Multidirectional, oblique-weighted, shaded-relief image of the Island of Hawaii

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Traditional computer-generated shaded-relief maps emphasize structures that happen to be obliquely illuminated, but wash out structures that are illuminated along the structural grain. This image, which emphasizes oblique illumination on all surfaces, is generated by combining computer-generated shaded-relief images illuminated from 225°, 270°, 315°, and 360° azimuth; each 30° above the horizon. Elevation data are from 84 US Geological Survey 30-meter DEMs. Weights were calculated for each image, on a cell-by-cell basis, using a generalized aspect map (smoothed 1000 meter-cells), such that:

W(225°) = sin2(aspect - 225°)
W(270°) = sin2(aspect - 270°)
W(315°) = sin2(aspect - 315°)
W(360°) = sin2(aspect - 360°)

Weighted-image = (W(225°) x image(225°) +
W(270°) x image(270°) +
W(315°) x image(315°) +
W(360°) x image(360°))/2

This technique produces more detail in the areas of an image that would otherwise be illuminated by direct light or left in darkness by a single-source illumination.

The image was created using ARC 6.0.1 GRID as follows:

```
shade225 = hillshade(hawaii, 225, 30, shade, 5)
shade270 = hillshade(hawaii, 270, 30, shade, 5)
shade315 = hillshade(hawaii, 315, 30, shade, 5)
shade360 = hillshade(hawaii, 360, 30, shade, 5)
h00 = resample(hawaii, 1000)
h01 = focalmean(h00)
h02 = focalmean(h01)
h03 = focalmean(h02)
asp = aspect(h03)
asp1 = con(isnull(asp), 293, asp)
w225 = sqr(sin((asp1 - 225) div deg ))
w270 = sqr(sin((asp1 - 270) div deg))
w315 = sqr(sin((asp1 - 315) div deg ))
w360 = sqr(sin(asp1 div deg ))
setcell minof
temp = w225 * shade225 + w270 * shade270 + w315 *
shade315 + w360 * shade360
shade4 = int(temp div 2)
```

Note: better results if smoothing is done at full resolution:

```
h03 = focalmean(hawaii, circle, 30)
```

but it takes MUCH longer!

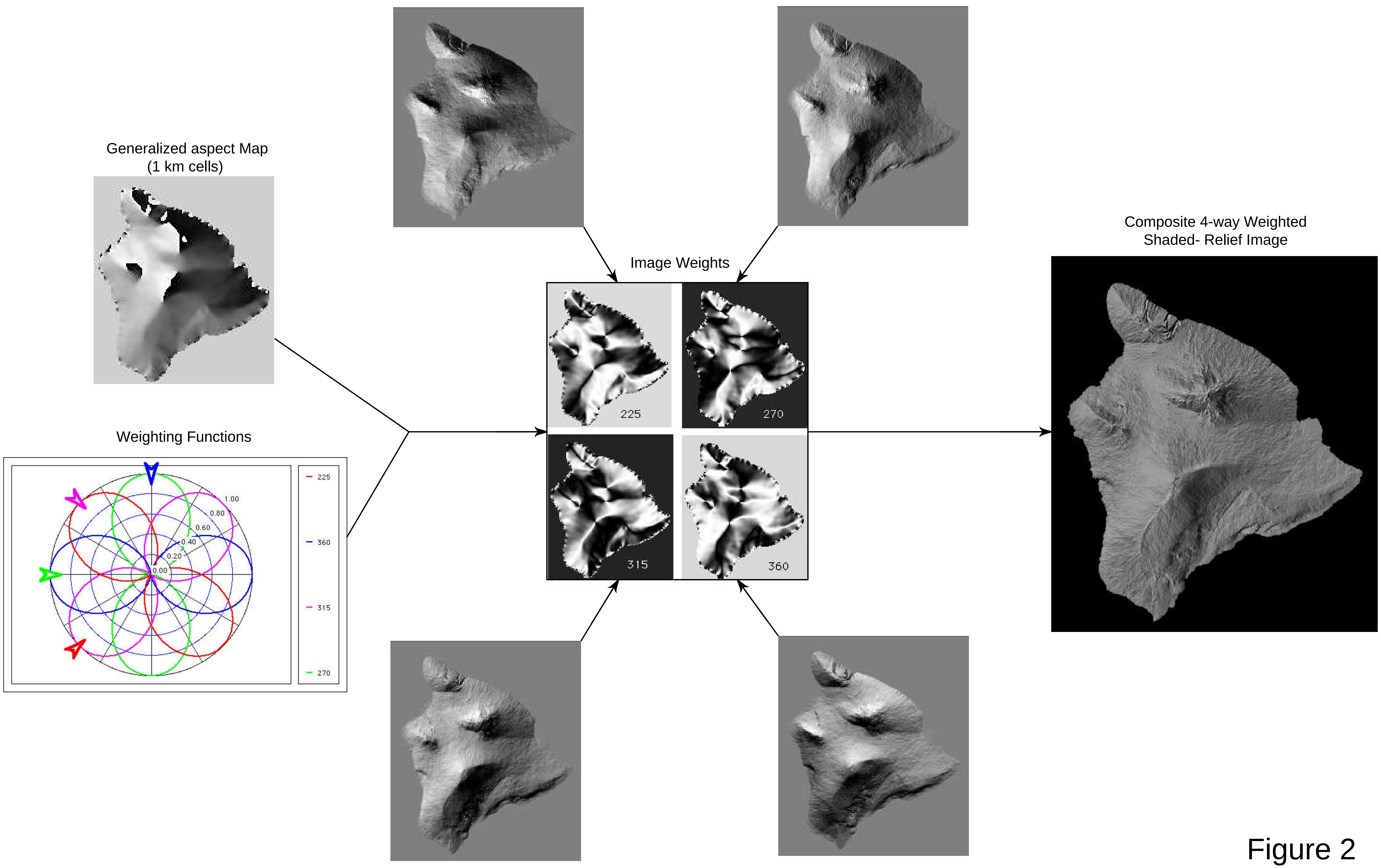
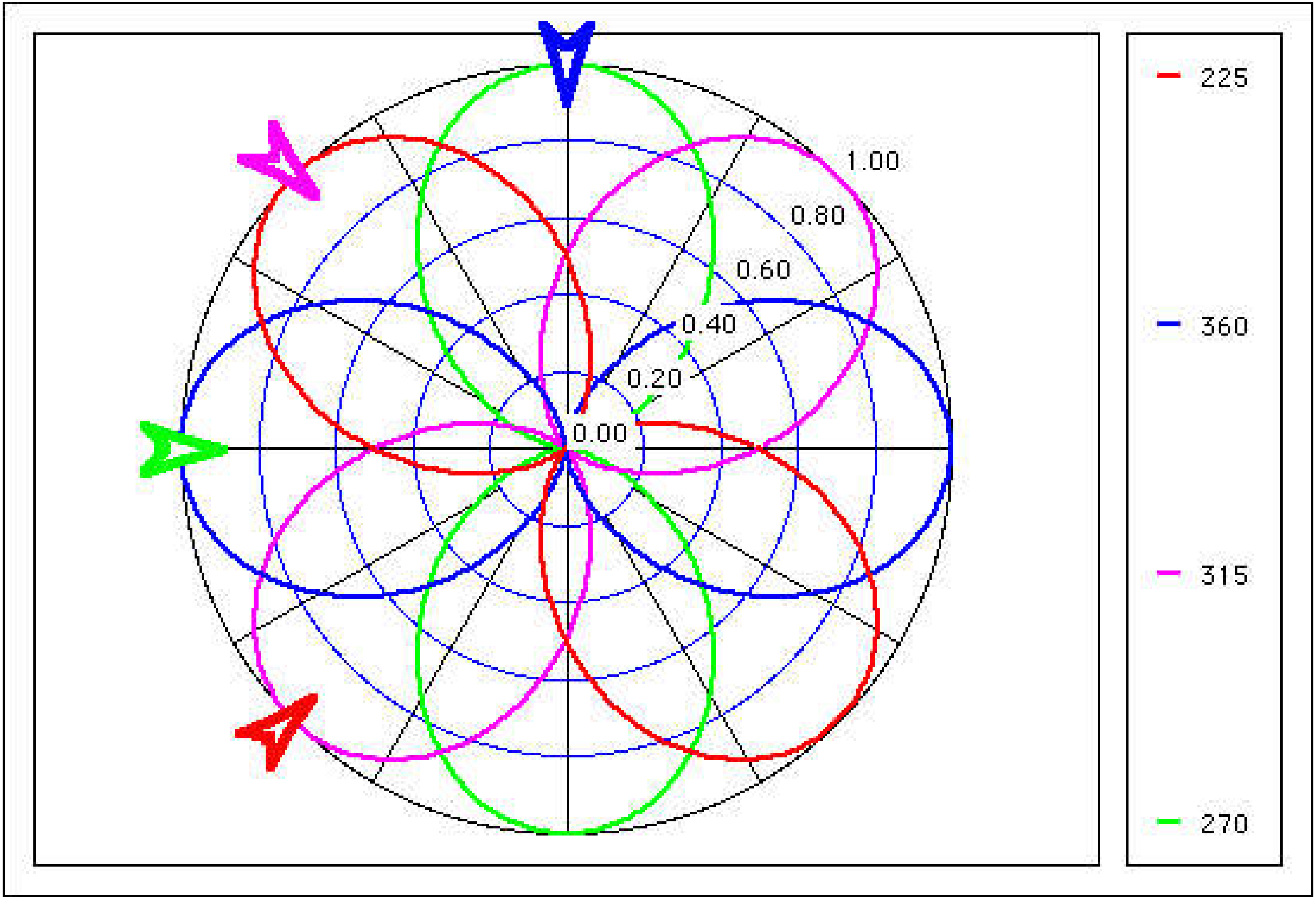

Generalized aspect Map
(1 km cells)
Weighting Functions
1.00
0.80
0.60
0.40
0.20
0.00
225
360
315
270
Image Weights
225
270
315
360
Composite 4-way Weighted
Shaded- Relief Image

Figure 2


1.00
0.80
0.60
0.40
0.20
0.00
225
360
315
270