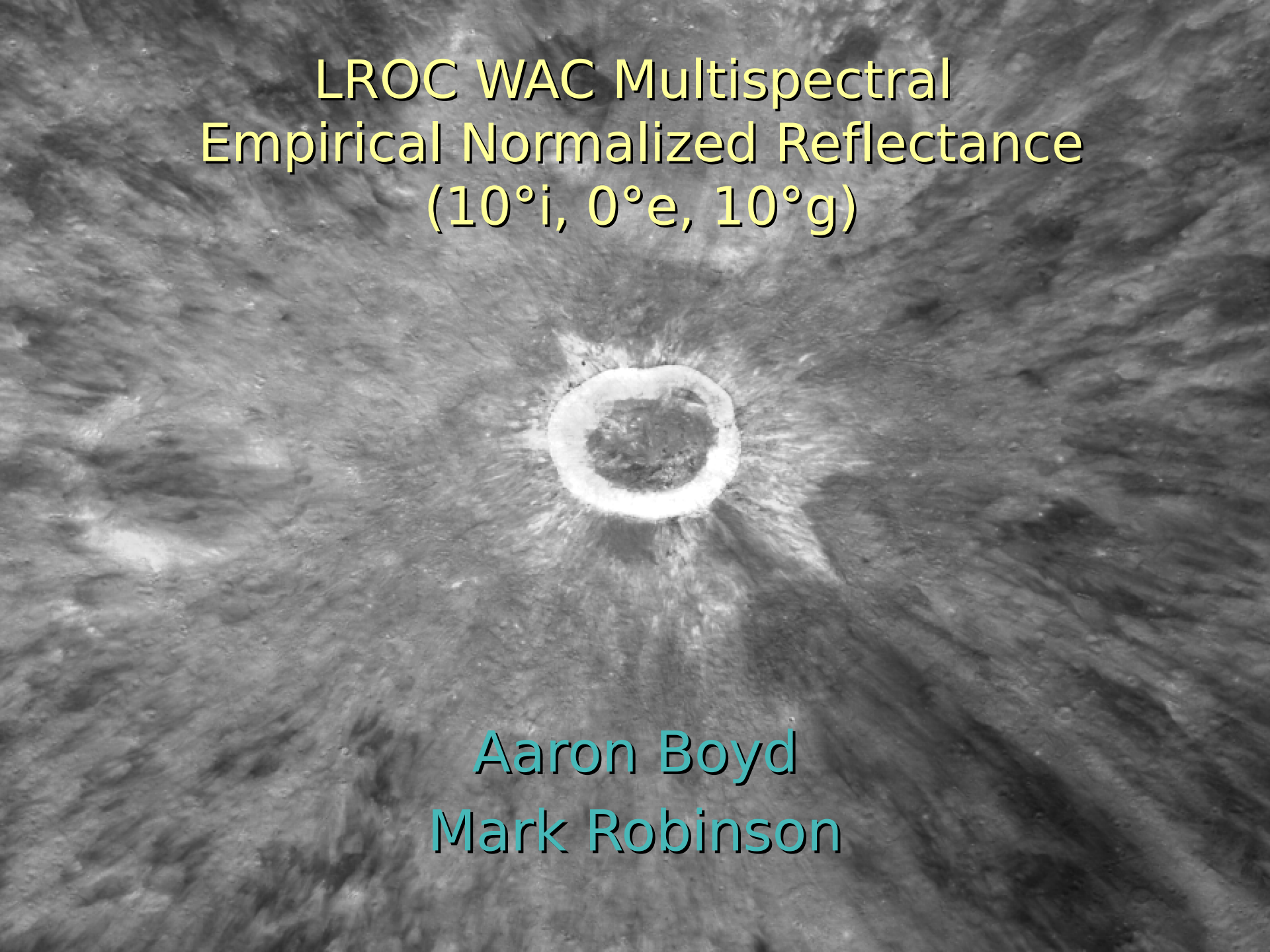
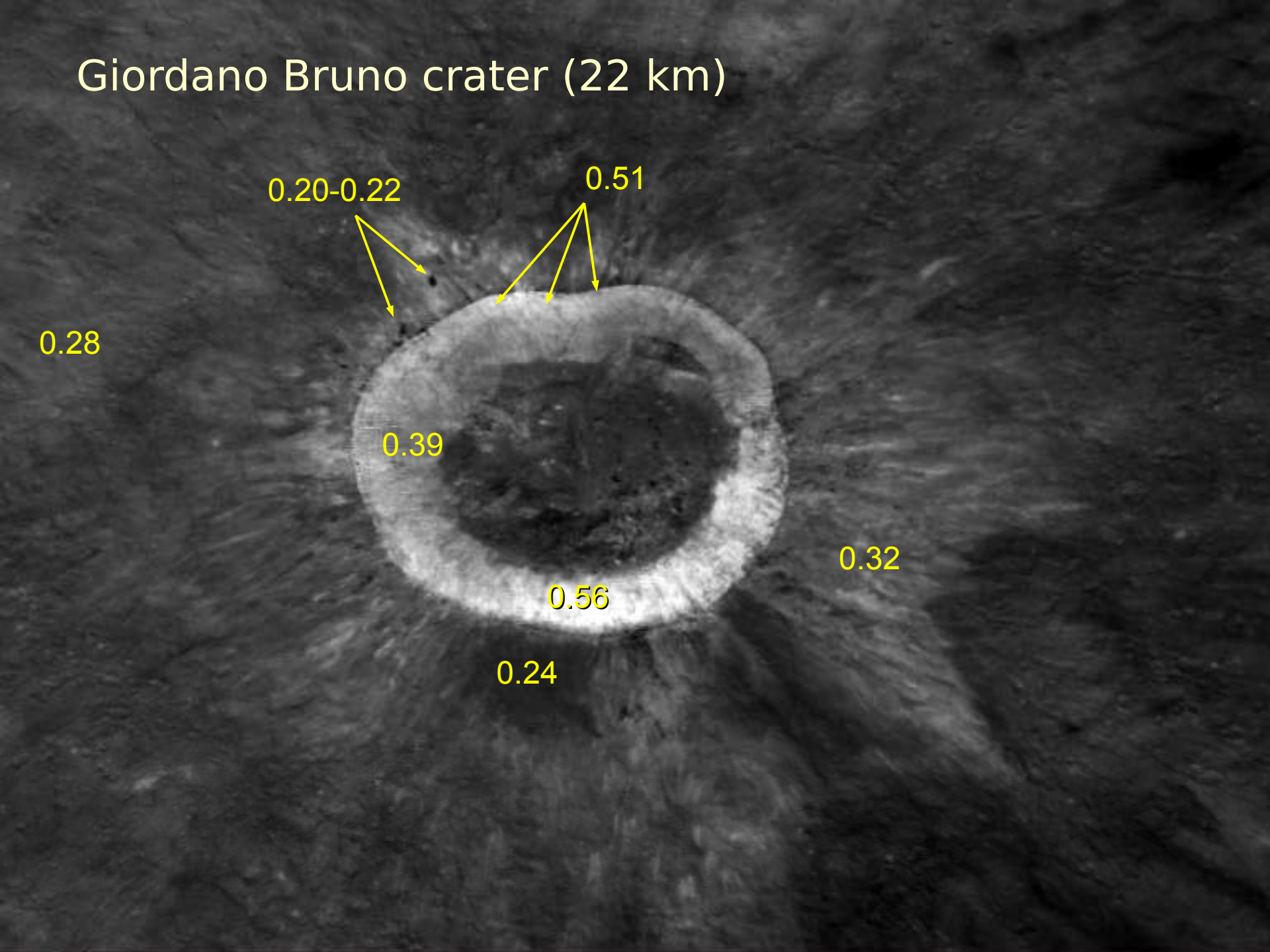
LROC WAC Multispectral Empirical Normalized Reflectance (10°i, 0°e, 10°g)



Aaron Boyd
Mark Robinson


Giordano Bruno crater (22 km)
0.20-0.22
0.51
0.28
0.39
0.32
0.56
0.24

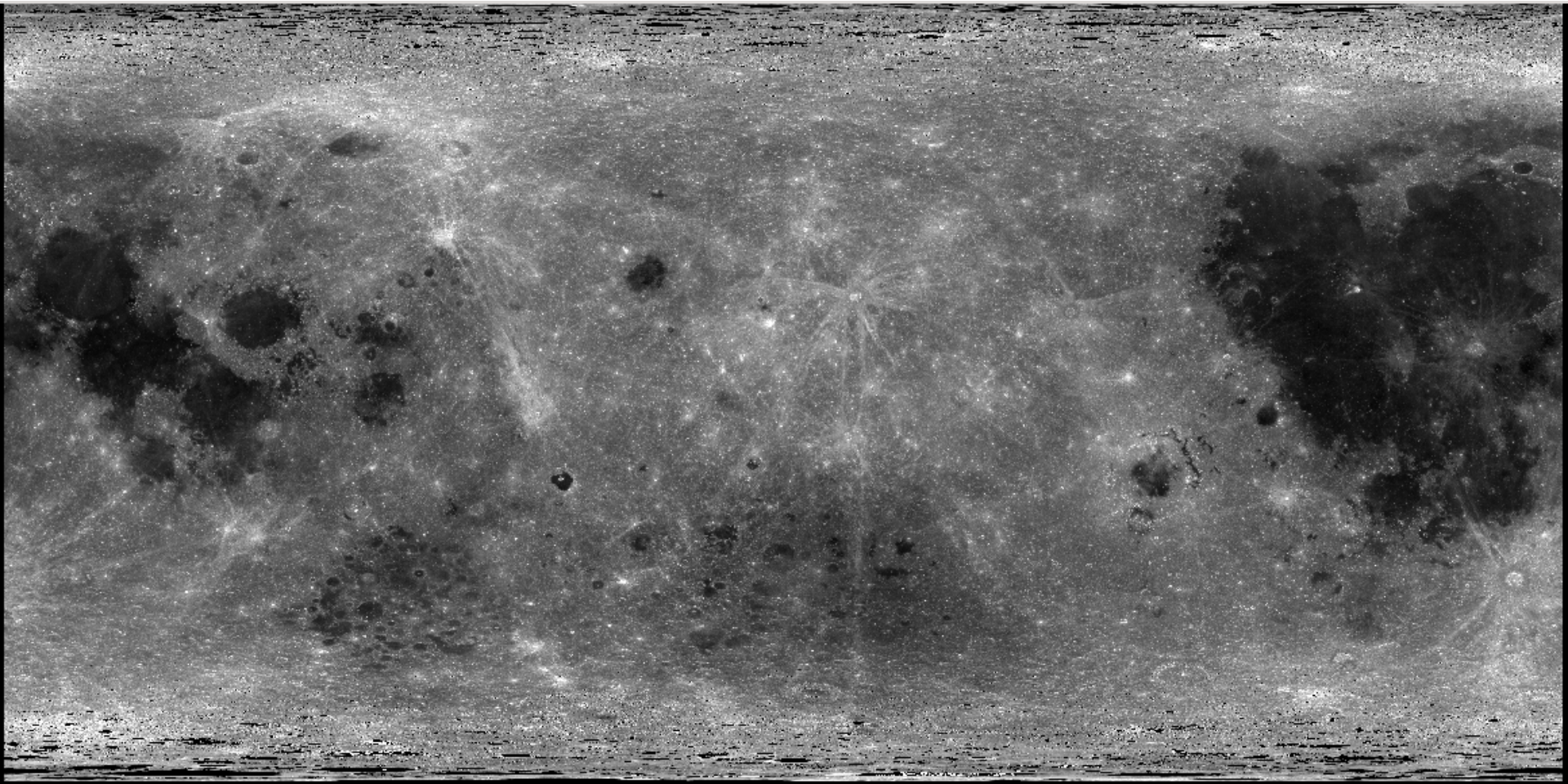
Overview

- **Global Empirical Photometric Function**
  - Photometric angles calculated using topography (GLD 100)
  - Empirical fit to data (i,e,g) from a strip of latitude 0°N to 90°N and 146°E to 148°E (Over 40,000,000 WAC Pixels)
  - Each wavelength (7 bands, 300-700 nm) is computed separately
- **Normalized I/F (n-I/F) Map Generation**
  - Over 100,000 WAC Observations
  - Calibrated to reflectance (I/F) and normalized by photometric angles (i,e,g). Data limited to incidence angles < 89° and a minimum I/F threshold.
  - Latitude and longitude for each pixel are calculated
  - Median, standard deviation, and count of the normalized reflectance data are calculated and stored for each equal area (sinusoidal) map location
  - Average of 86 data points (WAC pixels) for each output map pixel

The Moon

LROC WAC 643 nm n-I/F

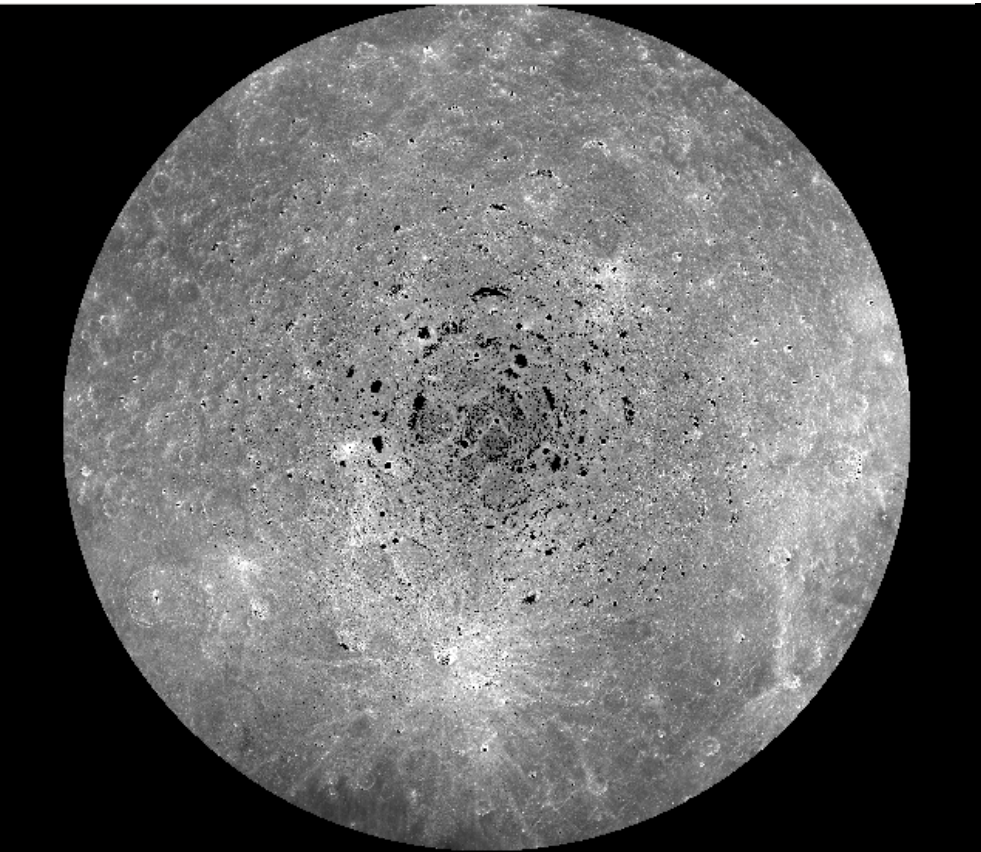
90°S to 90°N



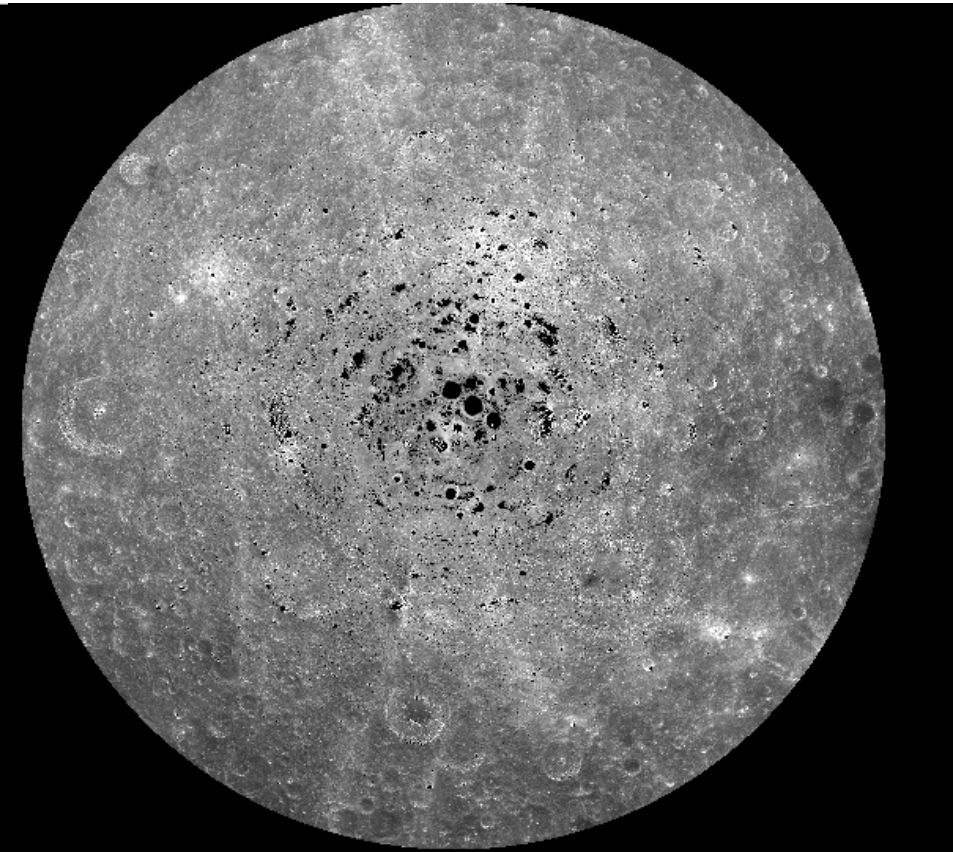
Polar Views

LROC WAC 643 nm n-I/F

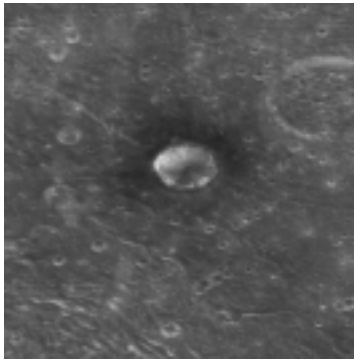
60°N to 90°N



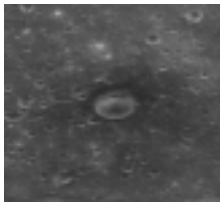
60°S to 90°S



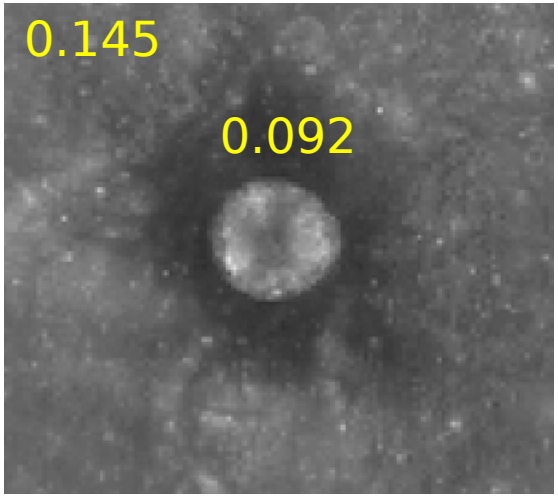
Dark Halo Craters



6.6-km diameter, 44.15°S, 289.10°
0.115 n-I/F ejecta
0.170 n-I/F background

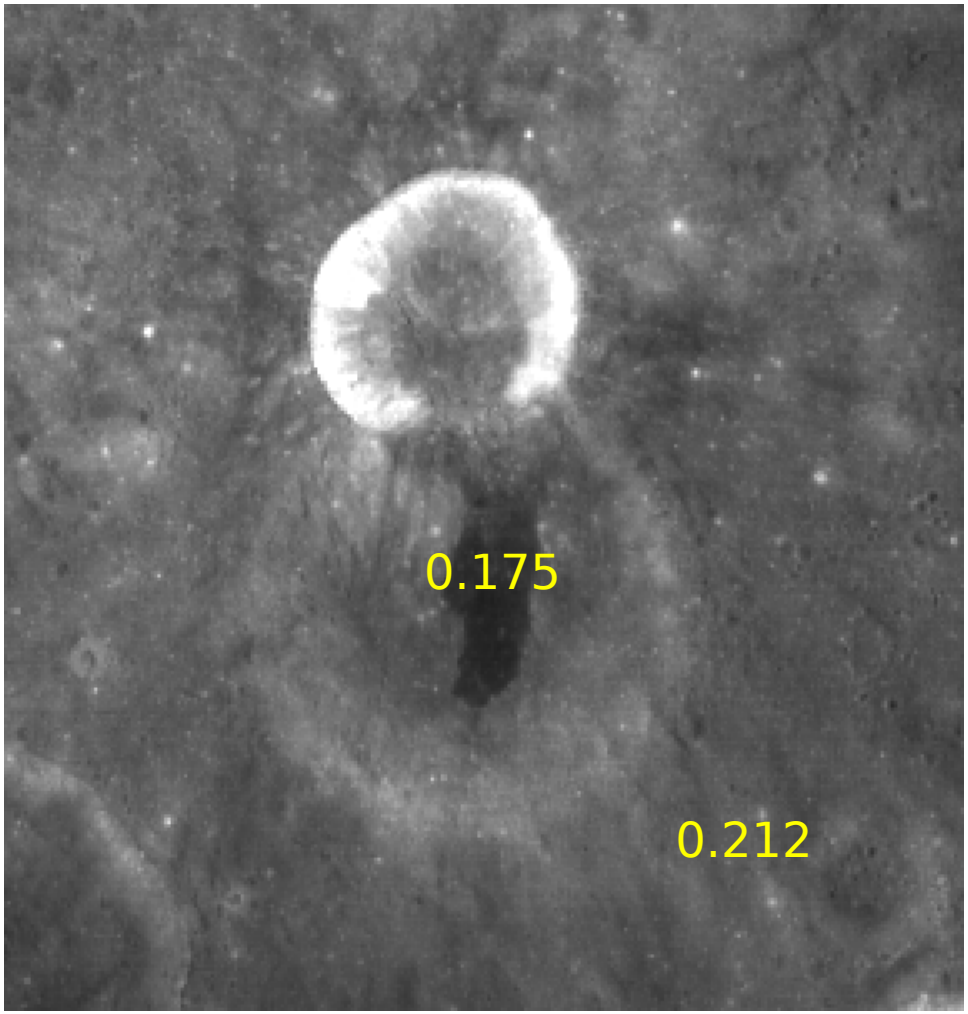


3.4-km diameter, 50.36°S, 299.52°E
0.11 n-I/F ejecta
0.15 n-I/F background



Dark Halo (or very unlucky mare puddle?)
9.6 km diameter, 8.83°N, 269.76°E

Impact Melt

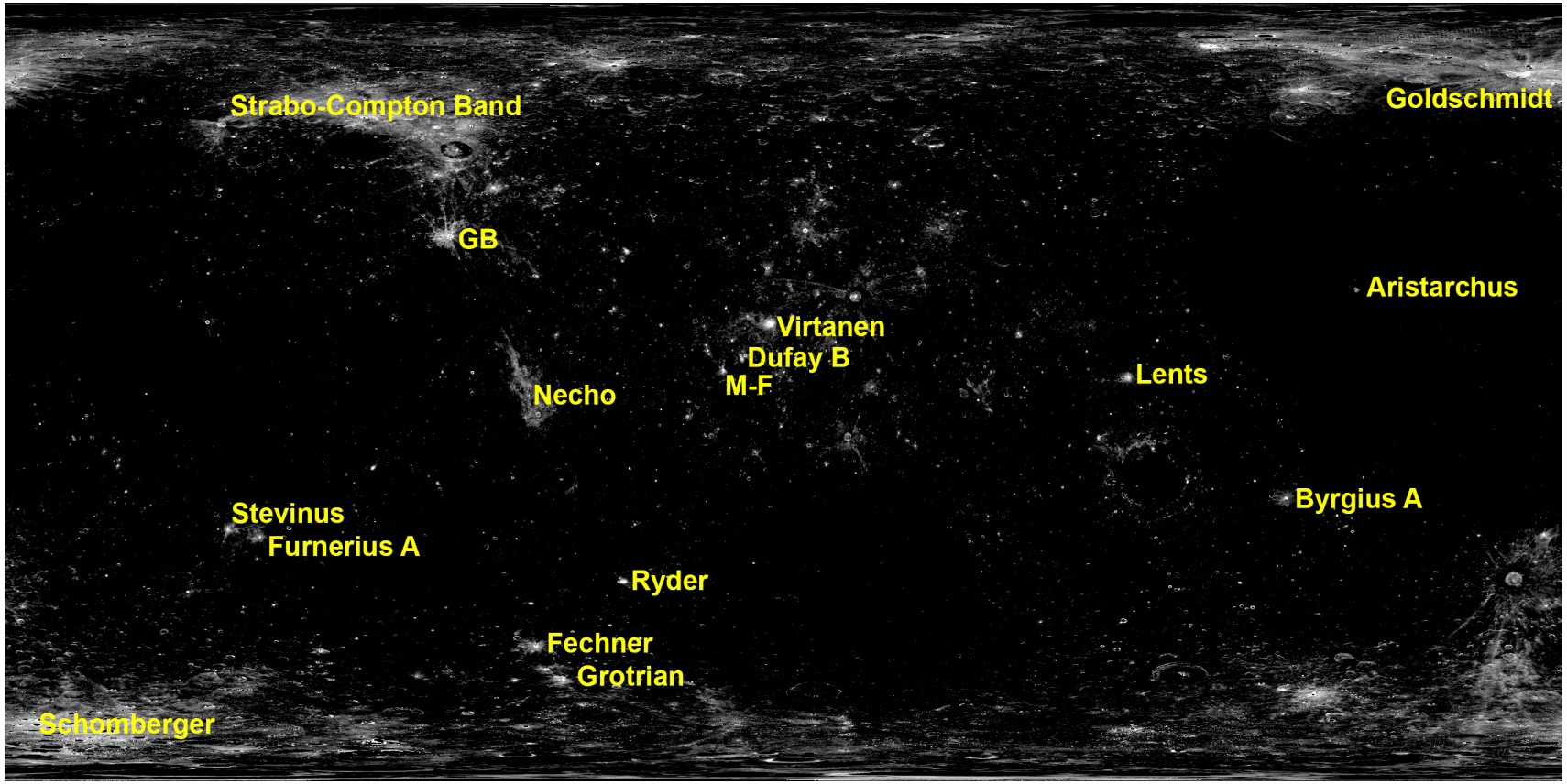


16.2 km diameter
0.97°N, 200.48°E

Nearby background material 0.168

High Reflectance

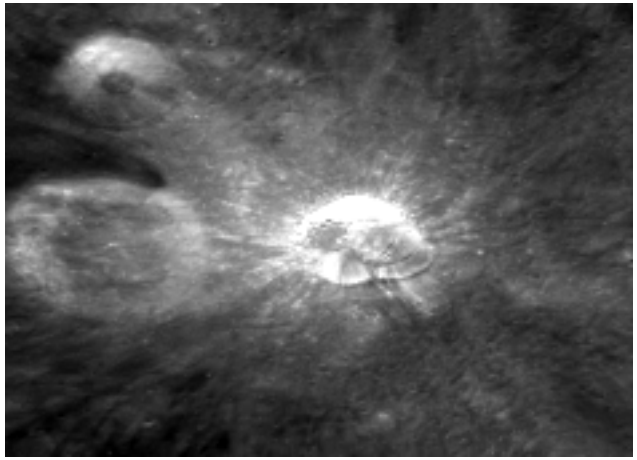
LROC WAC 643 nm n-I/F



High Reflectance

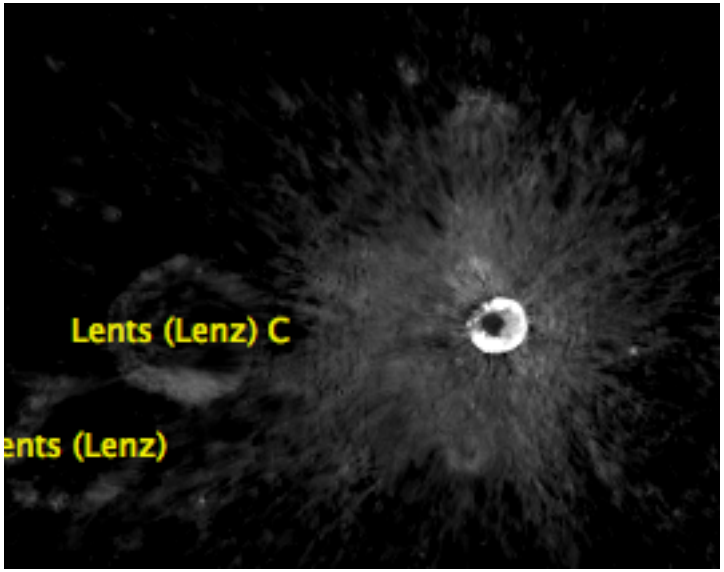
Name	Normalized Reflectance	Refl/ Global
Giordano Bruno	0.29	1.75
Ryder Crater	0.29	1.75
Lents C	0.29	1.75
Necho	0.23	1.39
Aristarchus	0.18	1.08
Byrgius A	0.24	1.45
Compton Belkovich	0.31	1.88

Copernicans



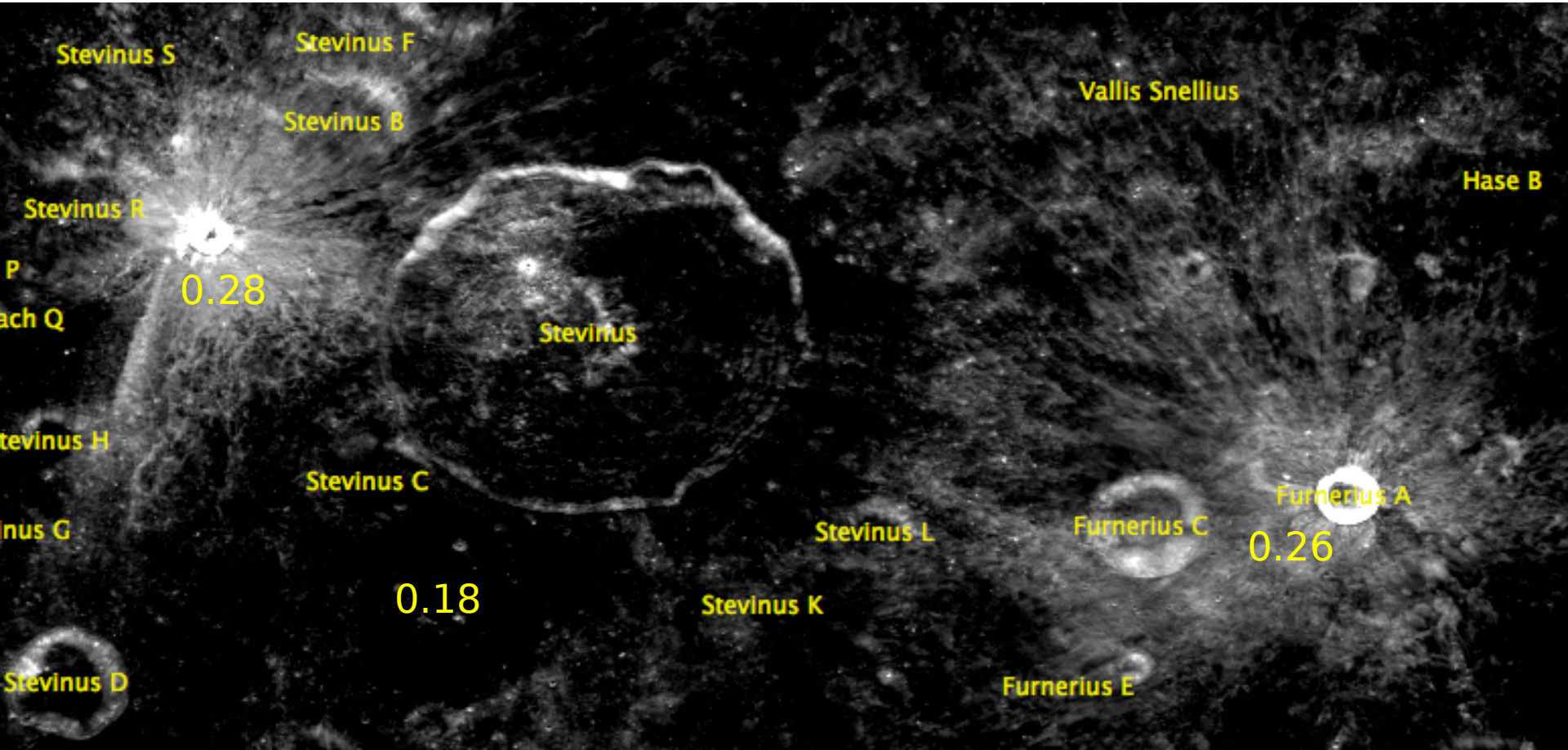
Ryder crater (43.91°S, 143.31°E)
13-km diameter
West Ejecta 0.29 n-I/F
East Ejecta 0.22 n-I/F
Nearby average 0.14 n-I/F

East of Lents C (3.282°N, 259.783°E)
4.4-km diameter
West Ejecta 0.29 n-I/F
SE Ejecta 0.29 n-I/F
Interior walls >0.45 n-I/F

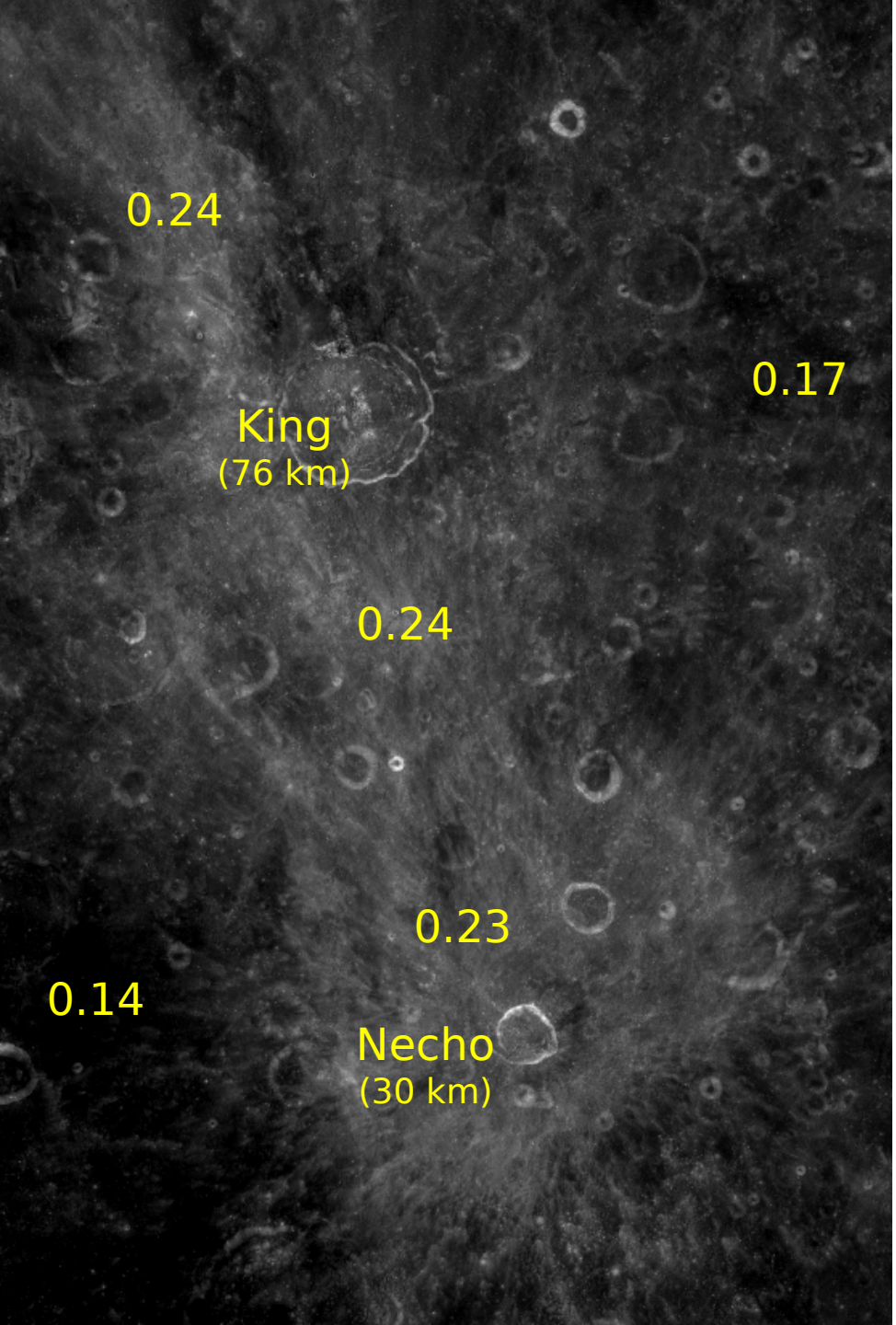


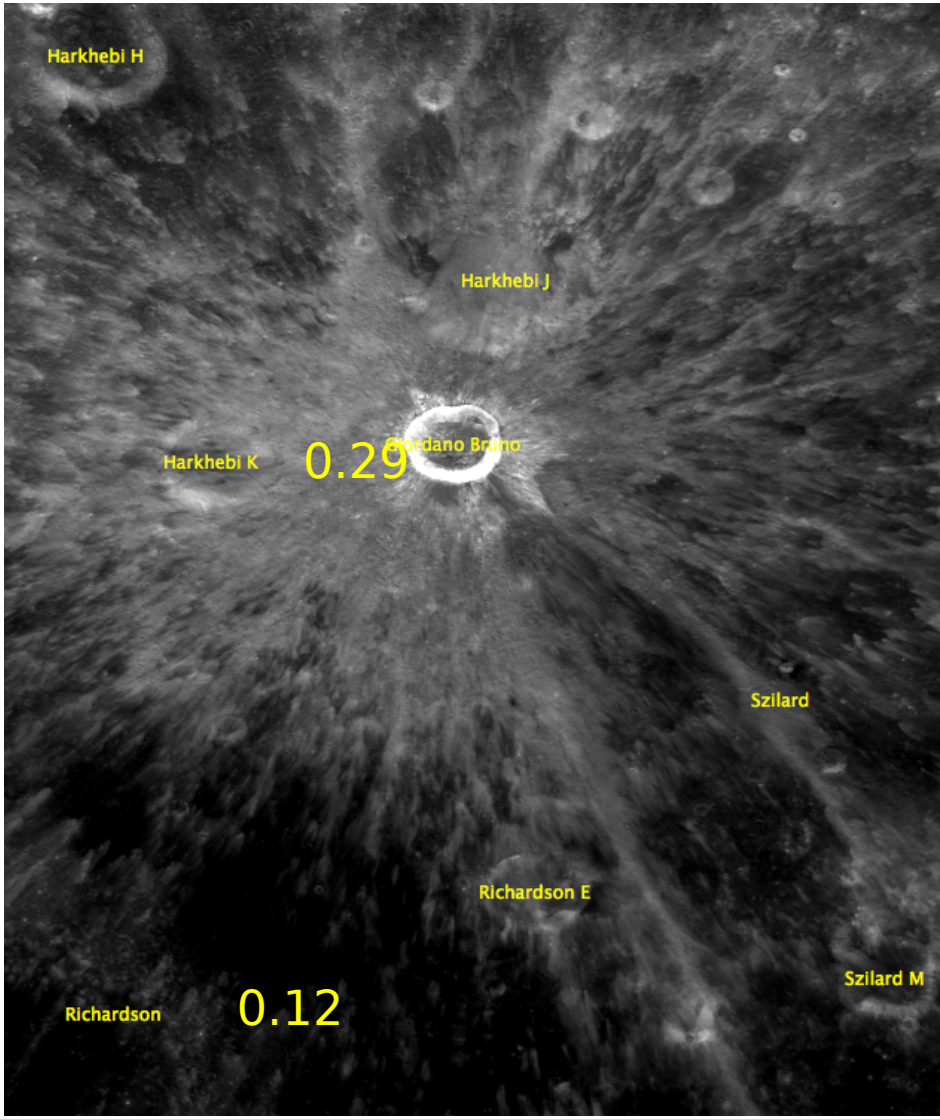
Stevinus Area

Stevinus crater 66-km diameter 32.51°S, 54.05°E



Rays

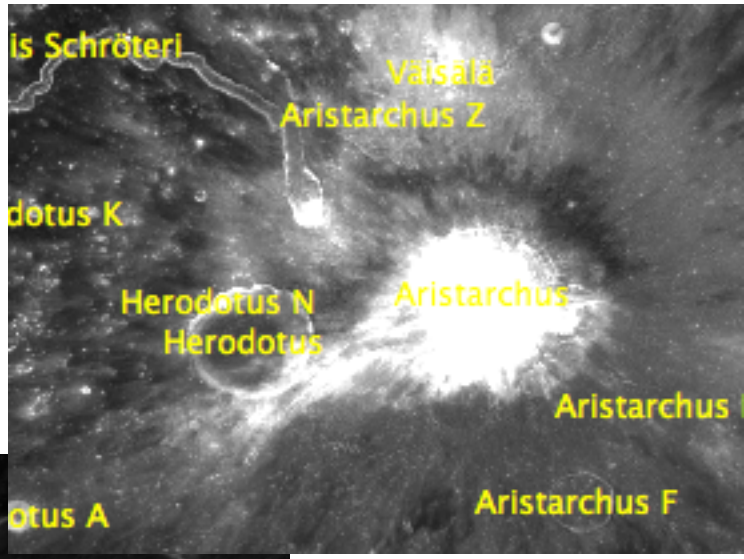


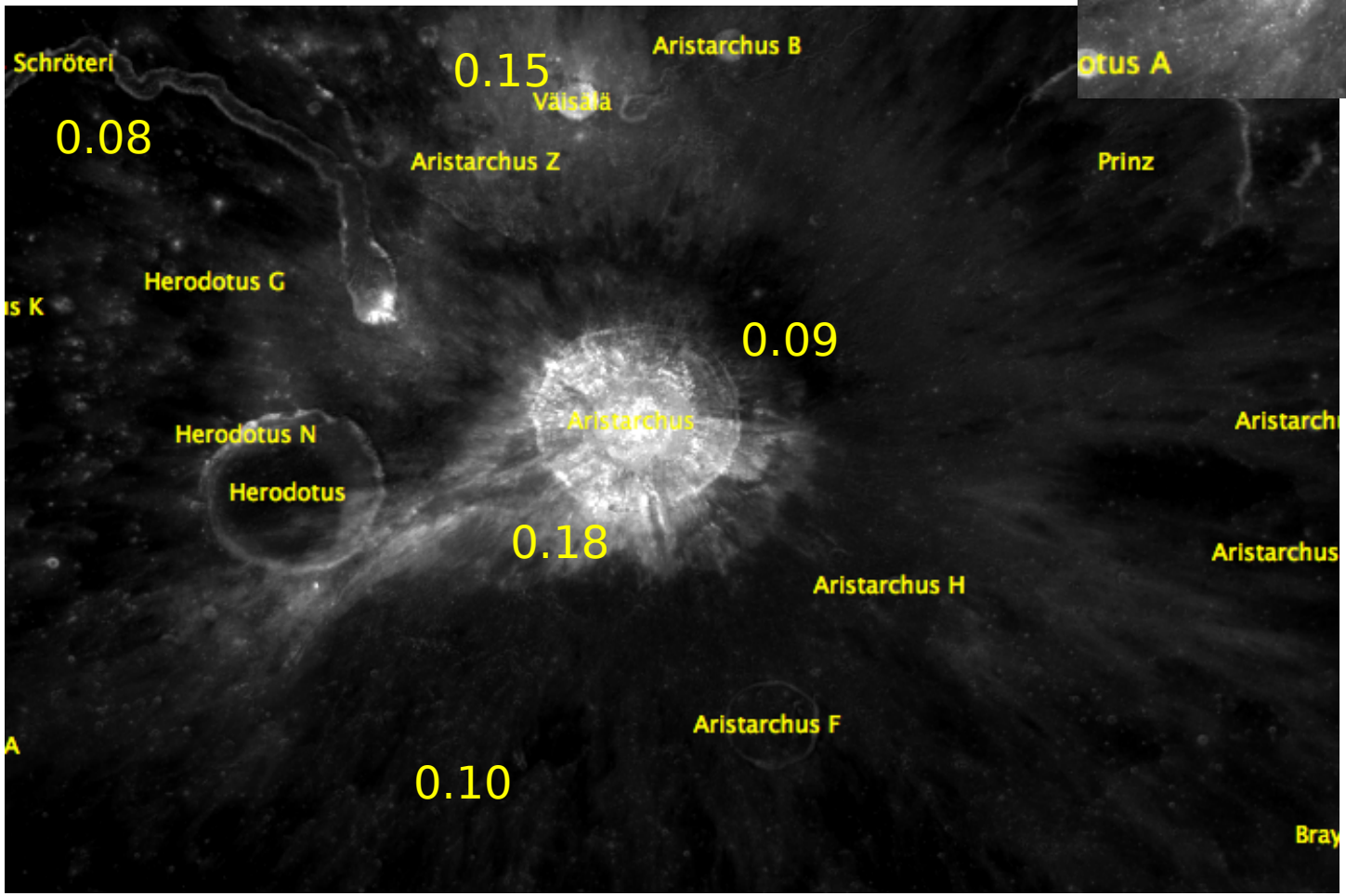


Giordano Bruno (22 km)

Aristarchus

37-km diameter, 23.66°N, 312.53°E

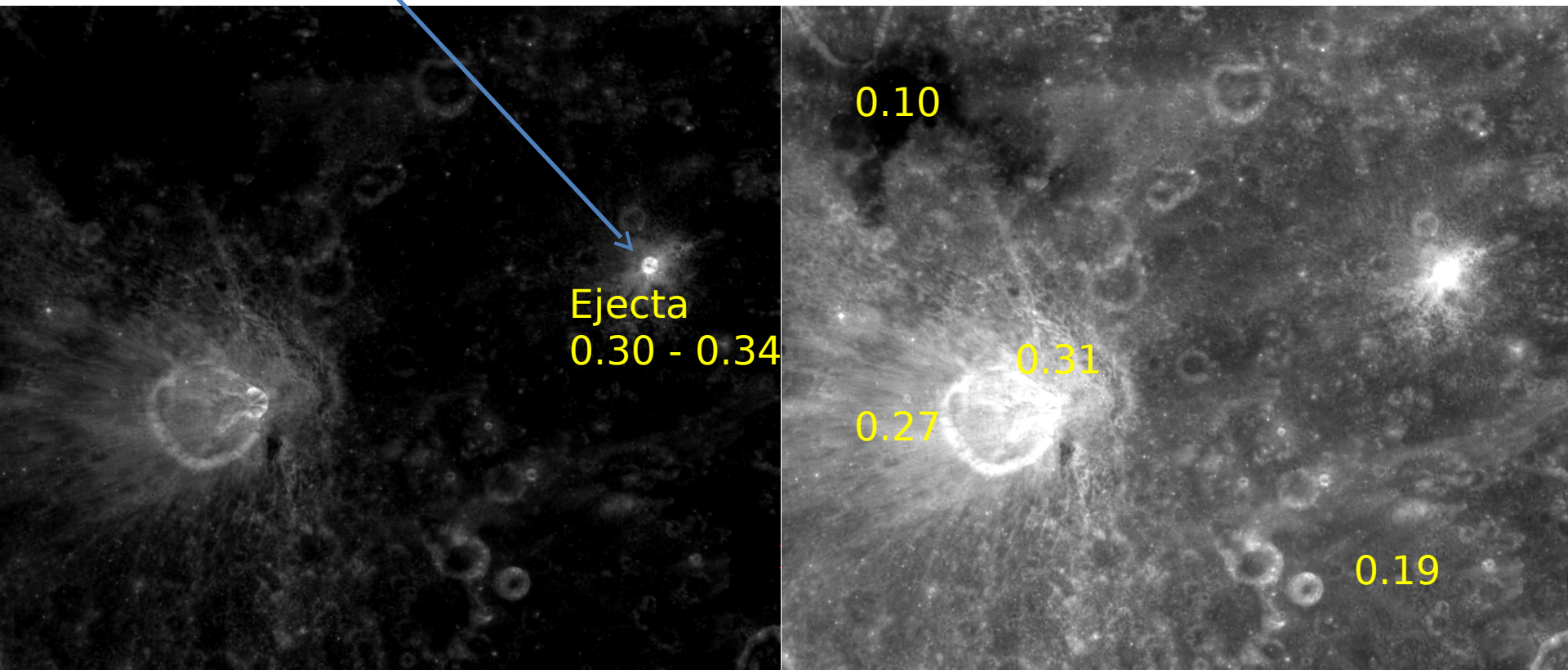




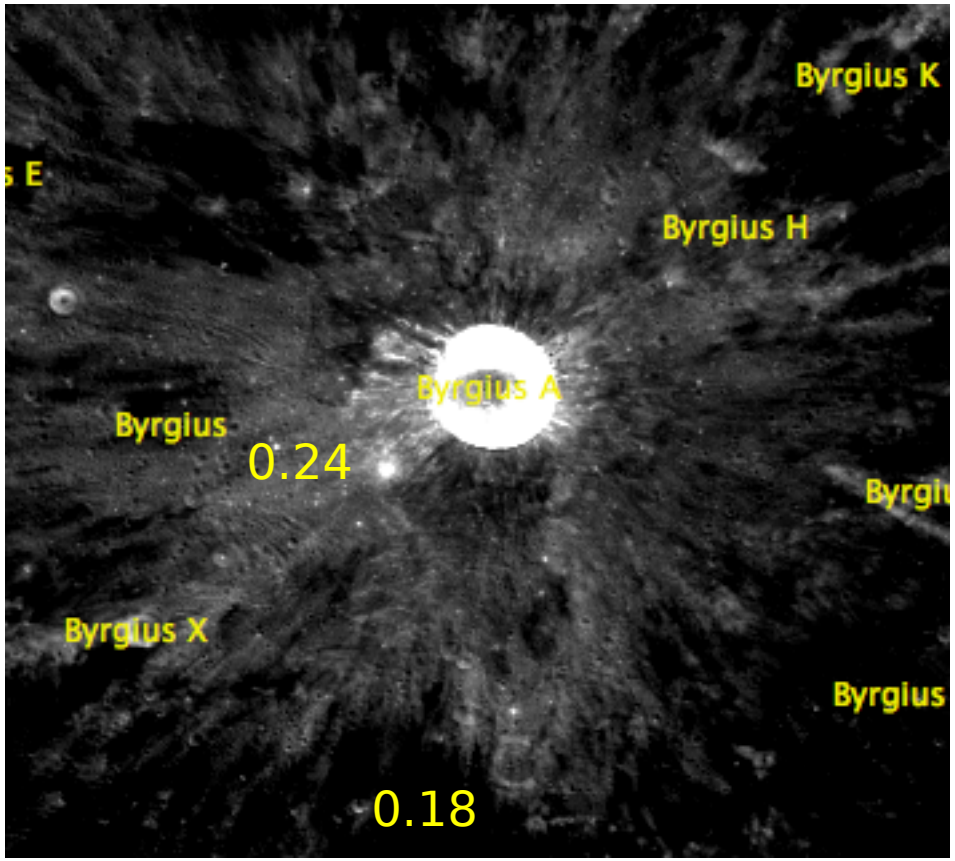
SW Interior 0.24

Virtanen

Virtanen 37-km diameter 15.70°N, 176.84°E
On East Rim Virtanen 9.8-km diameter
Small crater 4.4 km diameter 17.41°N, 182.06°E



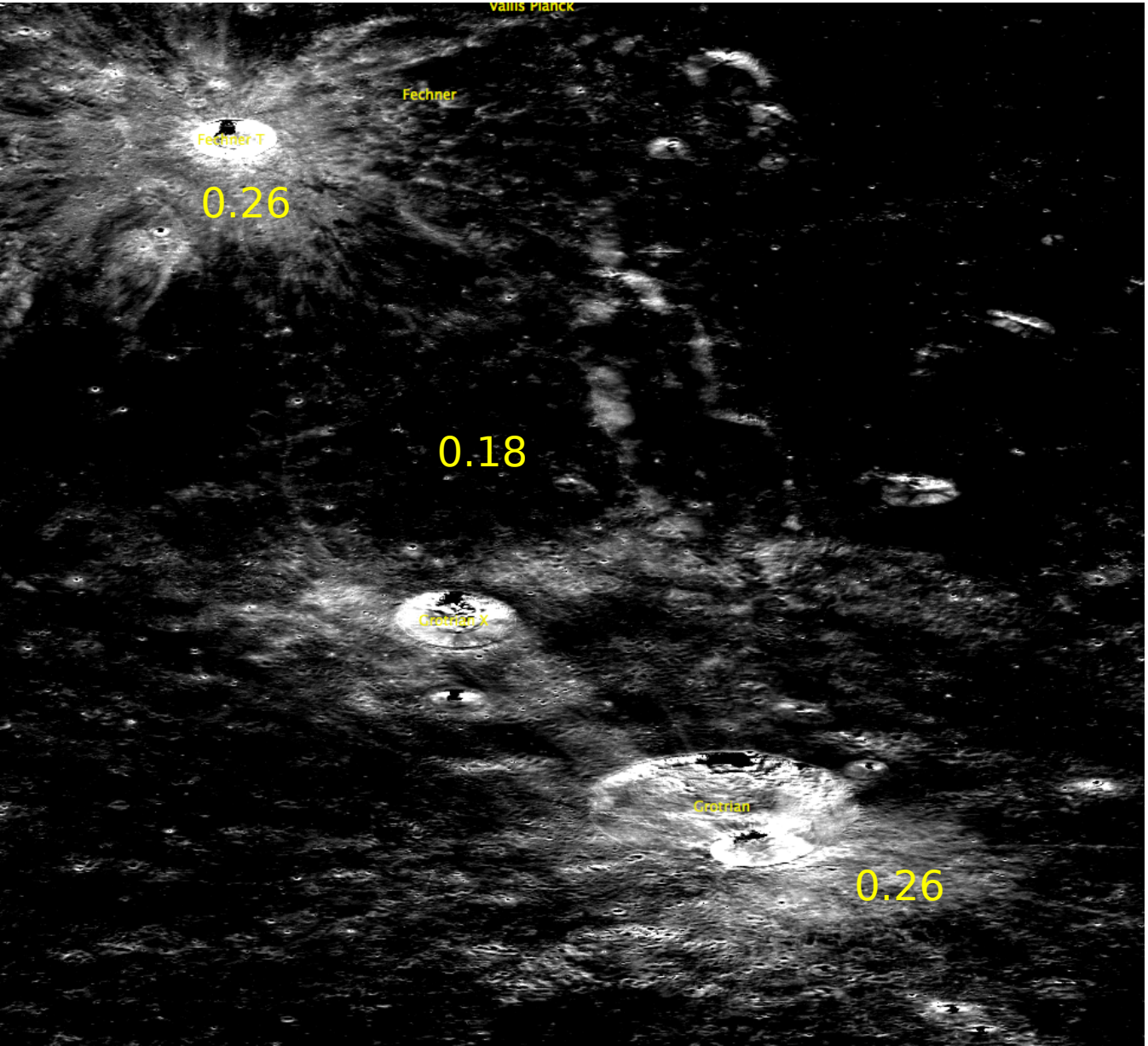
Byrgius A



18-km diameter
24.55°S, 296.16°E

High Reflectance walls 0.3 to 0.4

Fechner - Grotrian



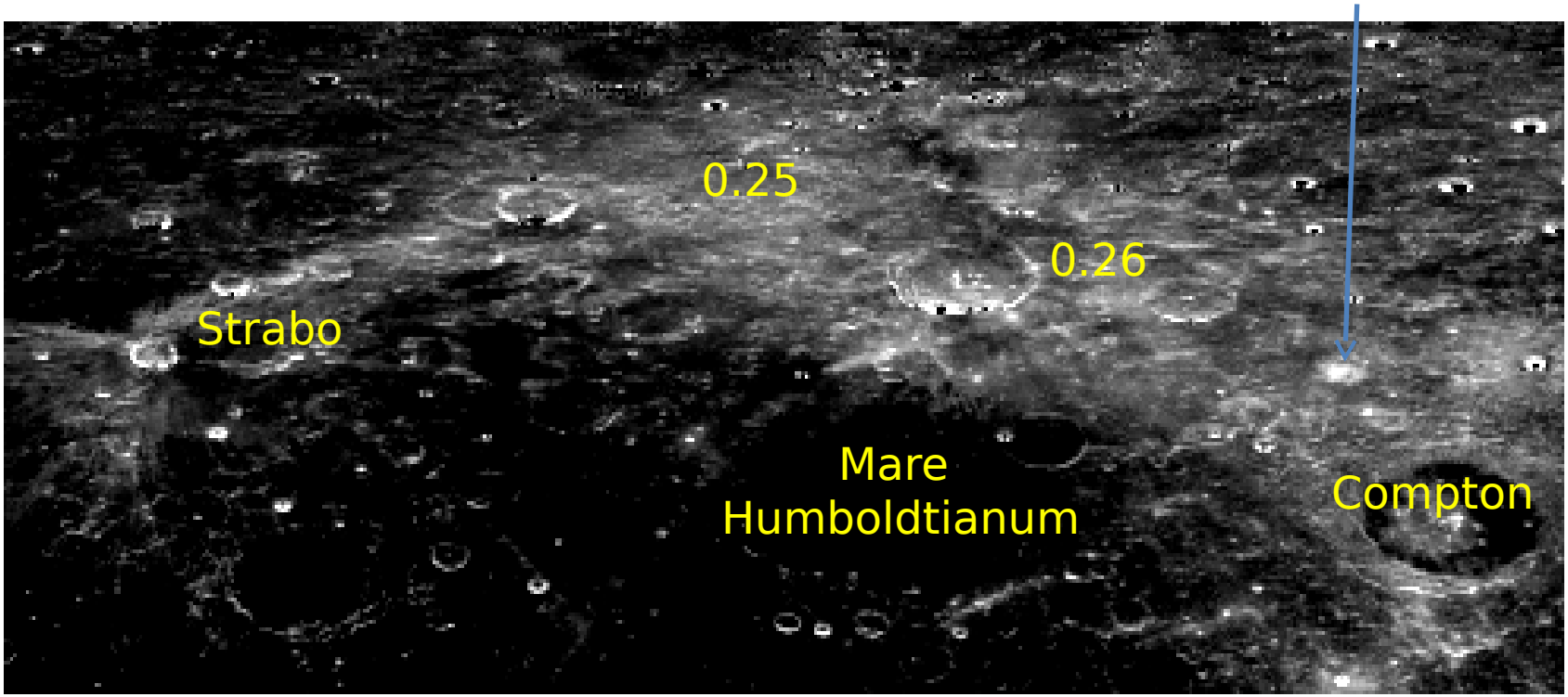
Fechner T
58.77°S, 122.78°E
14-km diameter

On rim of Grotrian
66.69°S, 128.16°E
13-km diameter

Just north of
Schrodinger

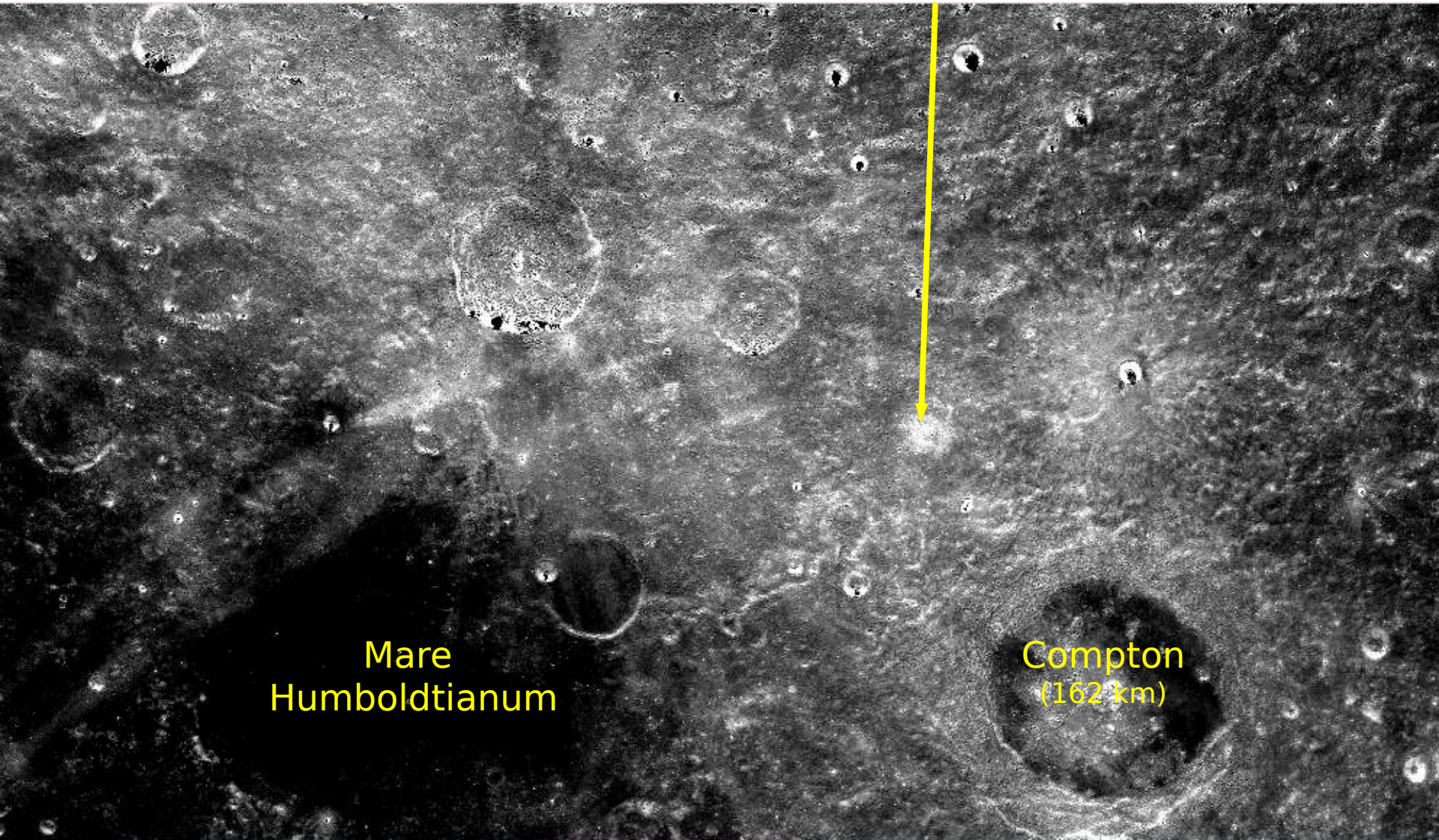
Strabo – Compton Band

CBVC 0.31 n-I/F

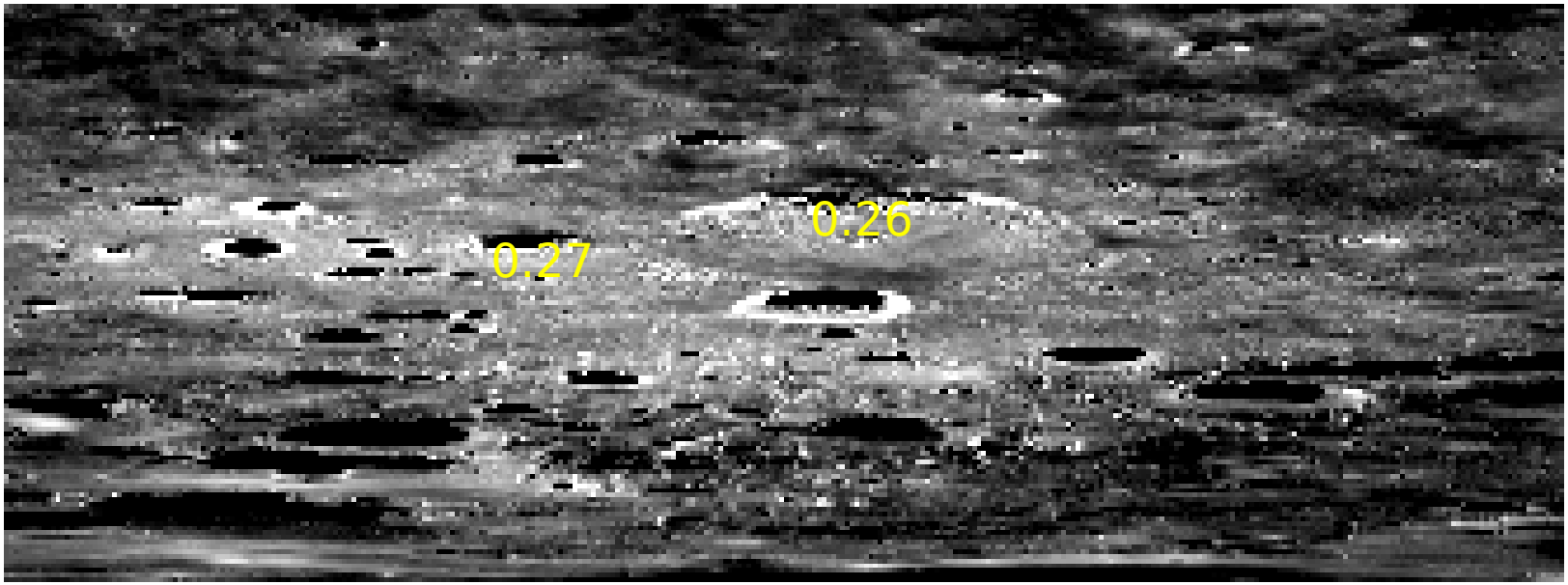


Scene 1100 km wide

Rays at CBVC



Schomberger



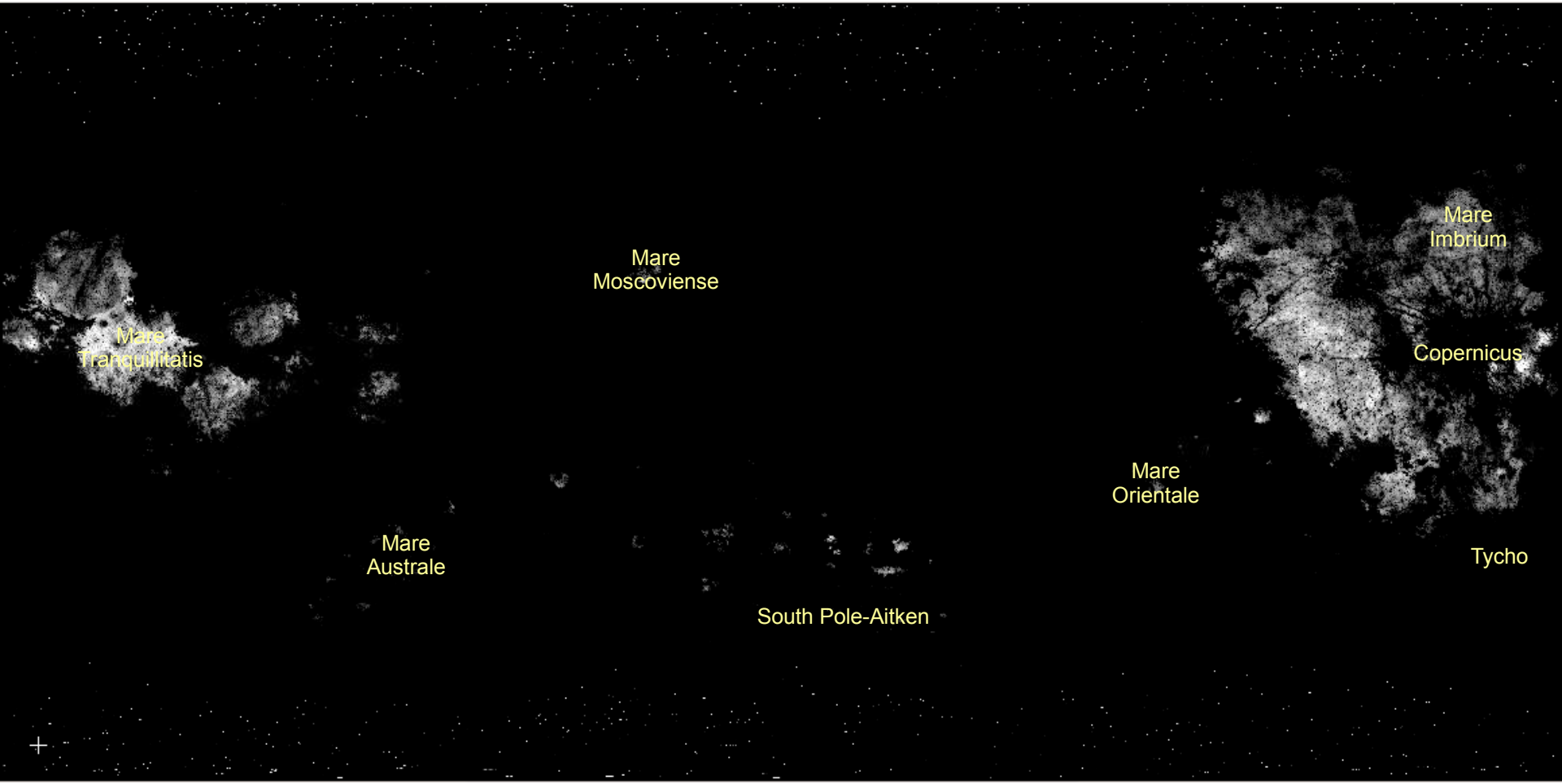
Scene is 225 km wide

Schomberger crater
76.64°S, 24.69°E 86 km diameter

Low Reflectance

LROC WAC 643 nm n-I/F

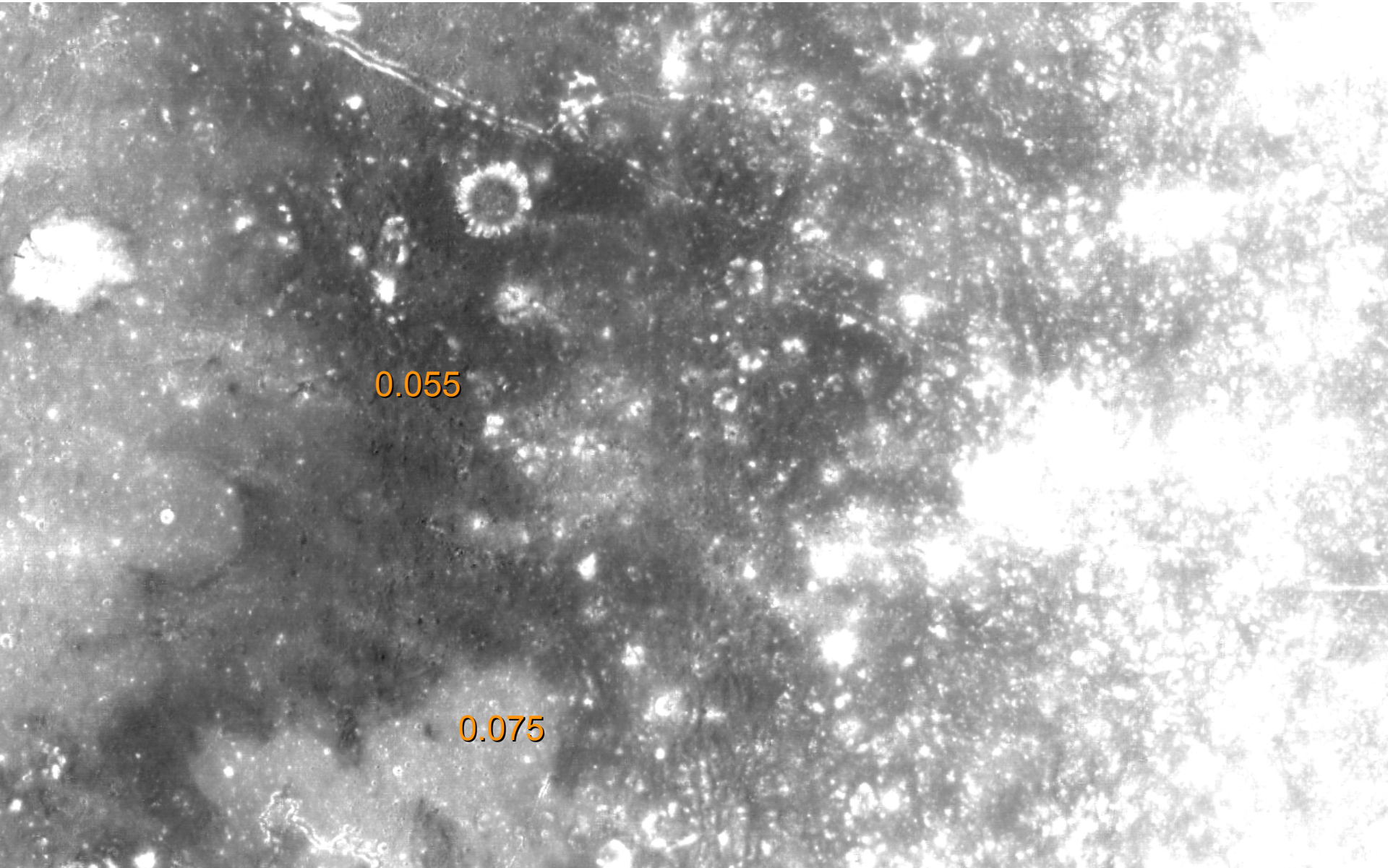
Inverted Scale
Black: n-I/F > 0.09
White: n-I/F < 0.06



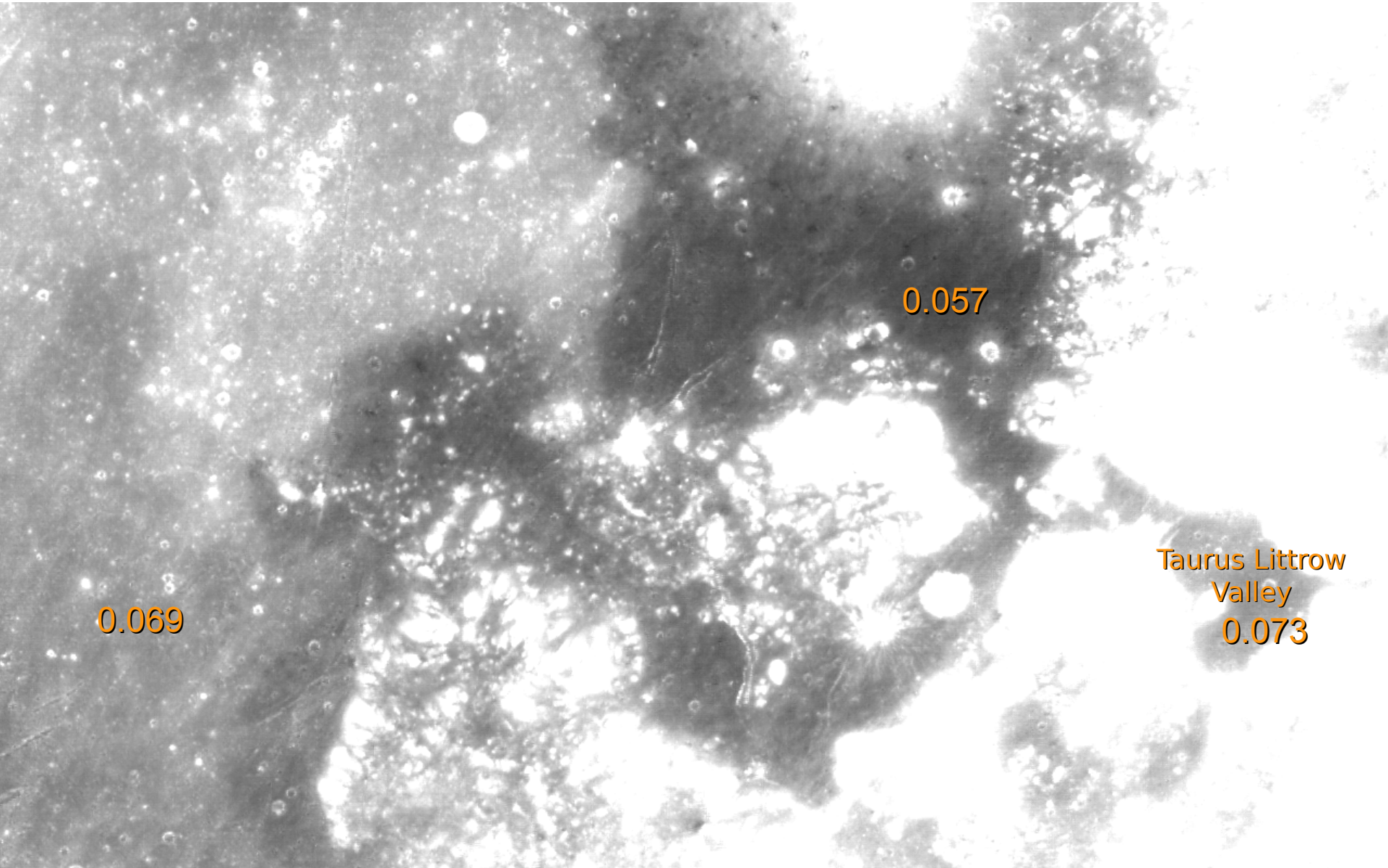
Low Reflectance

Name	Normalized Reflectance	Refl/ Global
Sinus Aestuum	0.055	0.33
Taurus-Littrow Valley	0.057	0.34
Marius Hills	0.059	0.36
Grimaldi	0.063	0.38

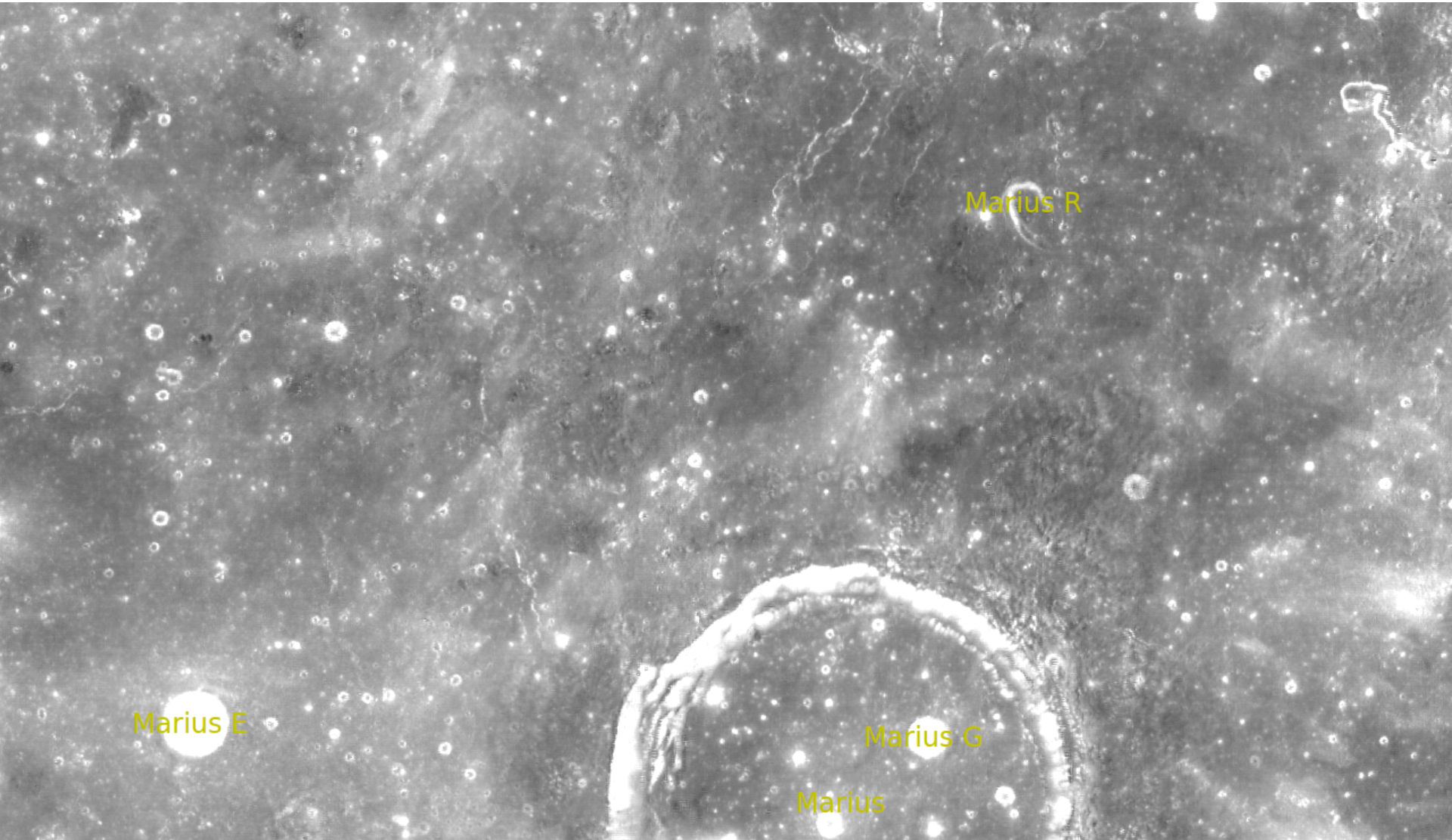
Sinus Aestuum (scene is 128 km across, linear stretch 0.04-0.09)



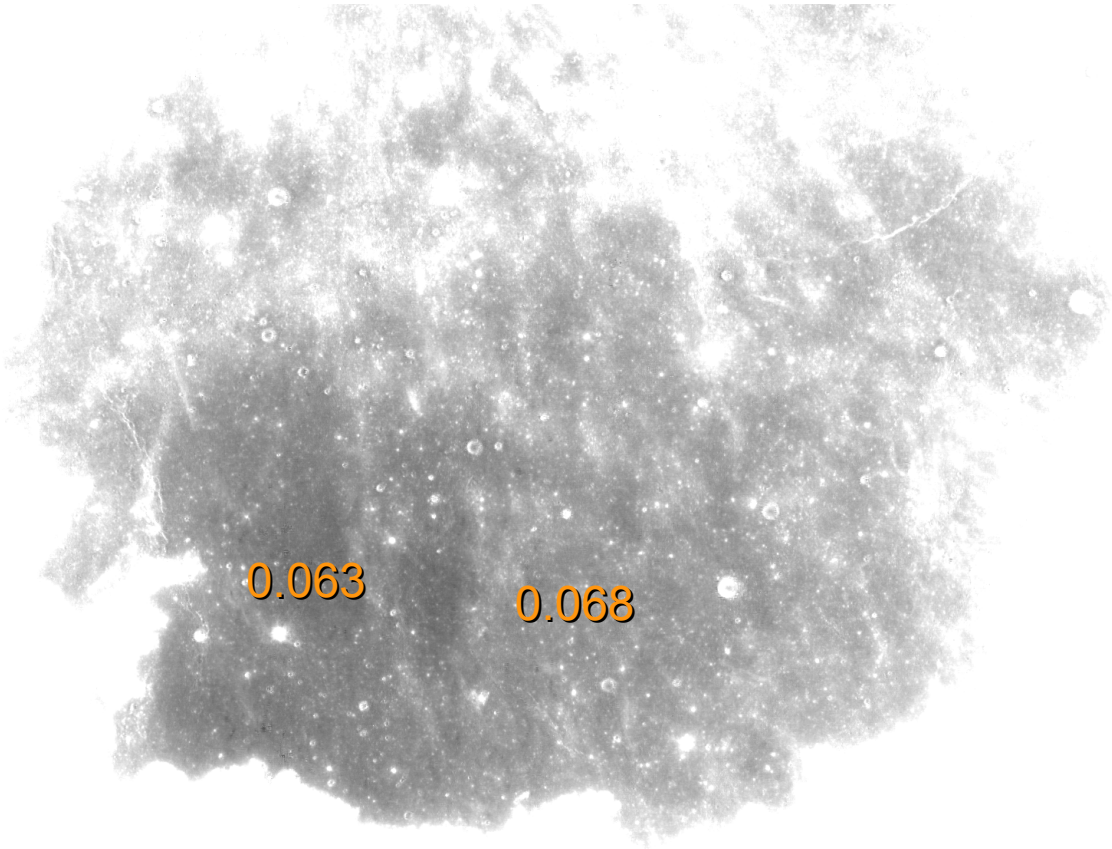
Taurus Littrow (scene is 128 km across, linear stretch 0.04-0.09)



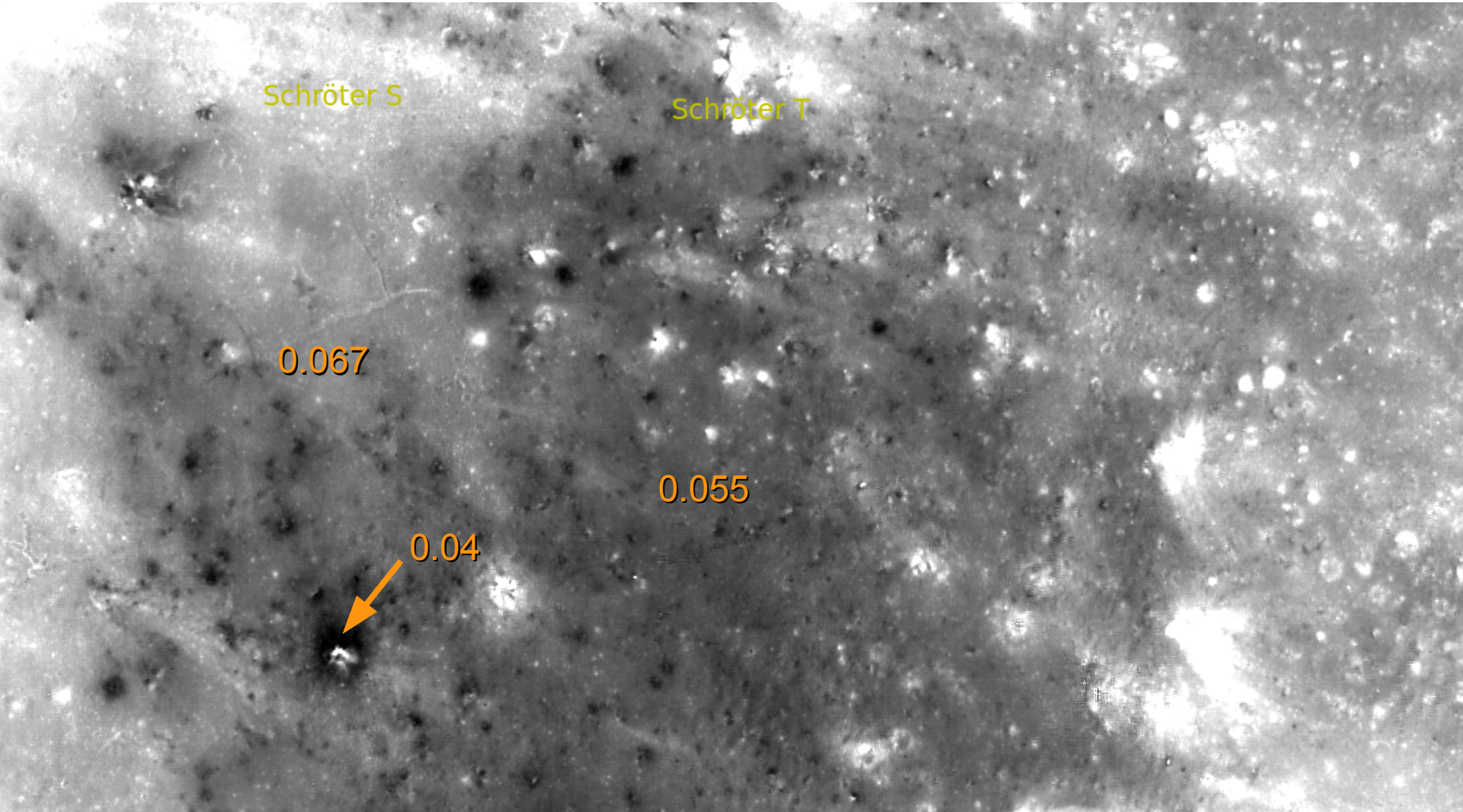
Marius Hills (scene is 128 km across, linear stretch 0.04-0.09)



Grimaldi (scene is 250 km across, linear stretch 0.04-0.09)



South Sinus Aestuum (scene is 128 km across, linear stretch 0.04-0.09)



Summary

- Normalized reflectance (10° incidence, 0° emission, 10° phase and corrected for topography) ranges from 0.051 to 0.51 (99.99% bounds)
- Global mean reflectance is 0.165
- Rays are typically >0.2
- Mare is typically < 0.1 with means for individual maria ranging from 0.066 – 0.086
- Lowest normalized reflectance materials are Pyroclastics (<0.051)
- Highest normalized reflectance materials are found on crater walls (>0.51)