

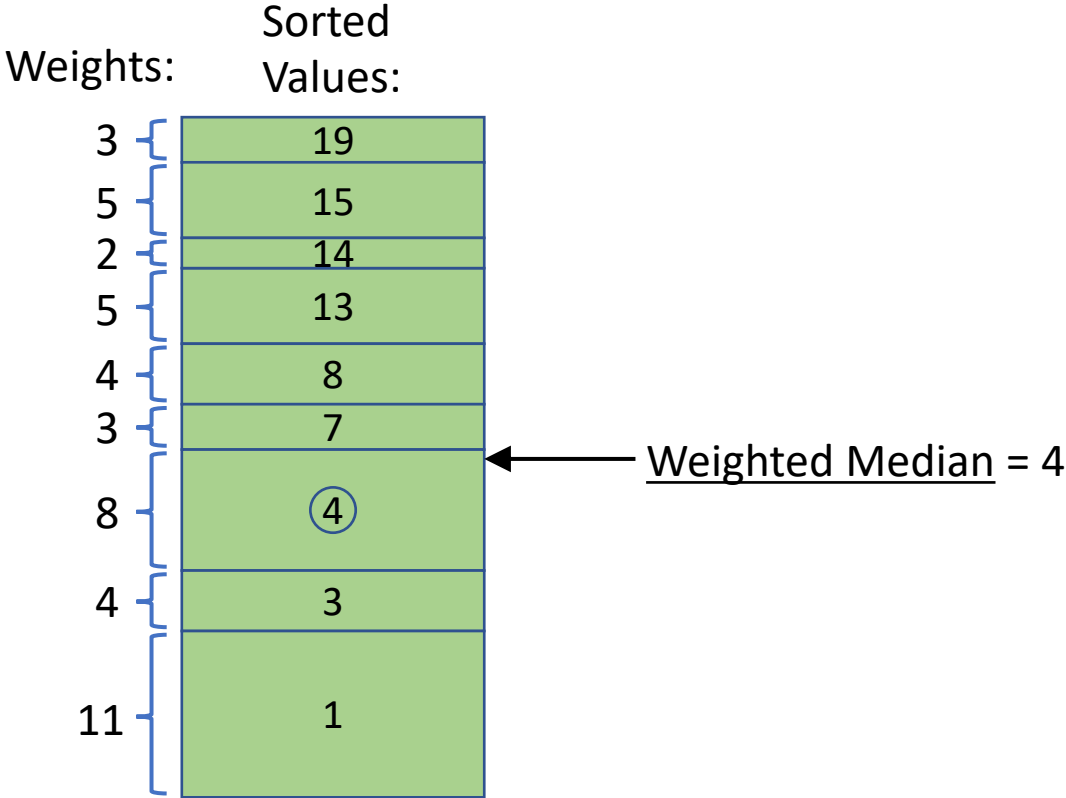
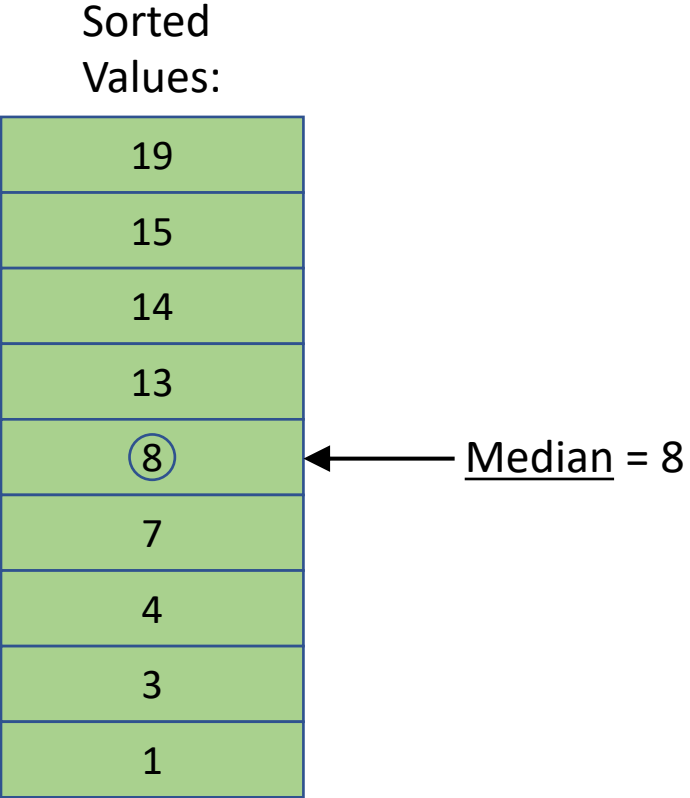
Weighted Median Filtering

Leland Brown

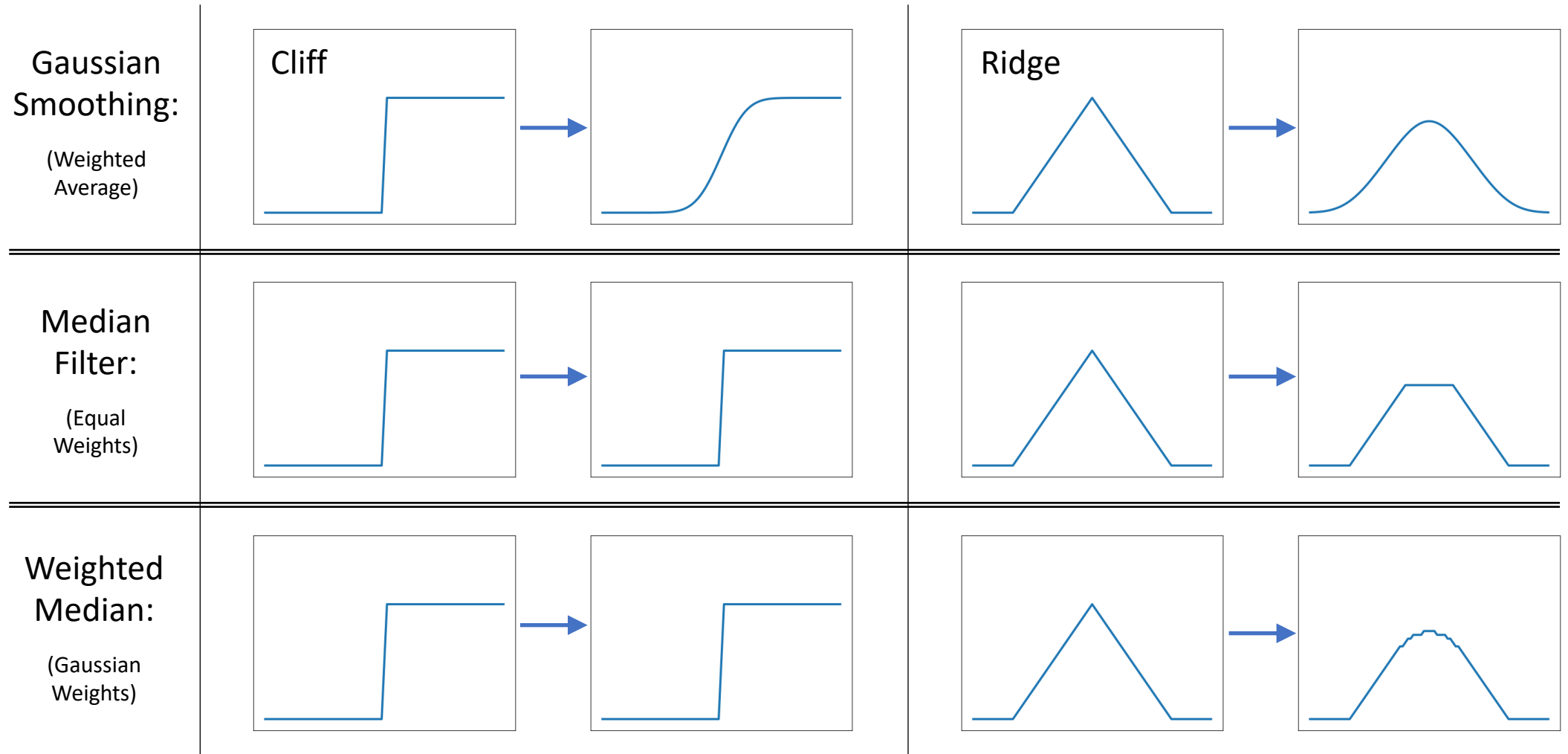
12 April 2023

12th ICA Mountain Cartography Workshop

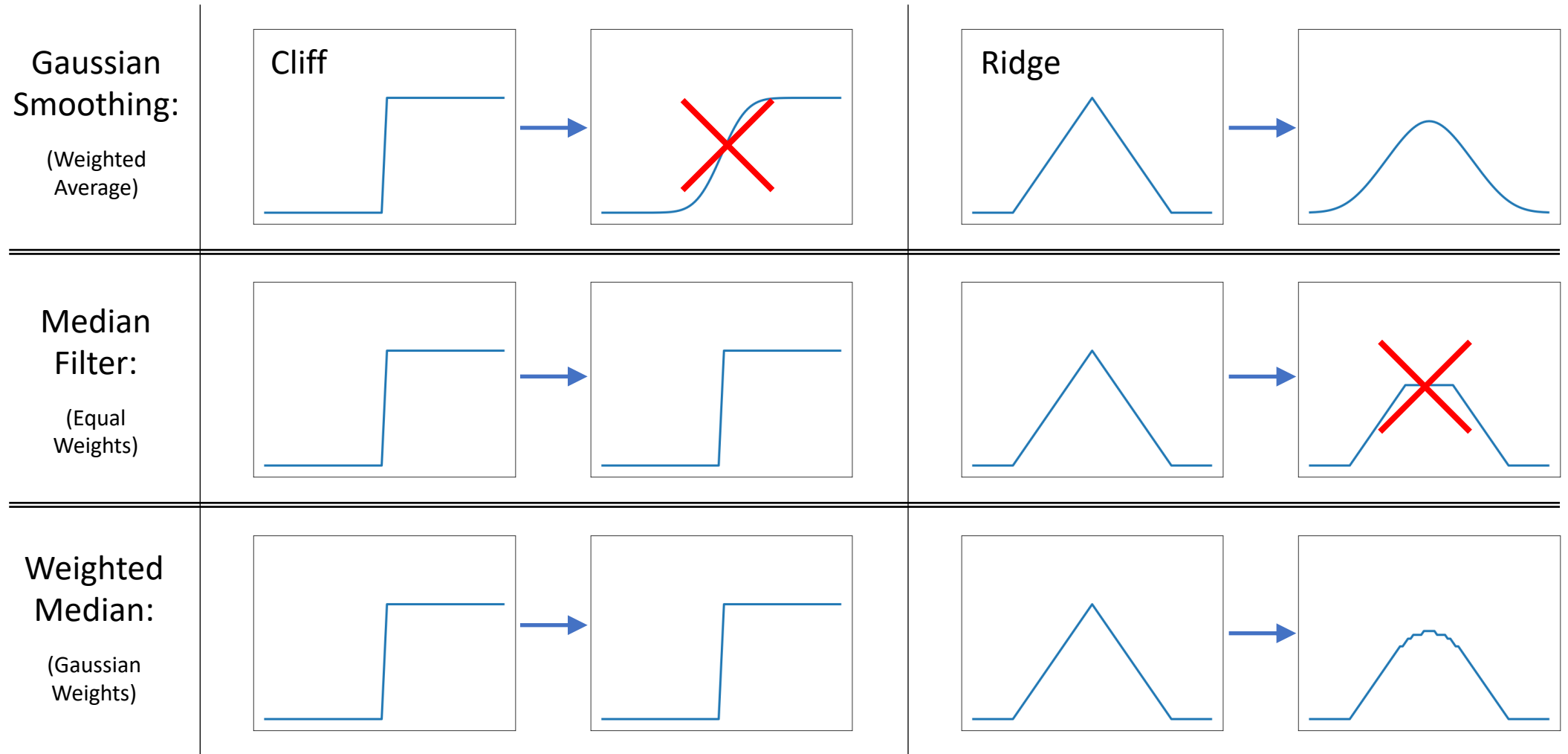
Median vs. Weighted Median



Comparison of Filters on DEM (Profile View)

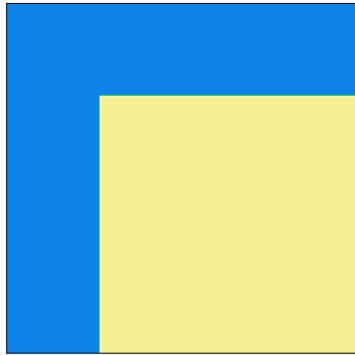


Comparison of Filters on DEM (Profile View)

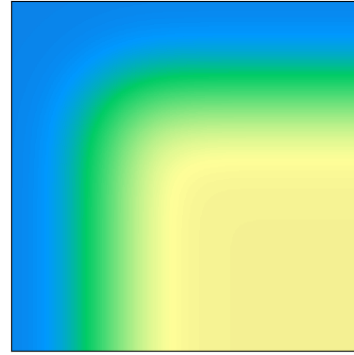


Comparison of Filters (Plan View / Contours)

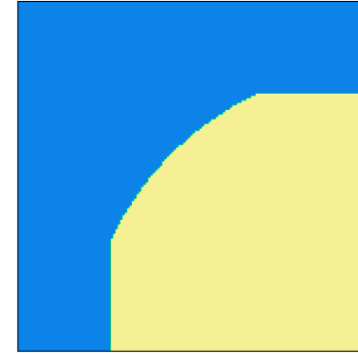
Plateau with Corner
(colored by elevation)



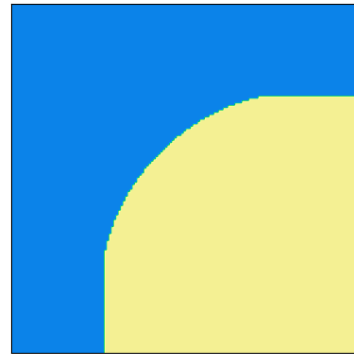
Gaussian
Smoothing



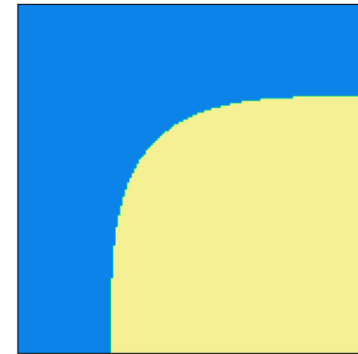
Median
Filter
(Square)



Median
Filter
(Circle)

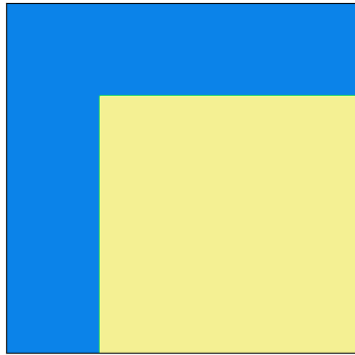


Weighted
Median

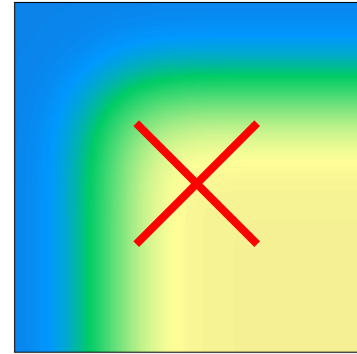


Comparison of Filters (Plan View / Contours)

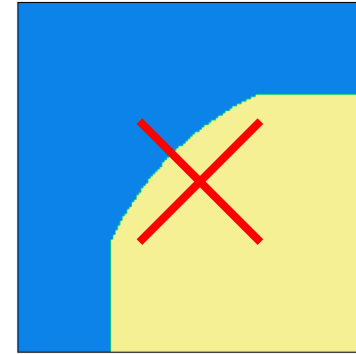
Plateau with Corner
(colored by elevation)



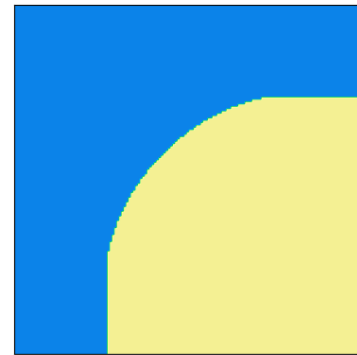
Gaussian
Smoothing



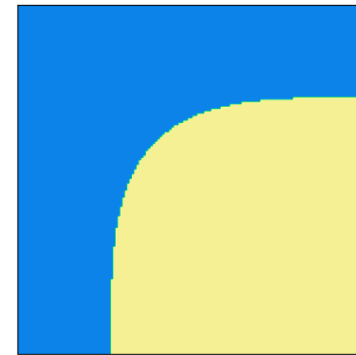
Median
Filter
(Square)



Median
Filter
(Circle)



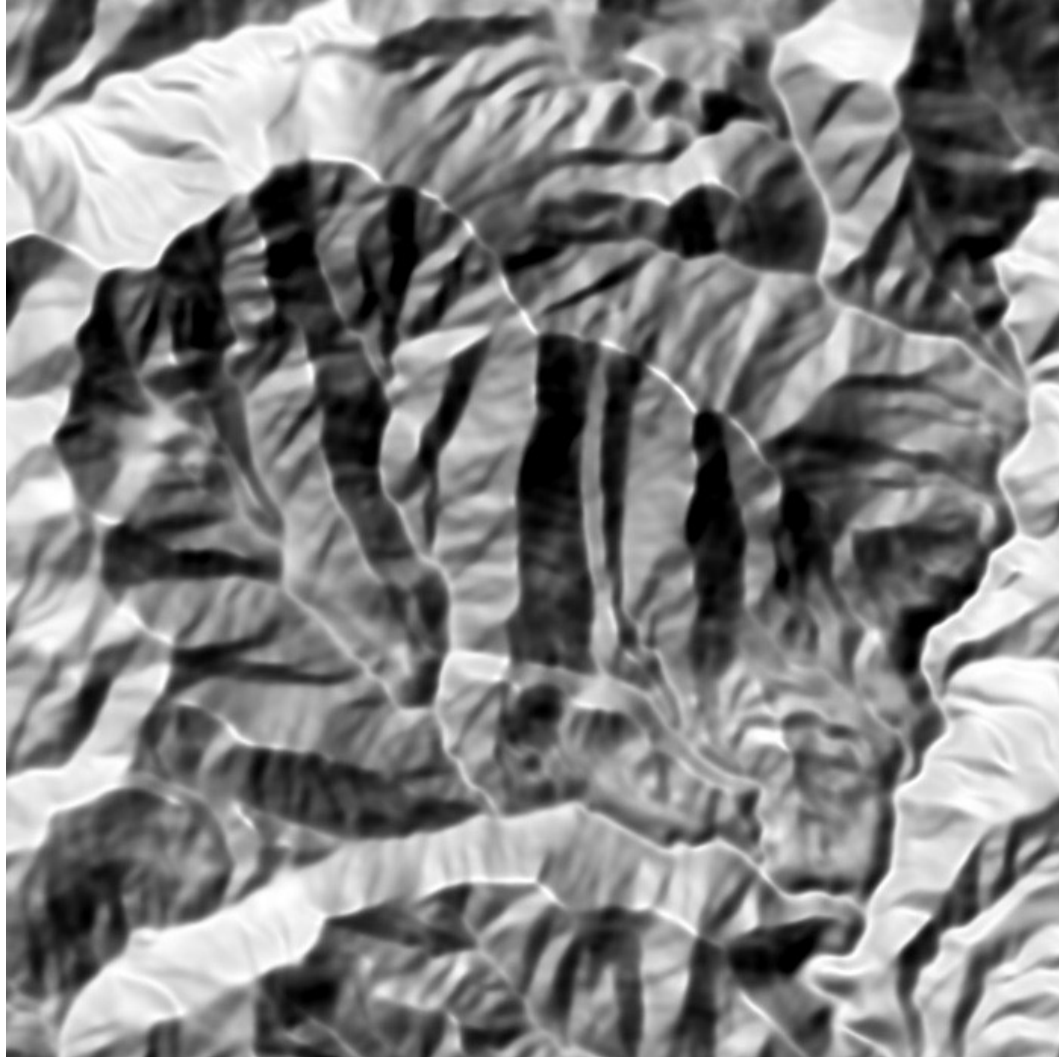
Weighted
Median



Example - Original DEM, Hillshaded



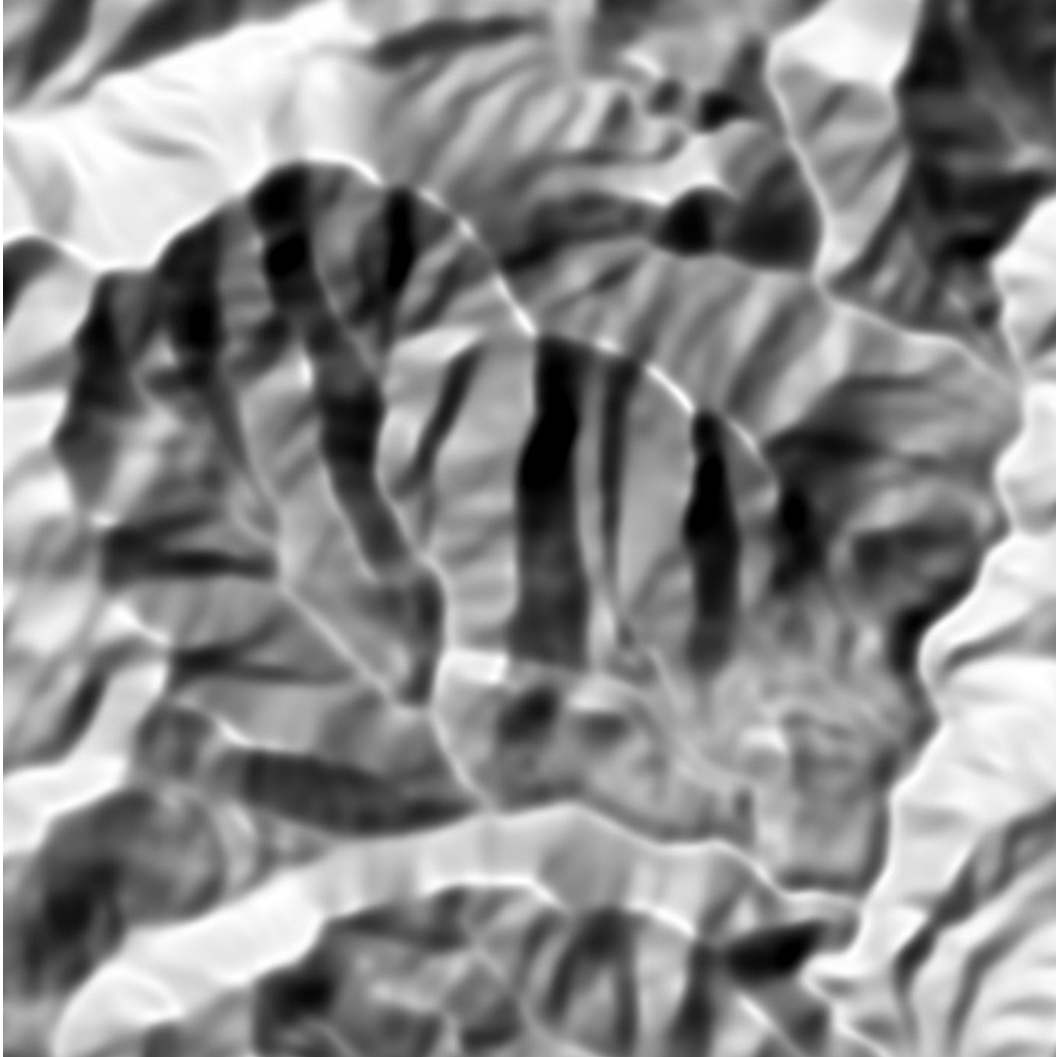
Gaussian Smoothing Applied to DEM (1 of 2)



Process:

1. Apply filter to DEM data
2. Render hillshading

Gaussian Smoothing (2 of 2)



Terrain becomes very smooth, almost blurry

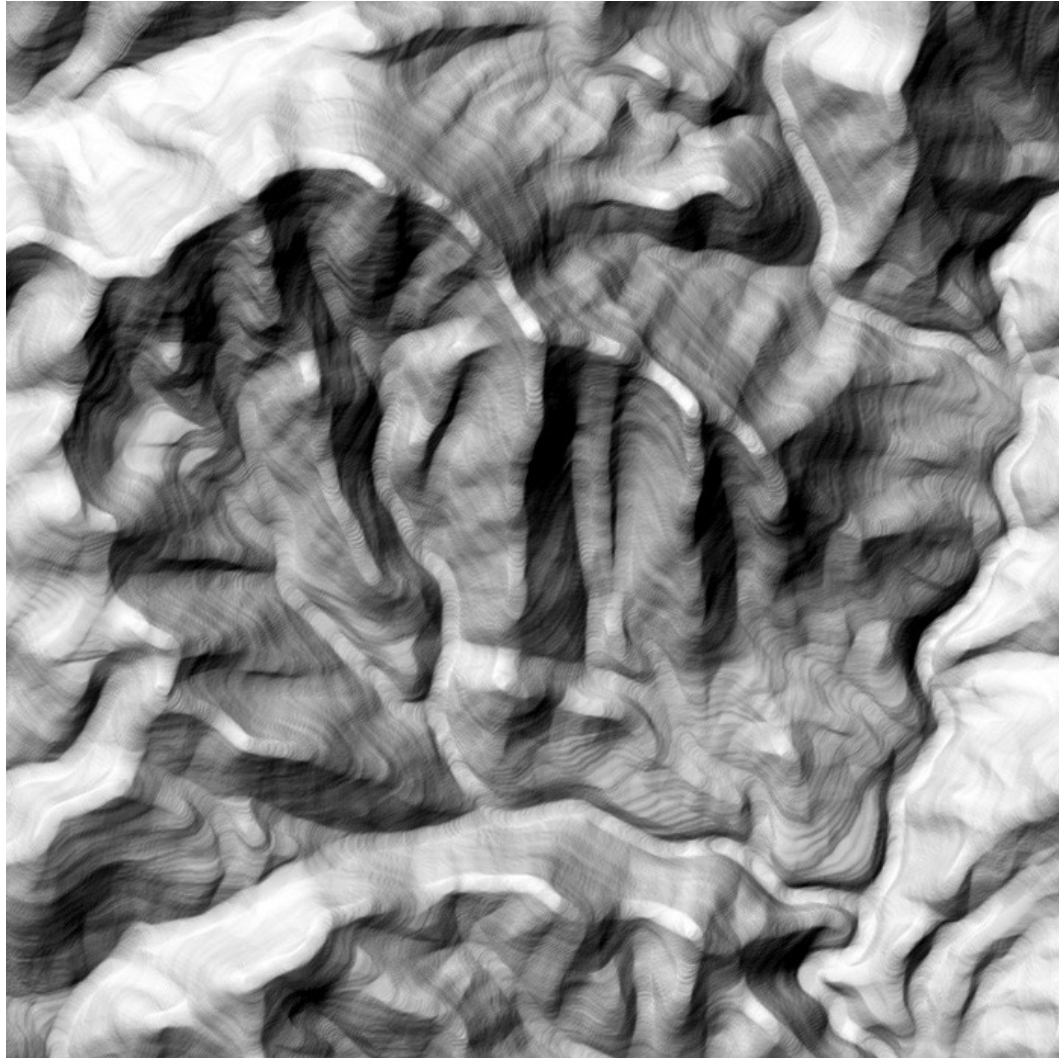
Median Filter (1 of 3)



Median Filter (2 of 3)



Median Filter (3 of 3)

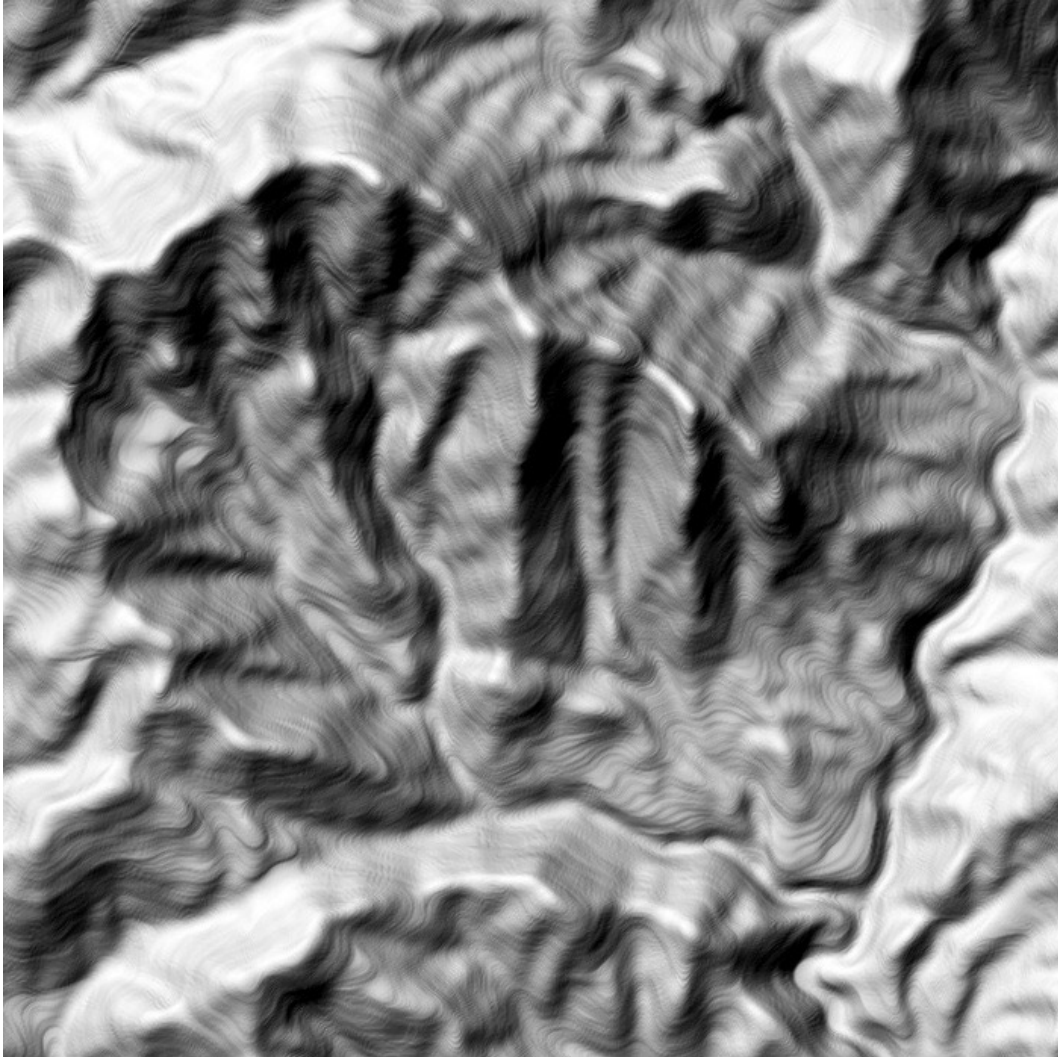


Ridge tops and canyon bottoms are flattened

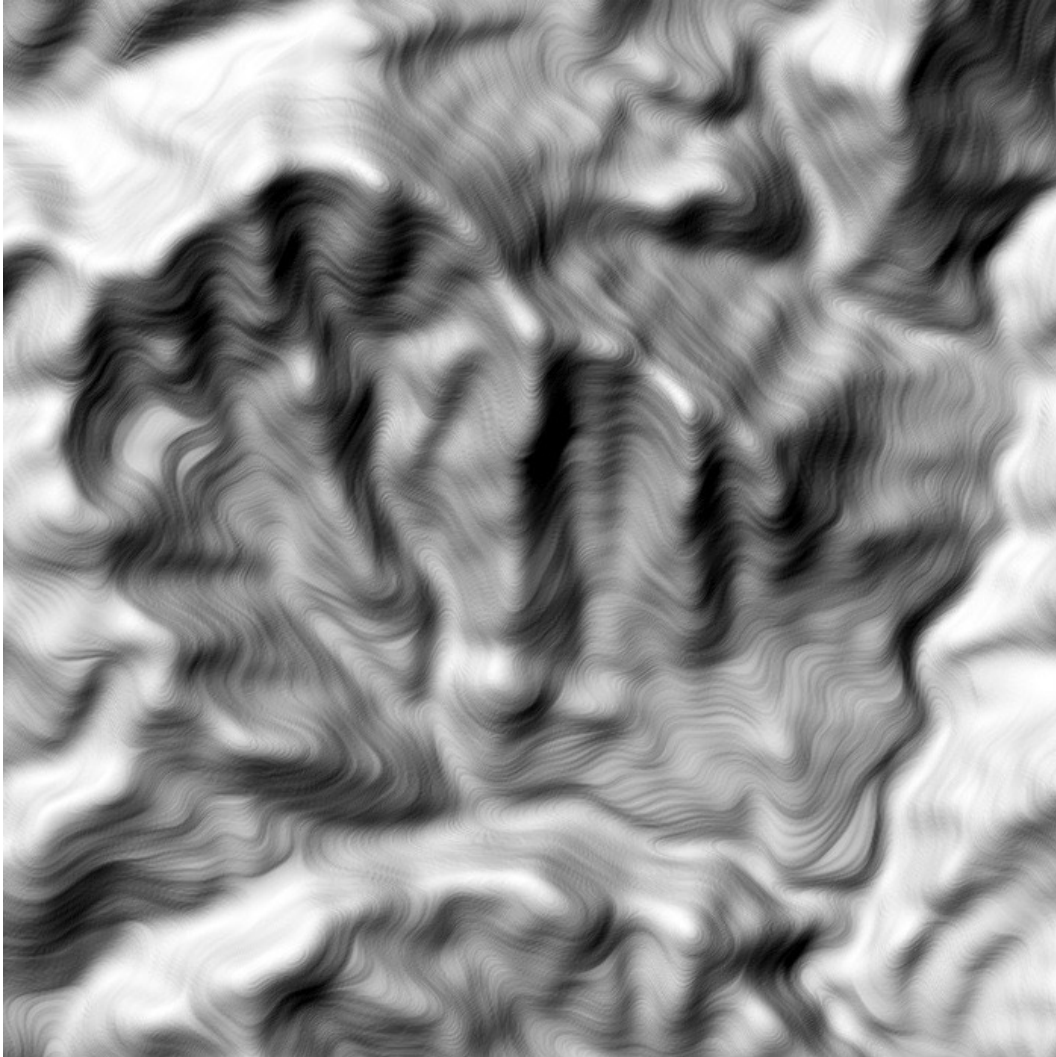
Weighted Median Filter (1 of 4)



Weighted Median Filter (2 of 4)

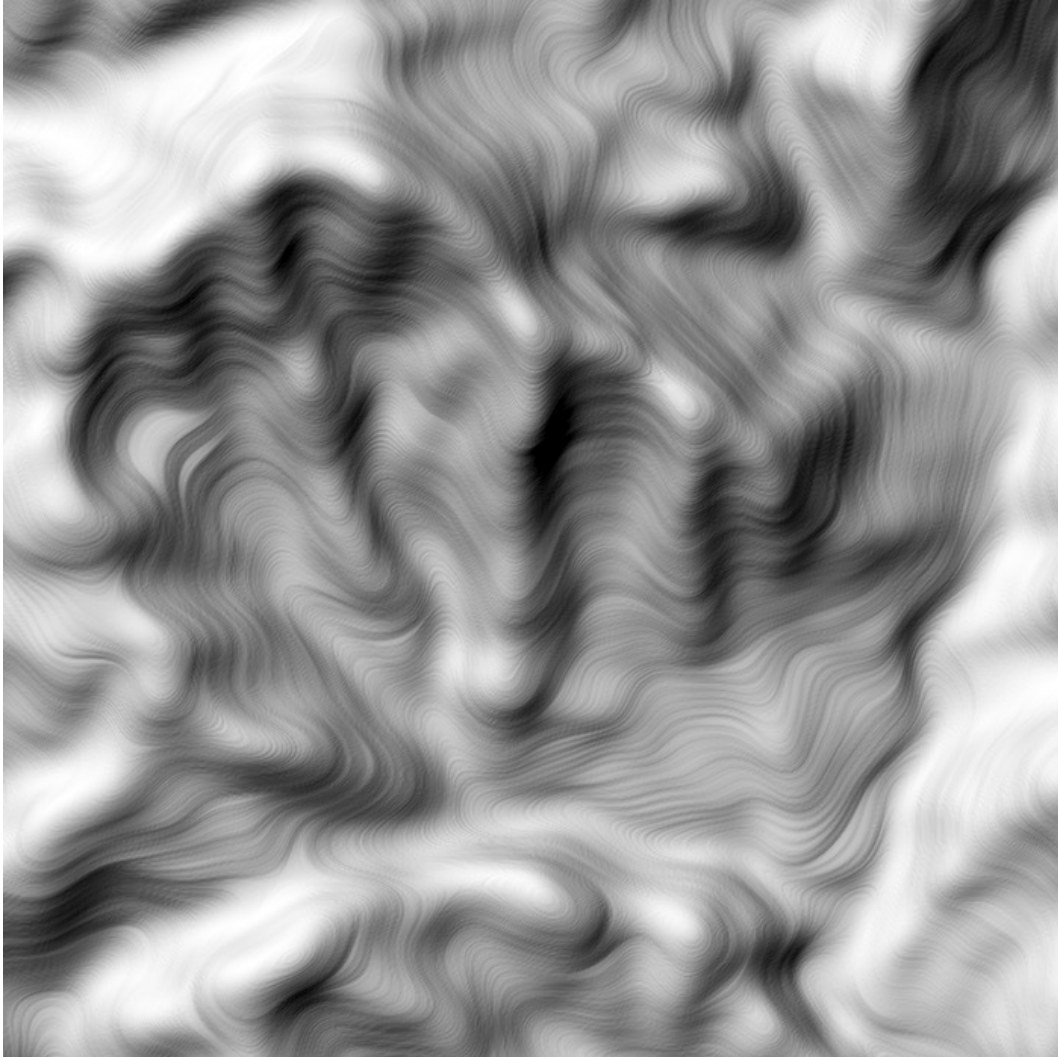


Weighted Median Filter (3 of 4)



Latent terracing artifact
remains from original data

Weighted Median Filter (4 of 4)



Original DEM Again



Weighted Median Applied to *Image* (1 of 2)



Process:

1. Render hillshading
2. Apply filter to image pixels

Weighted Median Applied to *Image* (2 of 2)



Gaussian Smoothing Again



Ridges are bright because smoothing flattens them

DEM Smoothing + Image Smoothing



Process:

1. Apply 1st filter to DEM
(Gaussian smoothing)
2. Render hillshading
3. Apply 2nd filter to image
(weighted median)

Weighted median reduces bright ridges and further generalizes the image