

Photoclinometry evaluations of HiRISE images of proposed sites

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HIGH RESOLUTION IMAGING
SCIENCE EXPERIMENT

URL for HiRISE data:

<http://hirise.lpl.arizona.edu/<Observation ID>>

http://hirise.lpl.arizona.edu/PSP_003259_1850

Engineering Constraint

Length scales of 2-5 meters: maximum slope of 15° over all scales.

Rationale: ensure stability and trafficability of the rover in the touchdown condition.

Point Photoclinometry Technique

- Apply point photoclinometry to HiRISE images of landing ellipses
- Cannot apply to images with severe haze or albedo variations
- Converts all 10^{10+} image pixels per image to model slope values
- Verified against Viking and Pathfinder landing sites, as well as calibrated against simulated fractal topography and stereo models
- Used during similar stage of MER landing site selection process with MOC images, successfully predicted Gusev and Meridiani surface slopes

Landing Sites Measured

Nilli Fossae Trough (PSP_005565_2020)

Holden Crater (PSP_005411_1535)

Terby Crater (old: PSP_002572_1520,
new: PSP_005618_1525)

Marwth Vallis (PSP_004263_2050)

Eberswalde Crater (PSP_001600_1560)

Gale Crater (PSP_003453_1750)

N Meridiani (PSP_003405_1825)

Juventae Chasma (PSP_003368_1755,
old E ellipse)

Nilo Syrtis (PSP_005420_2095)

Nili Fossae Crater (PSP_004299_1985,
nulled)

Eos Chasma (PSP_005622_1690)

NE Syrtis Major (PSP_002809_1965)

Xanthe/Hypanis Vallis
(PSP_002919_1915)

W. Meridiani (PSP_003722_1785)

W. Meridiani additional
(PSP_005344_1765)

Elysium/Avernus Colles
(PSP_002832_1770)

Isidis Basin Escarpment
(PSP_004233_1980)

Ariadnes Colles (PSP_005377_1450)

Landing Sites Not Evaluated

Melas Chasma (albedo variation)

E. Meridiani (albedo variation)

Iani Chaos (albedo variation)

Hellas/Dao Vallis (albedo, haze, errors)

Mawrth additional site (1/3 had albedo variations)

Aeolis fan delta (albedo variation, fan scarp)

Meridiani B2 (albedo variations)

W Candor alternate (PSP_005531_1740, waiting for RED mosaic)

Juventae Chasma W wall ellipse, no coverage

Meridiani Crater lake (waiting for observation)

SW Arabia Terra (no coverage of ellipse)

W Arabia (no coverage of ellipse areas)

Ritchey Crater (no coverage of ellipse)

Chloride Salt Deposits (no coverage of the 5 ellipses)

Tiu Valles (no coverage of ellipse)

Mawrth additional sites (no coverage for 2/3)

S. Meridiani / B3 (have suggestion, no image)

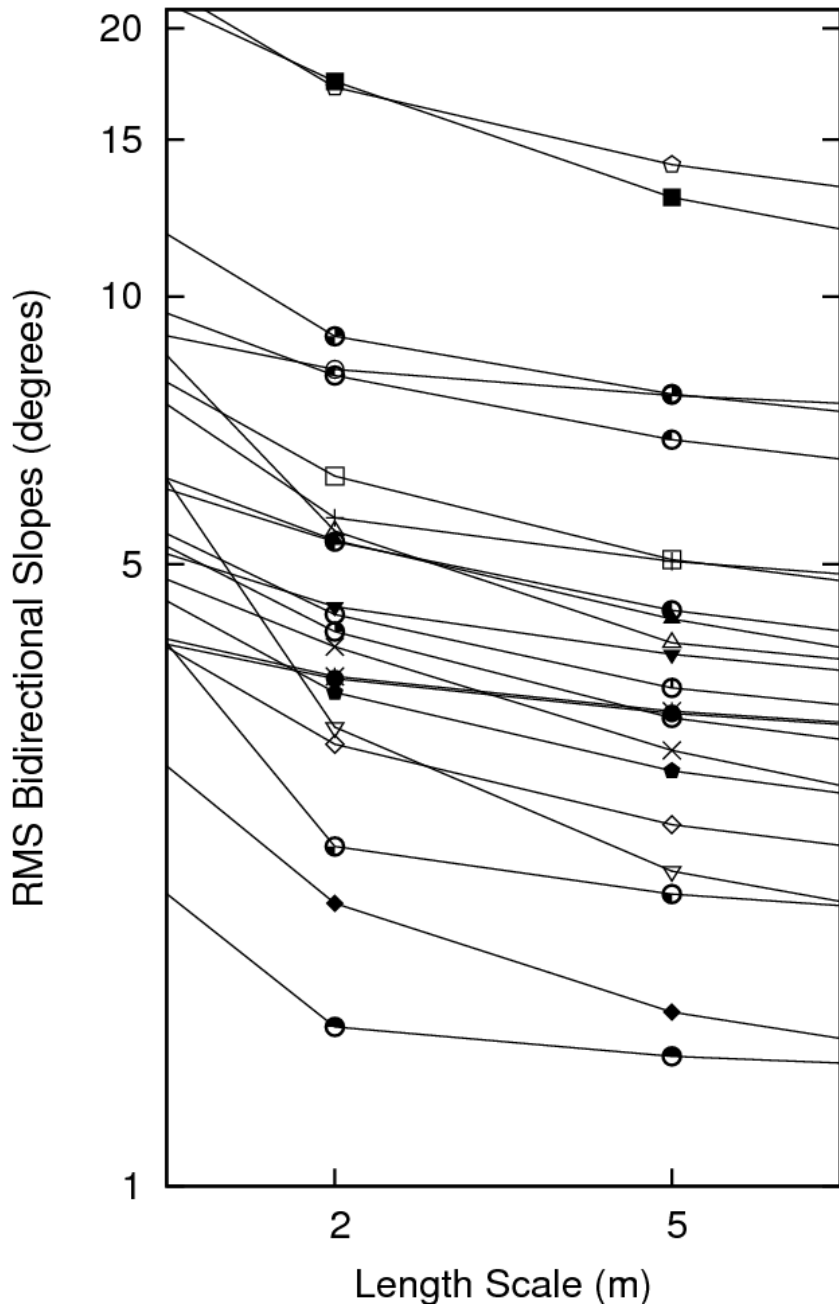
Samara Vallis (no coverage of ellipse)

Eos Alluvial (have suggestion, no image)

Meridiani B1 (no coverage of ellipse)

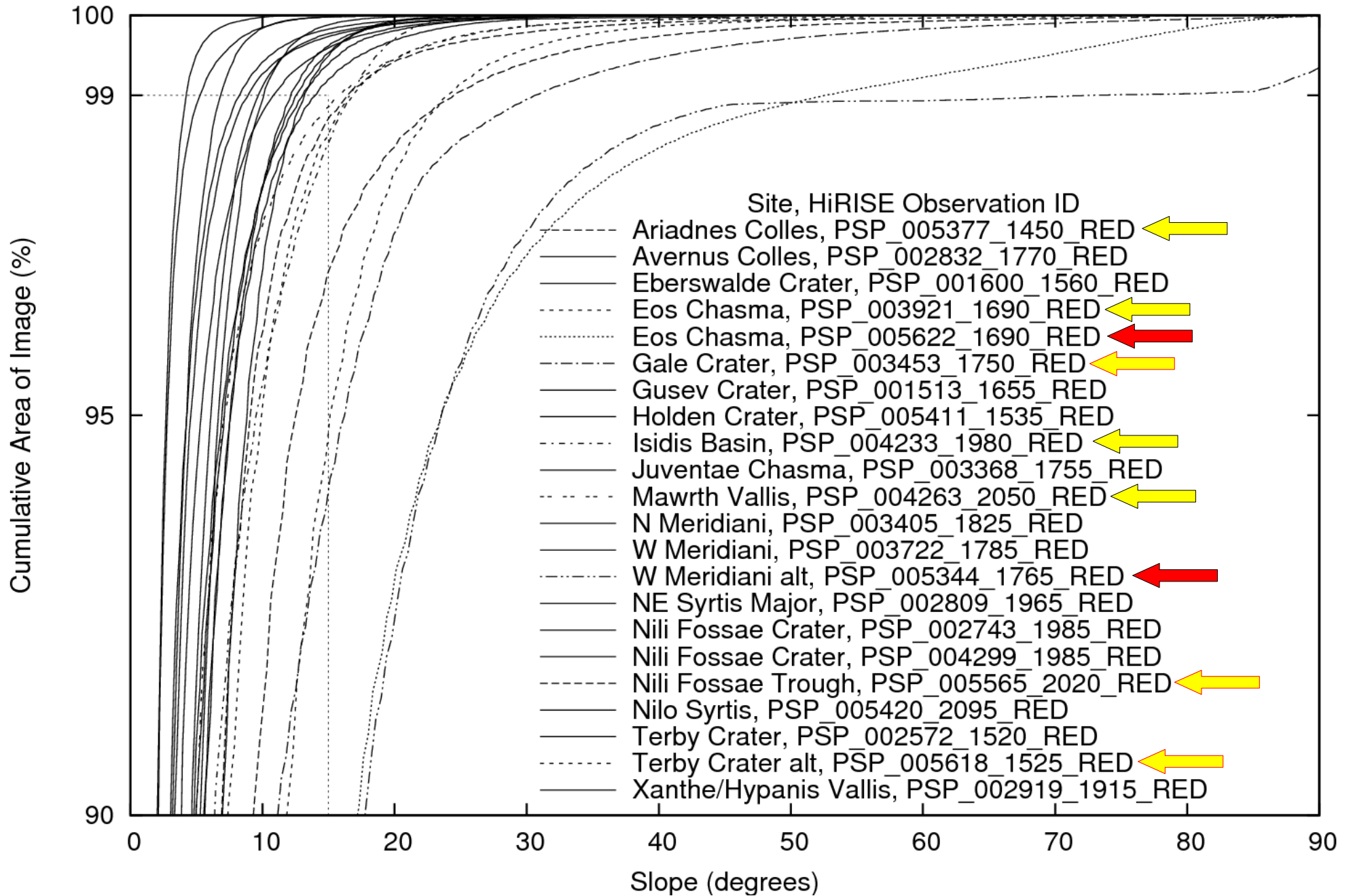
Meridiani B4 (no coverage of ellipse)

MSL Landing Site Roughnesses

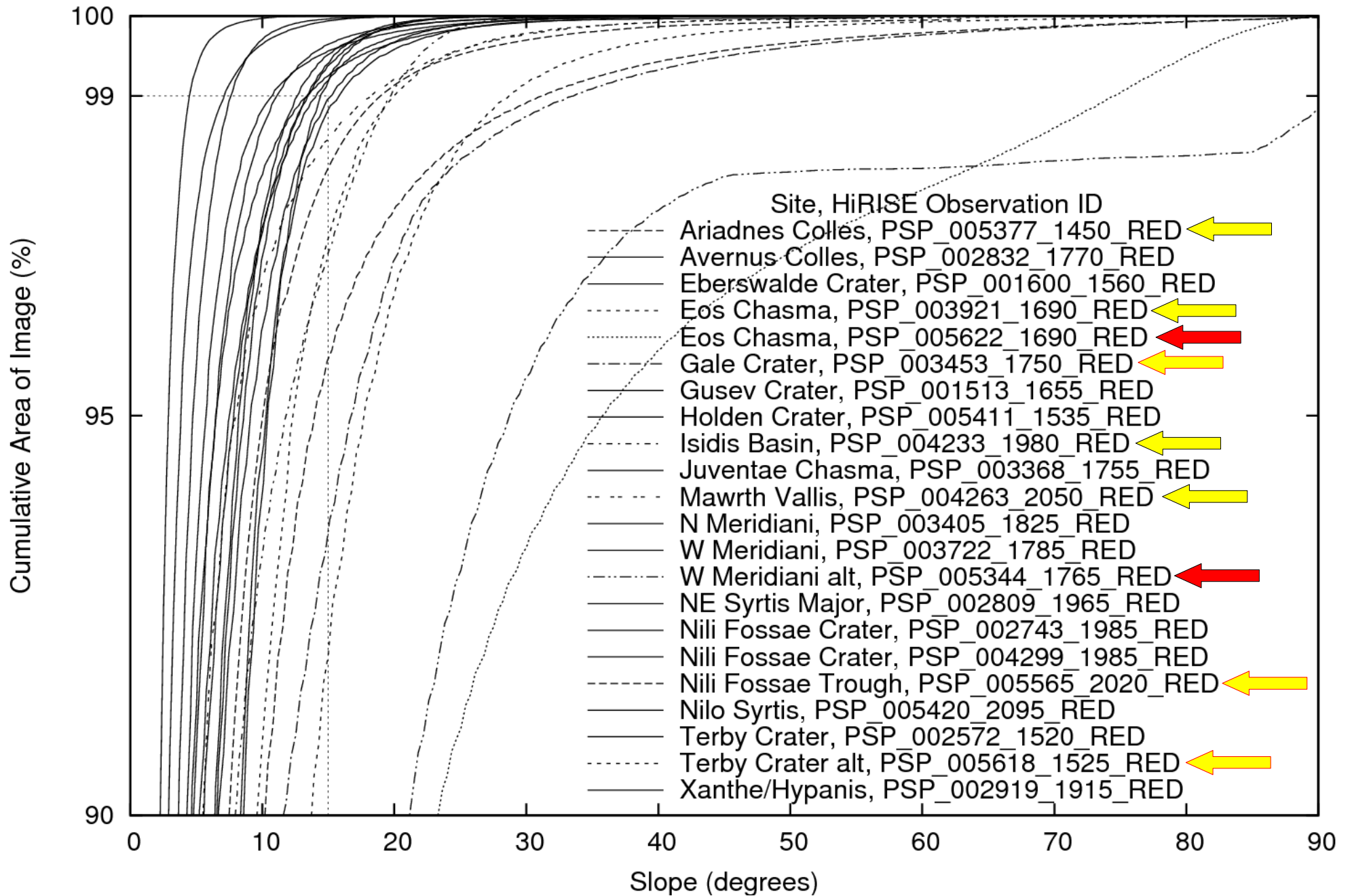


- Site, HiRISE Observation ID
- +— Ariadnes Colles, PSP_005377_1450_RED
 - x— Avernus Colles, PSP_002832_1770_RED
 - *— Eberswalde Crater, PSP_001600_1560_RED
 - Eos Chasma, PSP_003921_1690_RED
 - Eos Chasma, PSP_005622_1690_RED ←
 - Gale Crater, PSP_003453_1750_RED ←
 - Gusev Crater, PSP_001513_1655_RED
 - △— Holden Crater, PSP_005411_1535_RED
 - ▲— Isidis Basin, PSP_004233_1980_RED
 - ▽— Juventae Chasma, PSP_003368_1755_RED
 - ▼— Mawrth Vallis, PSP_004263_2050_RED
 - ◇— N Meridiani, PSP_003405_1825_RED
 - ◆— W Meridiani, PSP_003722_1785_RED
 - ◇— W Meridiani alt, PSP_005344_1765_RED ←
 - NE Syrtis Major, PSP_002809_1965_RED
 - Nili Fossae Crater, PSP_002743_1985_RED
 - Nili Fossae Crater, PSP_004299_1985_RED
 - Nili Fossae Trough, PSP_005565_2020_RED ←
 - Nilo Syrtis, PSP_005420_2095_RED
 - Terby Crater, PSP_002572_1520_RED
 - Terby Crater alt, PSP_005618_1525_RED ←
 - Xanthe/Hypanis Vallis, PSP_002919_1915_RED

5m/pixel Slope Distribution



2 m/pixel Slope Distribution



Roughest sites at 2-5 m

Eos Chasma

W Meridiani alt

Terby Crater

Gale Crater

Nili Fossae Trough

Ariadnes Colles

Isidis Basin

Mawrth Vallis

All others evaluated have acceptable slopes.