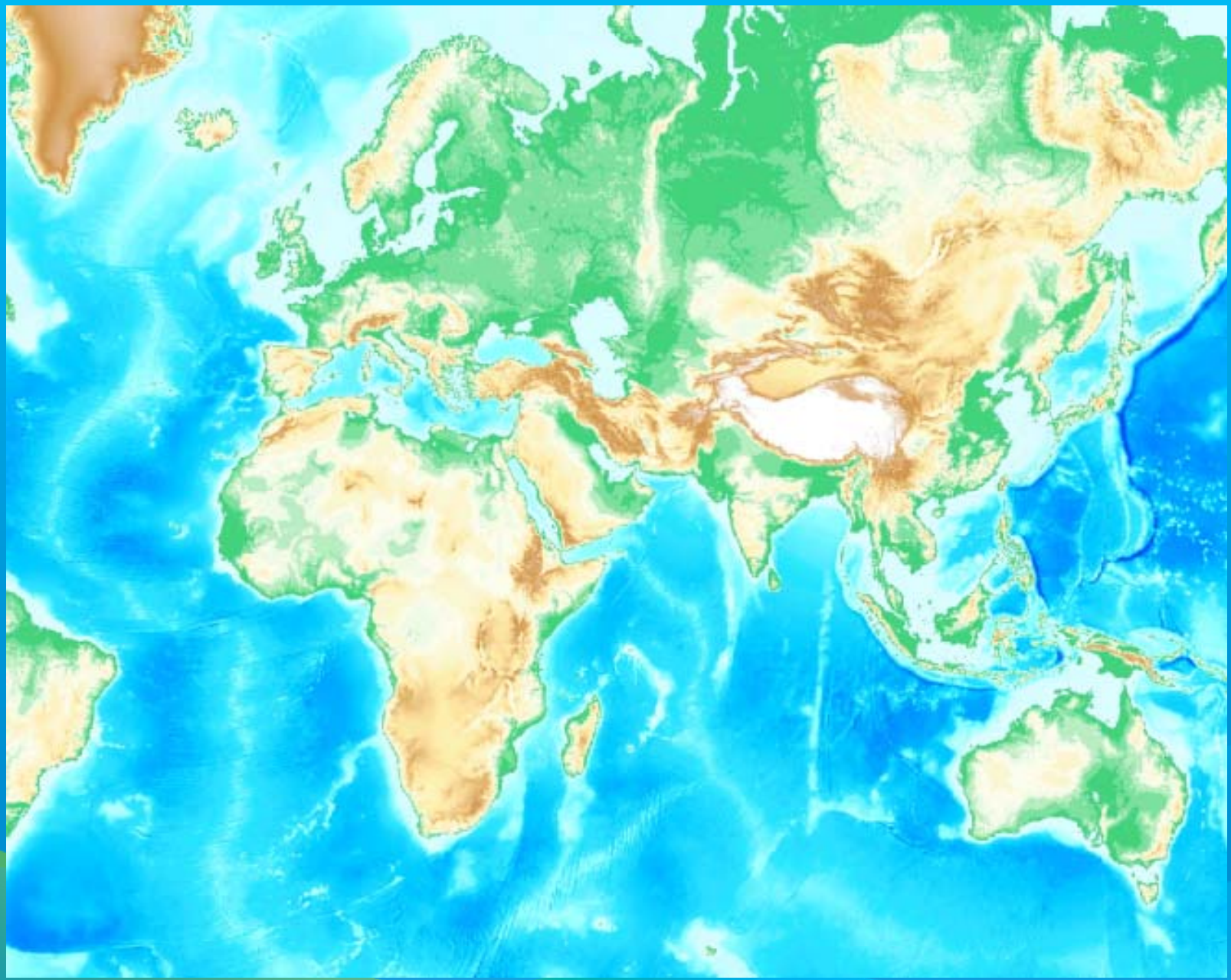
Aileen Buckley
Rajinder Nagi
Esri, Redlands, California, USA

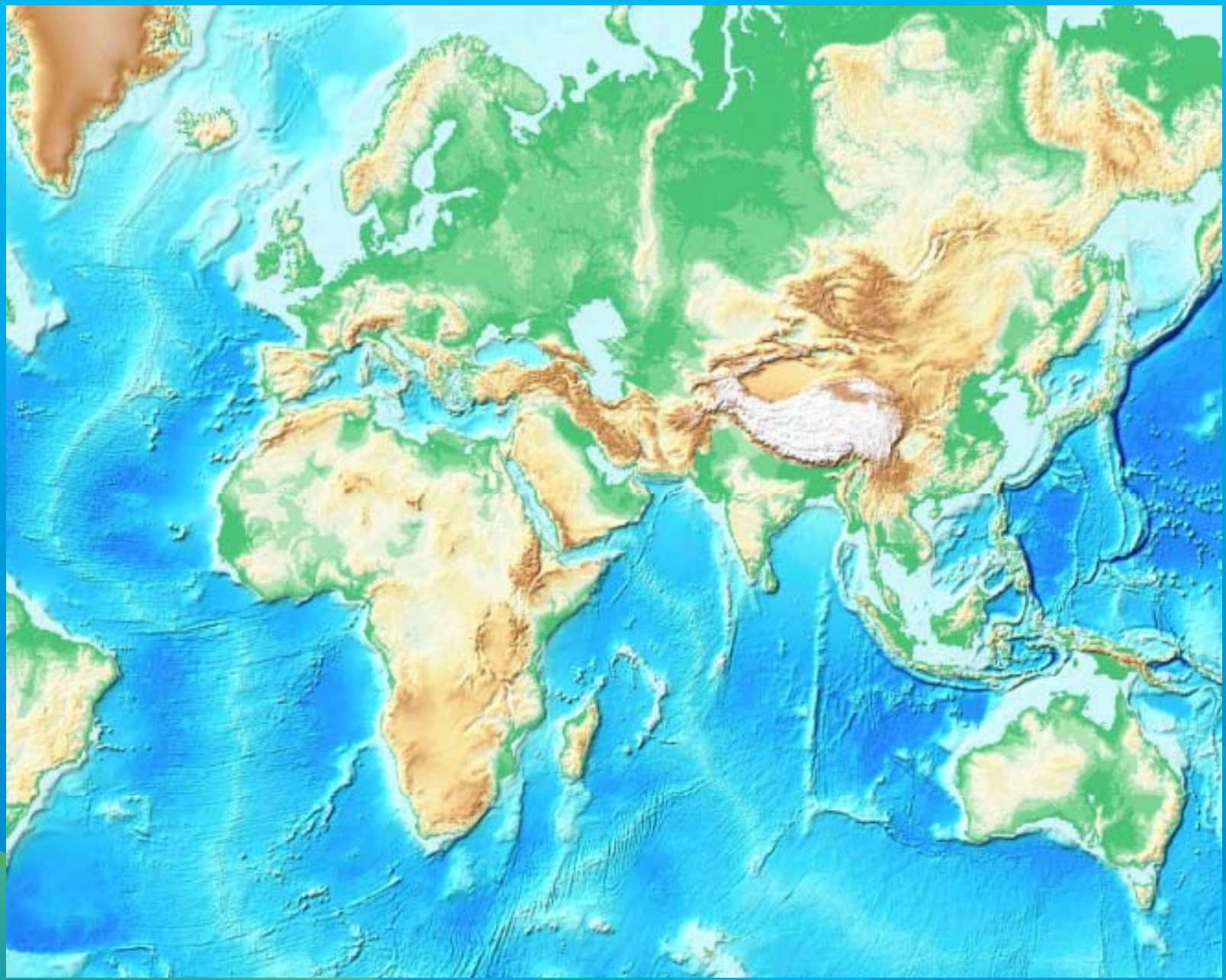
No Alteration of Grayscale or Intensity (NAGI) fusion method

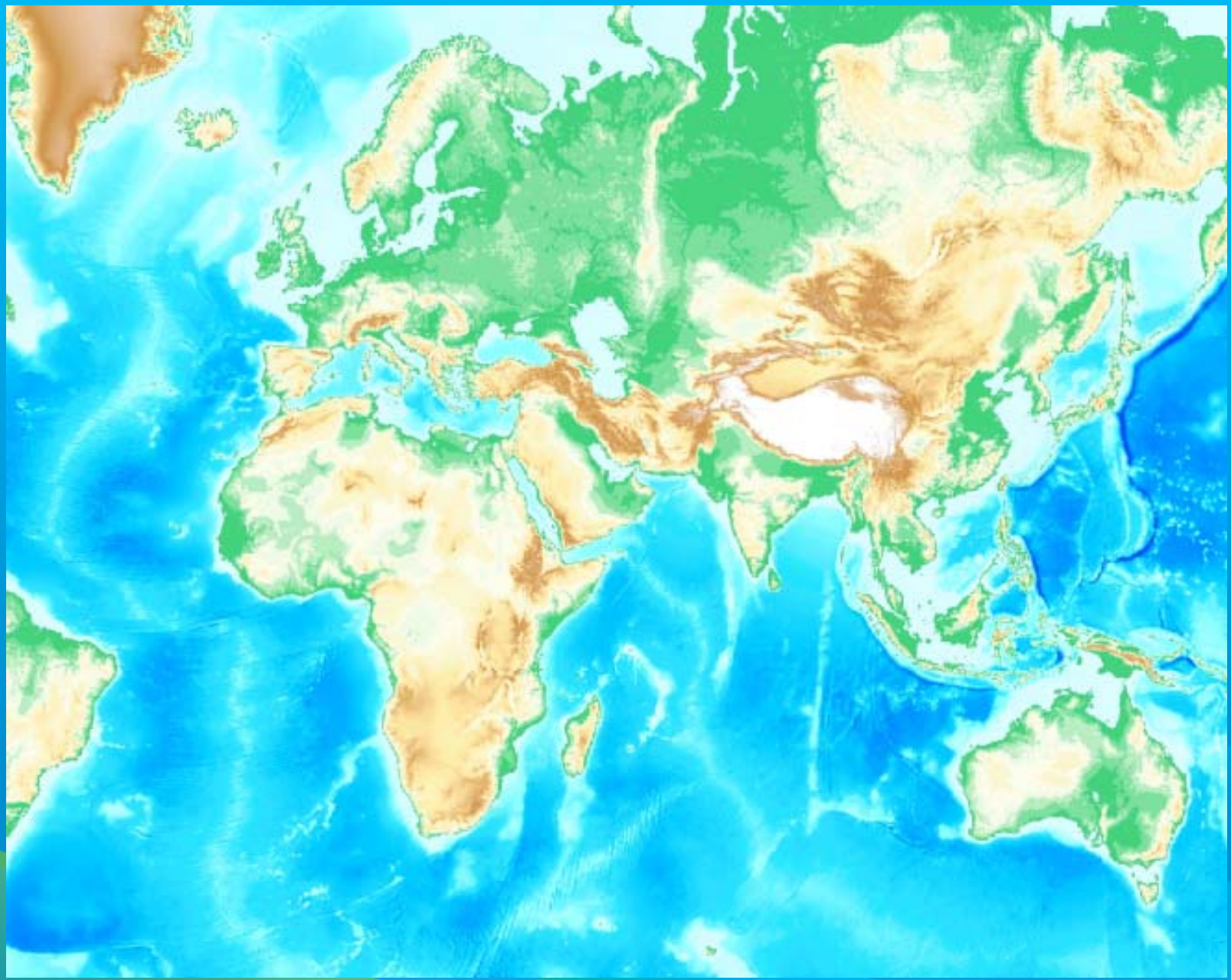
- Rajinder Nagi

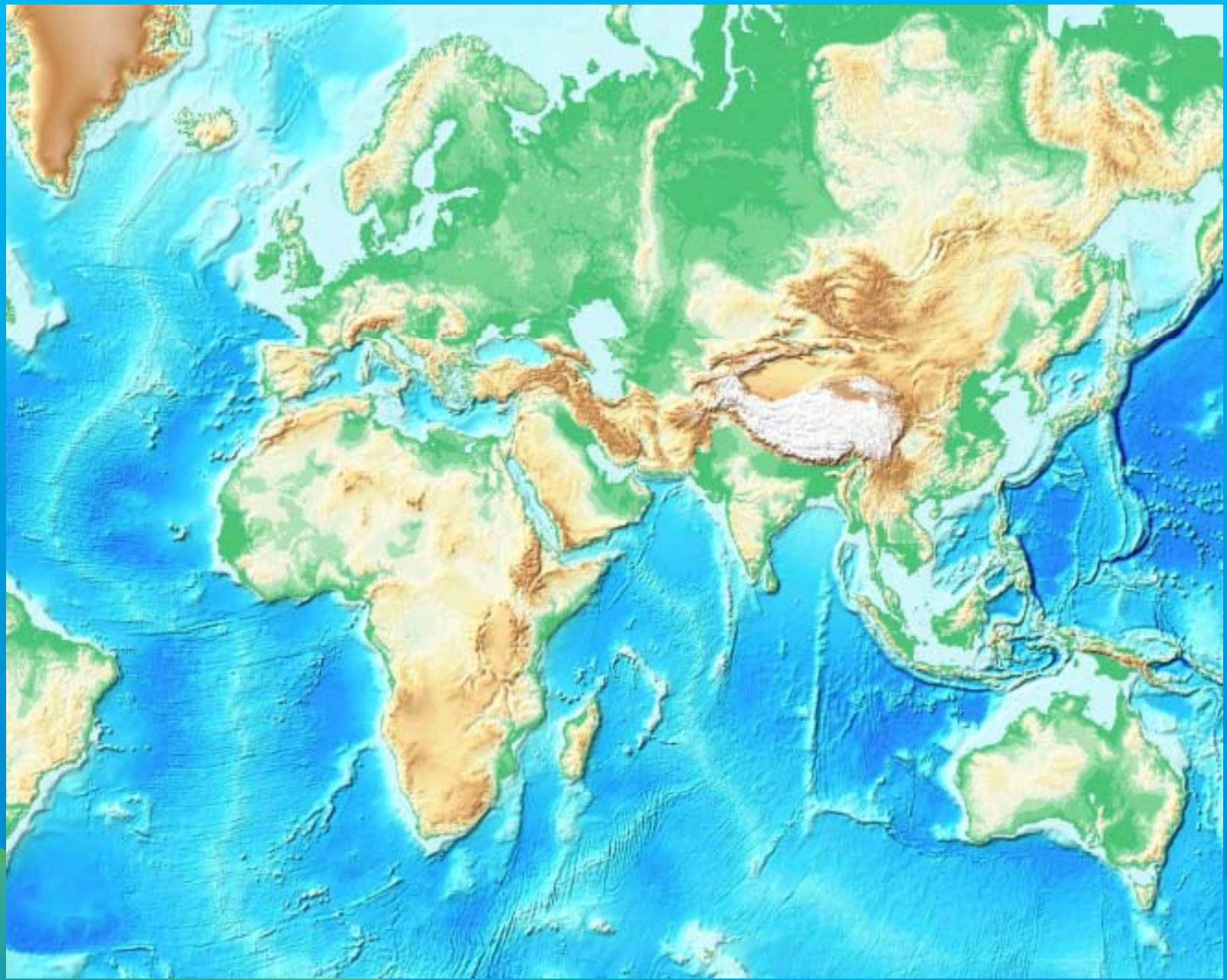
- to combine grayscale and colored raster without losing color intensity or hillshade detail
  1. a simple mean is calculated from combined input rasters
  2. a gamma stretch is applied to the output from the first step
  3. a contrast stretch is applied to the output from the second step



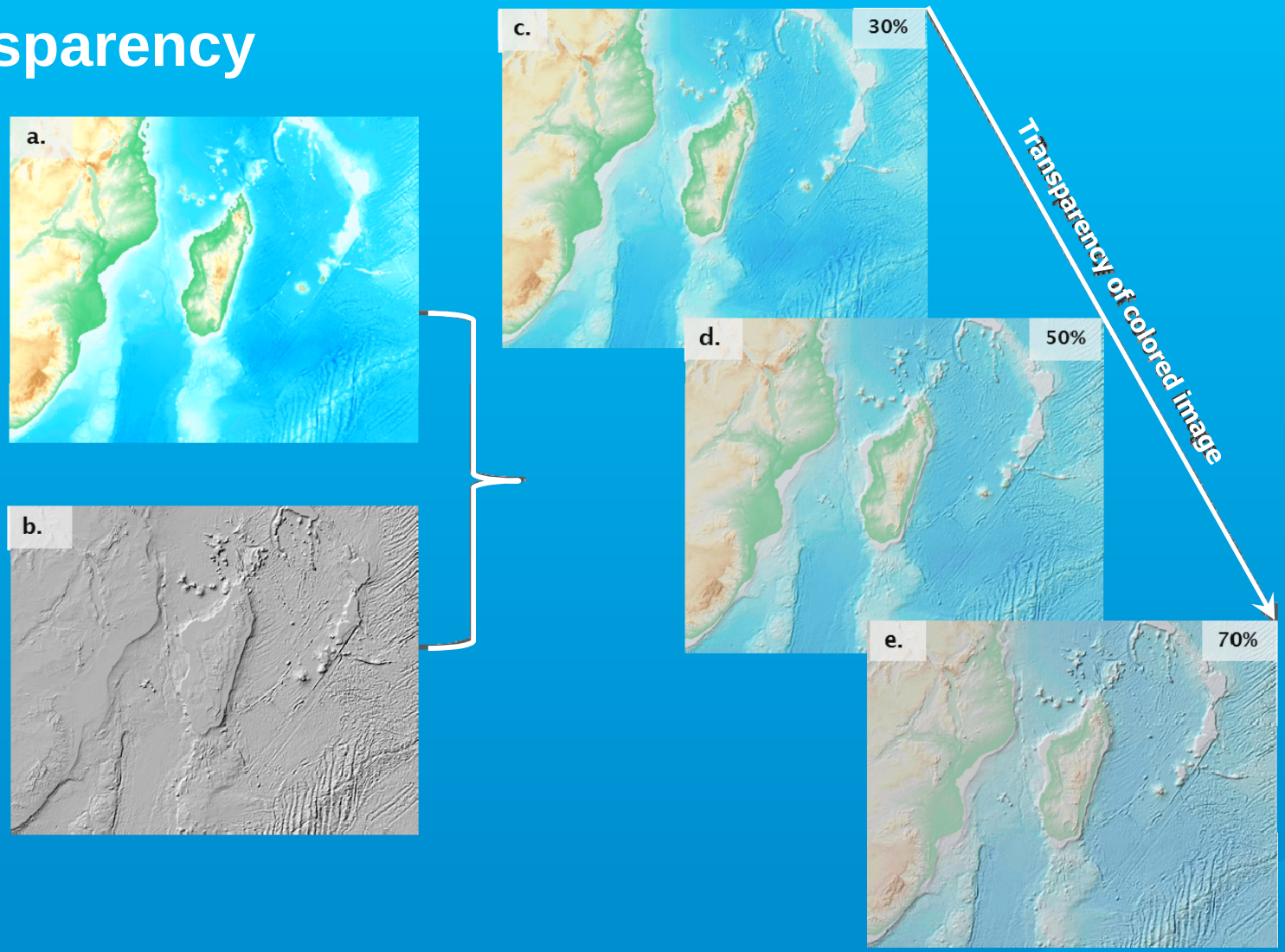






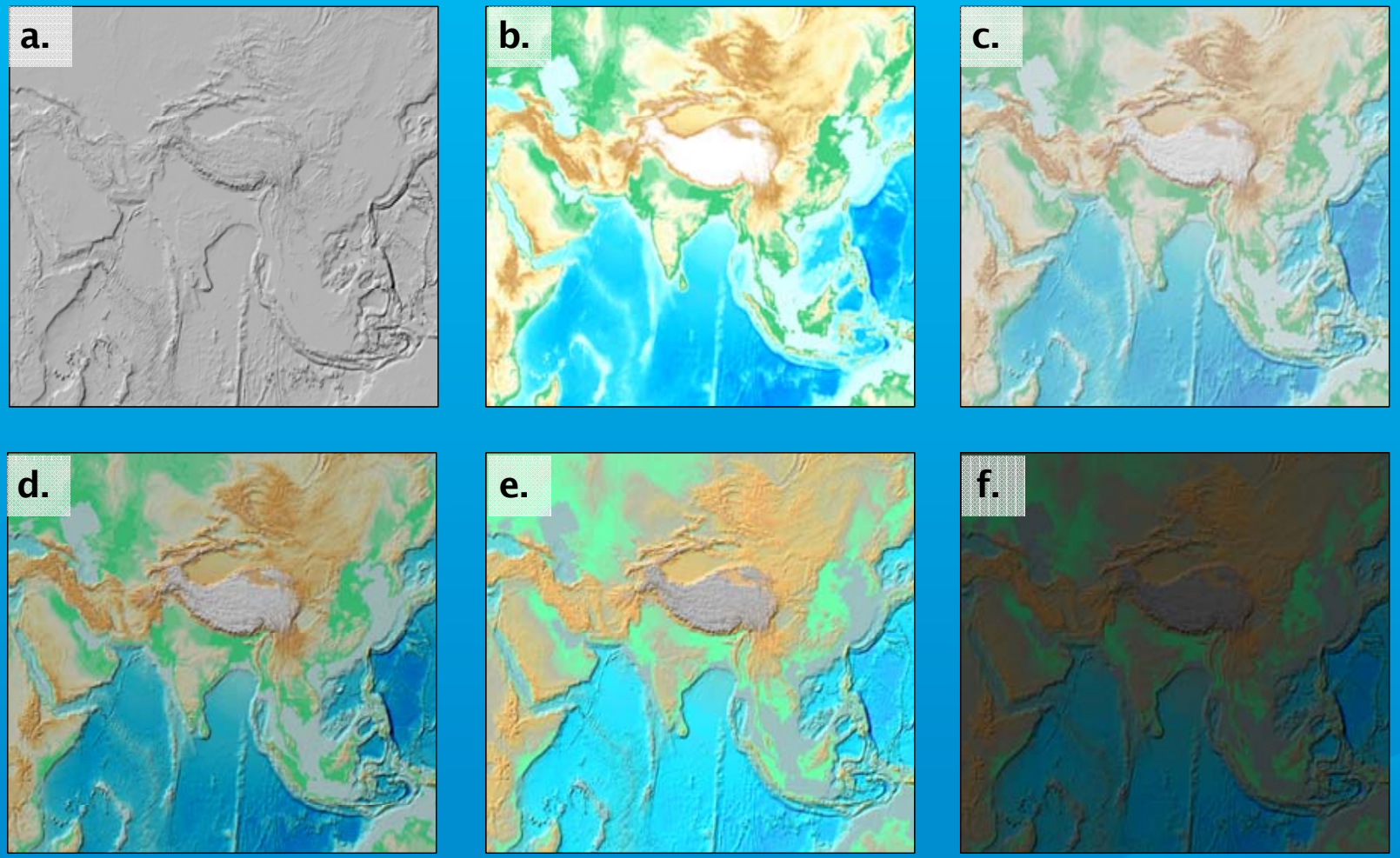


Transparency



(a) elevation tinted DEM, (b) hillshaded DEM, (c) elevation tint overlaid on hillshade with 30% transparency, (d) 50% transparency, and (e) 70% transparency

Pansharpening



(a) hillshade of DEM, (b) elevation tint of DEM, (c) elevation tint overlaid on hillshade with 50% transparency, (d) IHS pan sharpening, (e) Esri pan sharpening, and (f) Brovey pan sharpening

Step 1: Calculate the mean

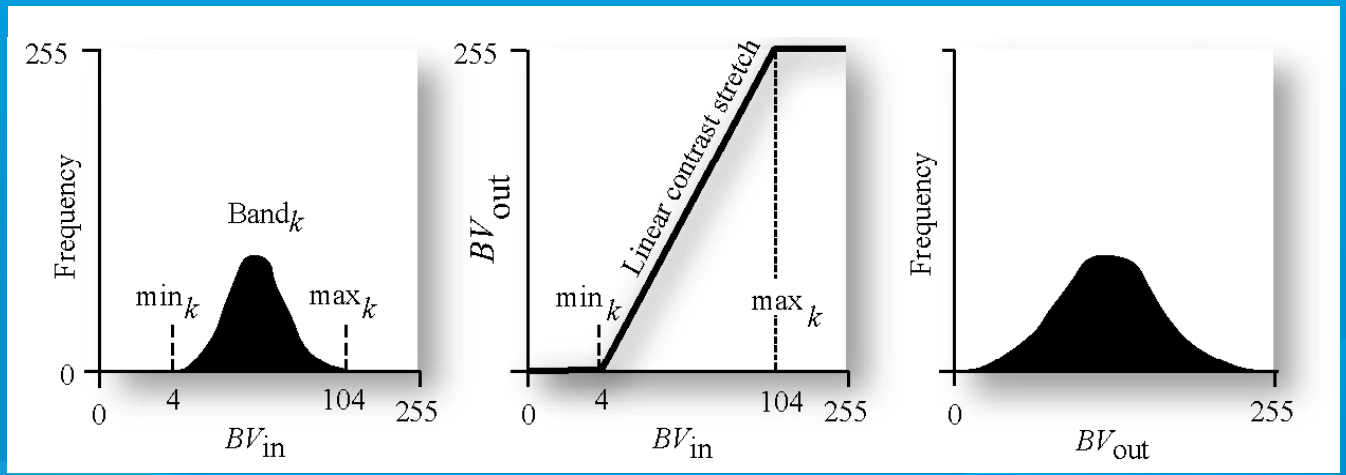
- a panchromatic image (e.g., hillshade) is added to each of the three bands of a multispectral (RGB) image
- then the mean is calculated
- the panchromatic raster could be a hillshade, black and white aerial image, panchromatic satellite image, etc…
- the multispectral raster could be a thematic layer, such as land cover/land use, soils, geology
  - in this example, an elevation tint

Step 2: Gamma stretch

- affects the degree of contrast between the midlevel gray values of a raster
- does not affect the black or white values
- the overall brightness of a raster dataset is altered
  - values greater than 1 – increase the contrast in darker areas and decrease the contrast in the lighter areas
  - values lower than 1 – decrease the contrast in the darker areas and increase the contrast in the lighter areas
- NAGI fusion method: gamma value of 0.5

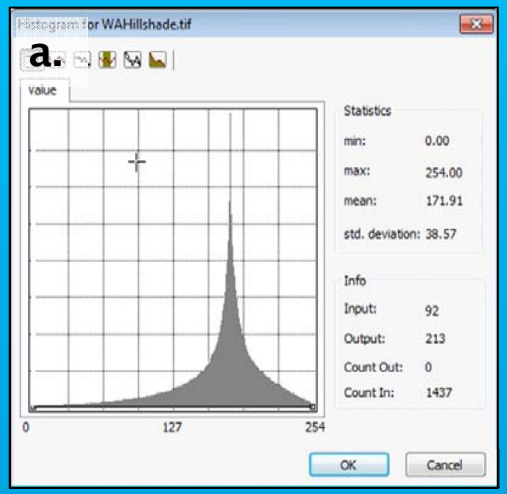
Step 3: Contrast stretch

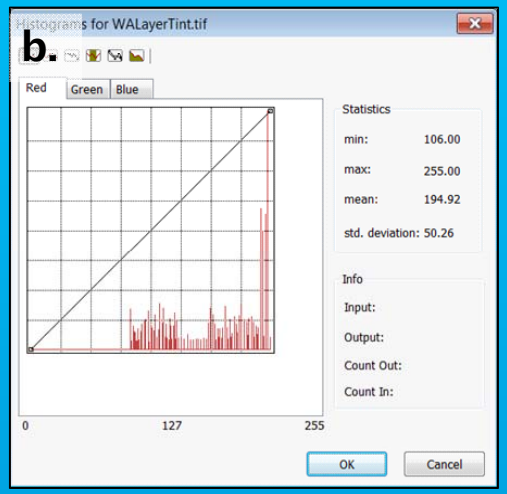
- enhances the contrast in an image
- values at the low end of the original histogram are assigned to black and values at the high end are assigned to white
- the remaining values are distributed linearly between the extremes

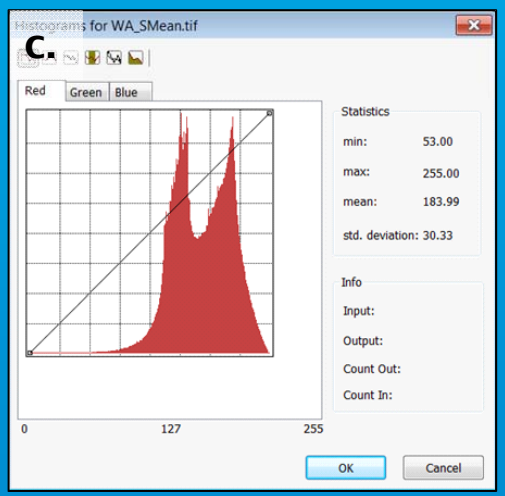


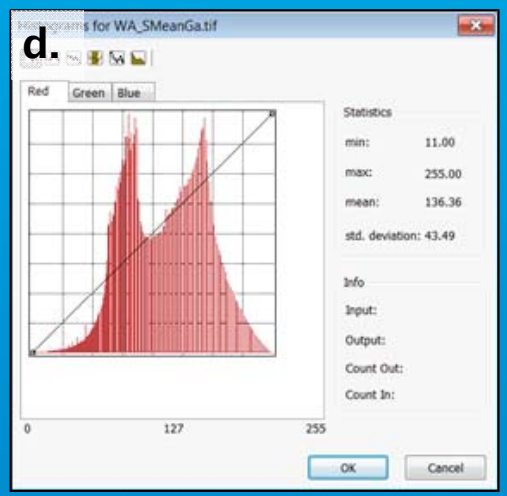
- NAGI fusion method: minimum-maximum stretch with values of 4 and 104

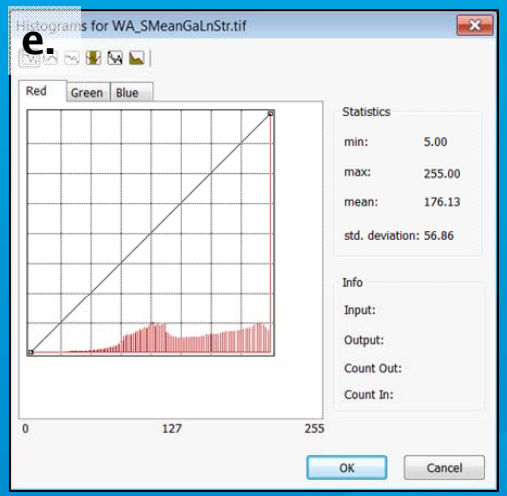
Transformations







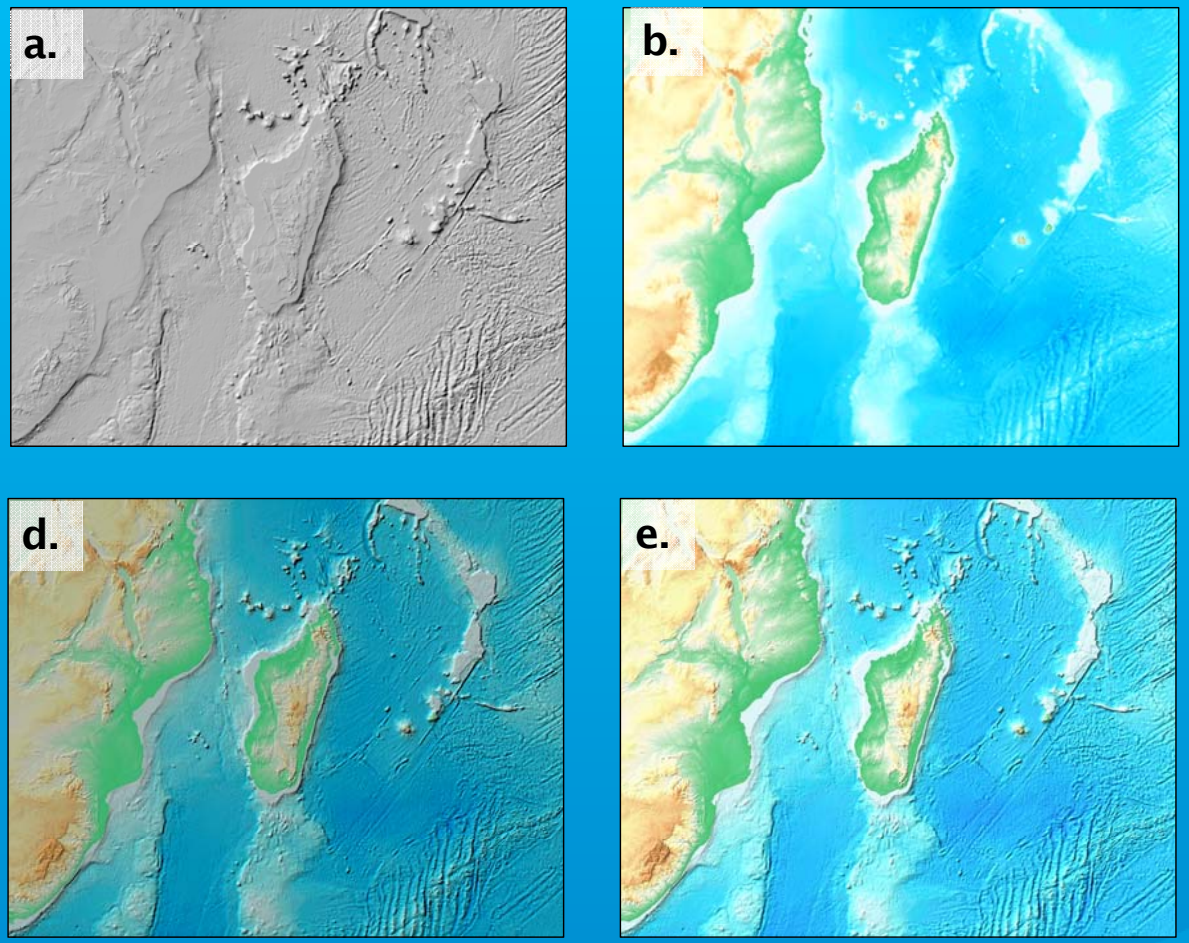




histograms of (a) hillshade, (b) red band of multispectral RGB image, (c) simple mean, (d) gamma stretch of 0.5, (e) minimum-maximum stretch

In ArcGIS

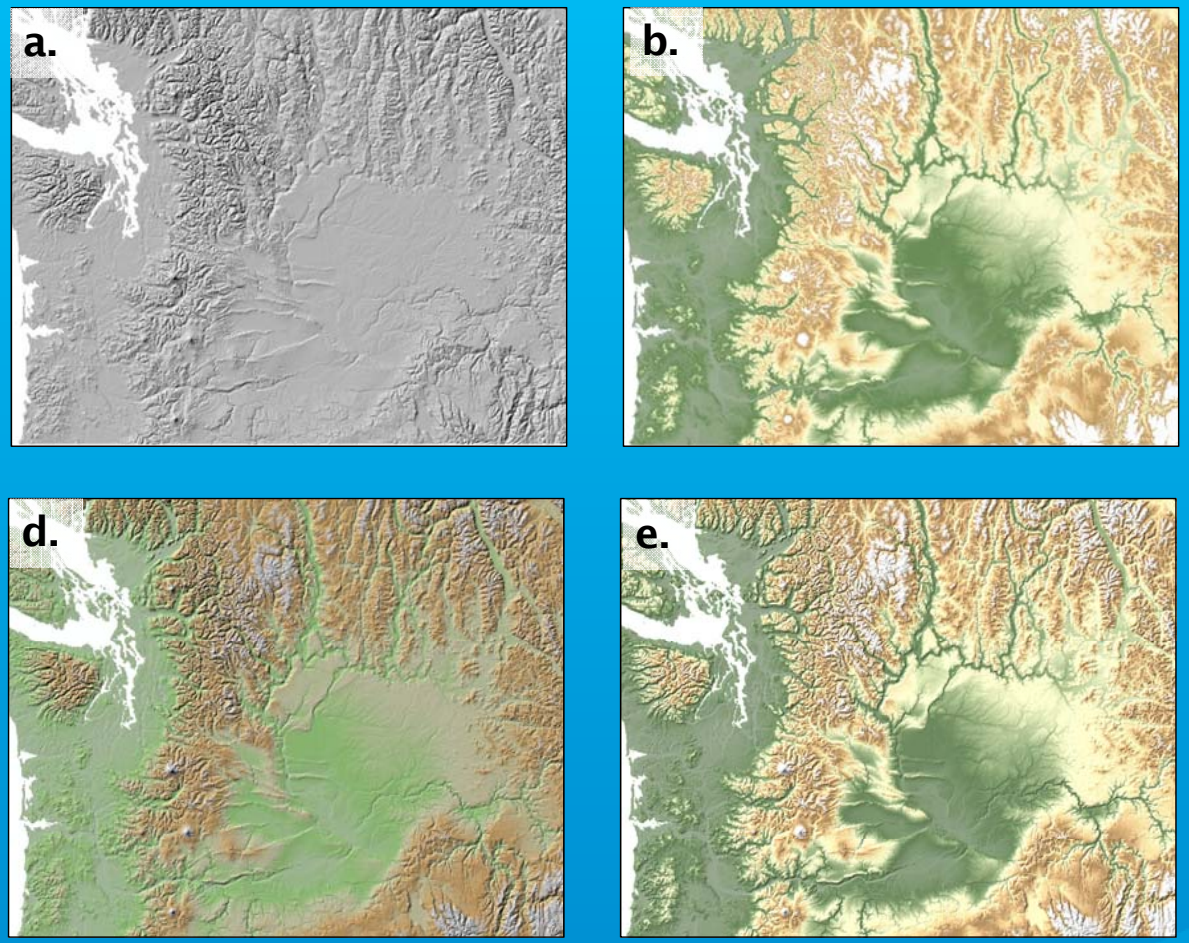
- ETOPO1
- colormap file
- mosaic dataset functions



(a) hillshaded DEM, (b) elevation tinted DEM, (c) elevation tint overlaid on hillshade with 50% transparency, (d) IHS fusion method output, and (e) NAGI fusion method output

In ArcGIS

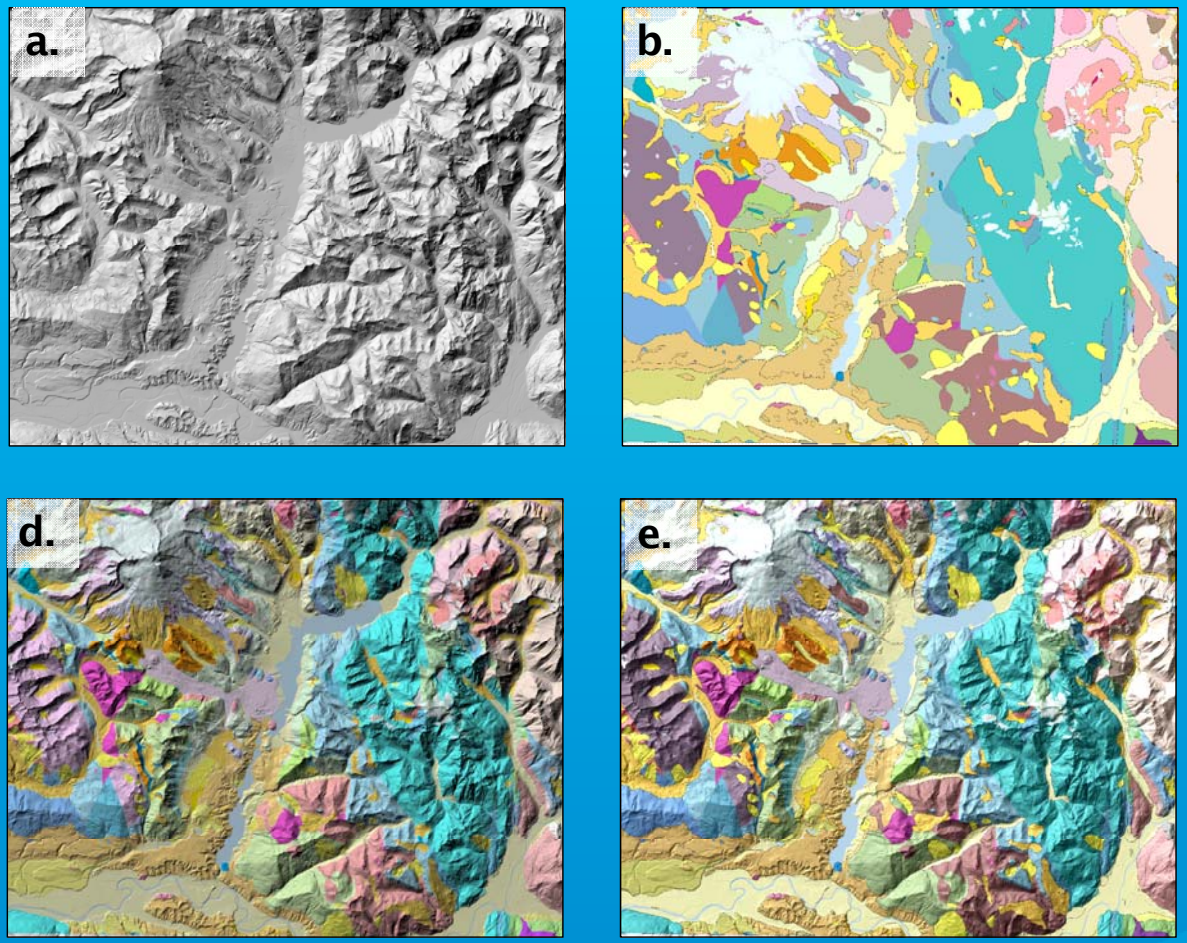
- GTOPO30
- color ramp
- Image Analysis functions



(a) hillshaded DEM, (b) elevation tinted DEM, (c) elevation tint overlaid on hillshade with 50% transparency, (d) IHS fusion method output, and (e) NAGI fusion method output

In ArcGIS

- Elevation Services
- classified renderer
- mosaic dataset functions



(a) hillshade of Mt. Baker DEM, (b) rasterized geology map of Mt. Baker, (c) geology map overlaid on hillshade with 50% transparency, (d) IHS fusion method output, and (e) NAGI fusion method output

To learn more…

- ArcWatch – Esri online monthly newsletter

- Nagi, R. (2012a) Learn a New Method for Displaying Hillshades and Elevation Tints. *ArcWatch March 2012 - Tip of the Month*. http://www.esri.com/news/arcwatch/0312/learn-a-new-method-for-displaying-hillshades-and-elevation-tints.html Last visited 08/01/2012.
- Nagi, R. (2012b) Using Image Analysis Functions to Display Layer Tints on Hillshades. *ArcWatch June 2012 - Tip of the Month*. http://www.esri.com/news/arcwatch/0612/using-image-analysis-functions-to-display-layer-tints-on-hillshades.html Last visited 08/01/2012.