Mars Exploration Rover Landing Site Ellipse Changes Since 2nd Workshop

M. Golombek & T. Parker

with help from Science Spokespersons and the Athena Science Team

3rd MER Landing Site Workshop

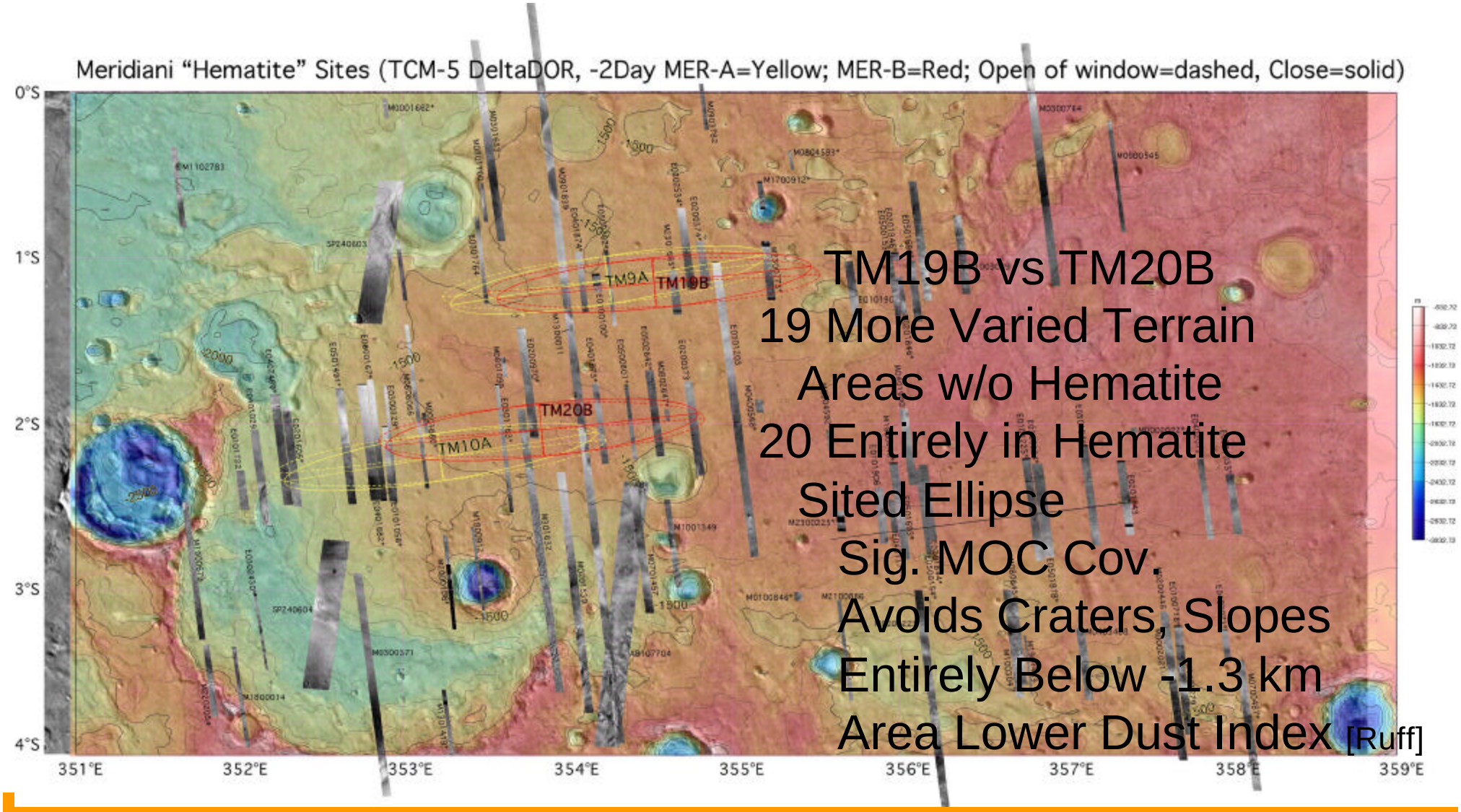
Pasadena, CA

March 27, 2002

ELLIPSE CHANGES

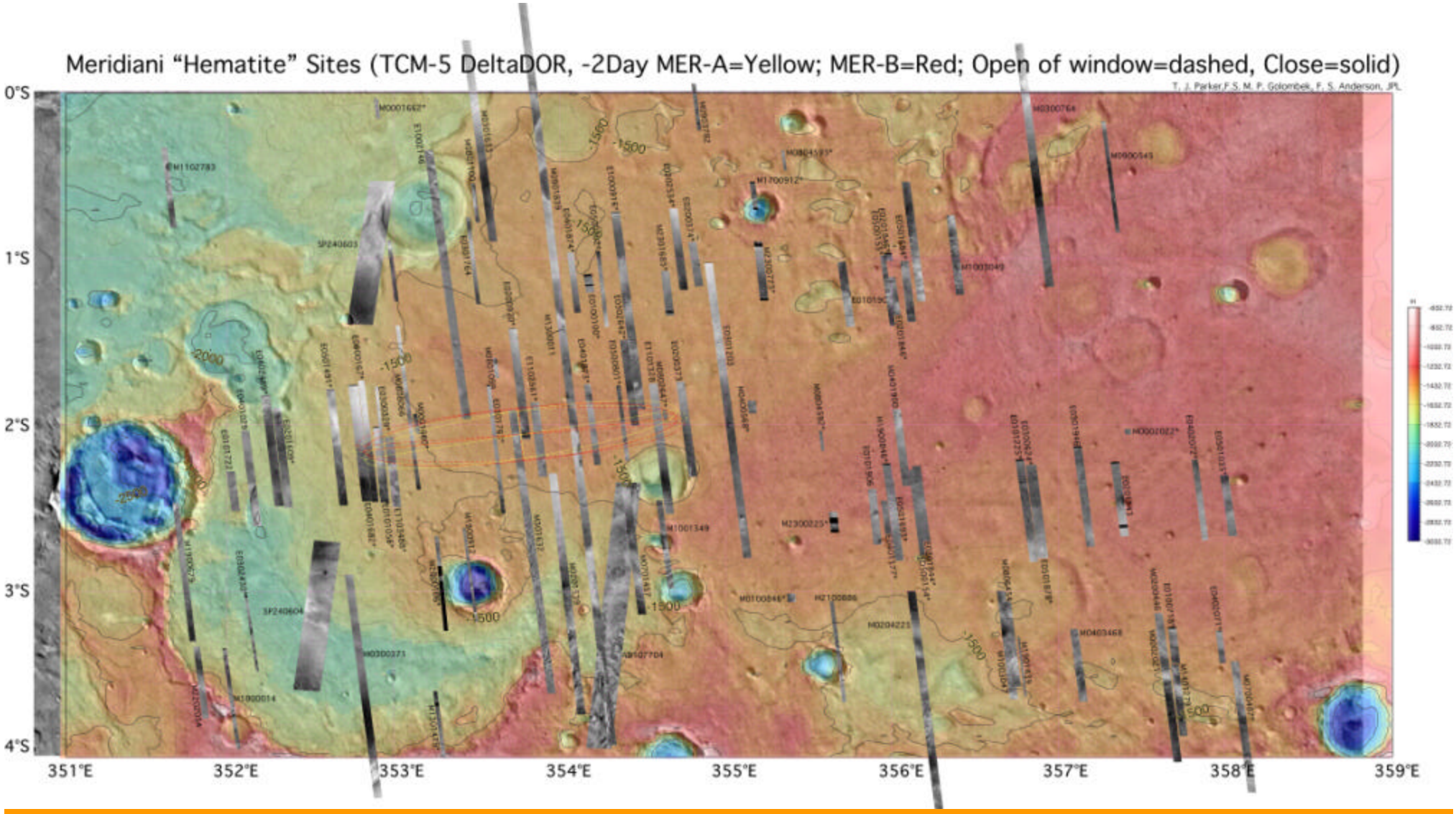
- Athabasca Vallis Demoted to Backup
  - Elevated Diffuse Radar Returns - Very Rough Surface [Haldemann Pres.]
  - Interpretation Corroborated by Outside Radar Experts
  - Agreed to by Landing Site Steering Committee; Complete Disclosure
  - Southern Ellipse Selected on Science and Safety Preference
- Isidis Elevated to Prime Site
  - Isidis Next Highest Ranked Site at 2nd Workshop
  - Moved South, Closer to Highlands and Channels
- Hematite - Selected TM20B as Prime (Hematite Everywhere)
- Gusev Ellipse Moved NW to Smooth Cratered Plains
- No Changes to Melas or Eos Chasmata Ellipses-Both Wedged
- All Ellipse Changes Filtered through Science Spokespersons
- Sites Continue to be Targets of MOC and THEMIS Images

HEMATITE SITE OPTIONS



TM19B vs TM20B
19 More Varied Terrain
Areas w/o Hematite
20 Entirely in Hematite
Sited Ellipse
Sig. MOC Cov.
Avoids Craters, Slopes
Entirely Below -1.3 km
Area Lower Dust Index [Ruff]

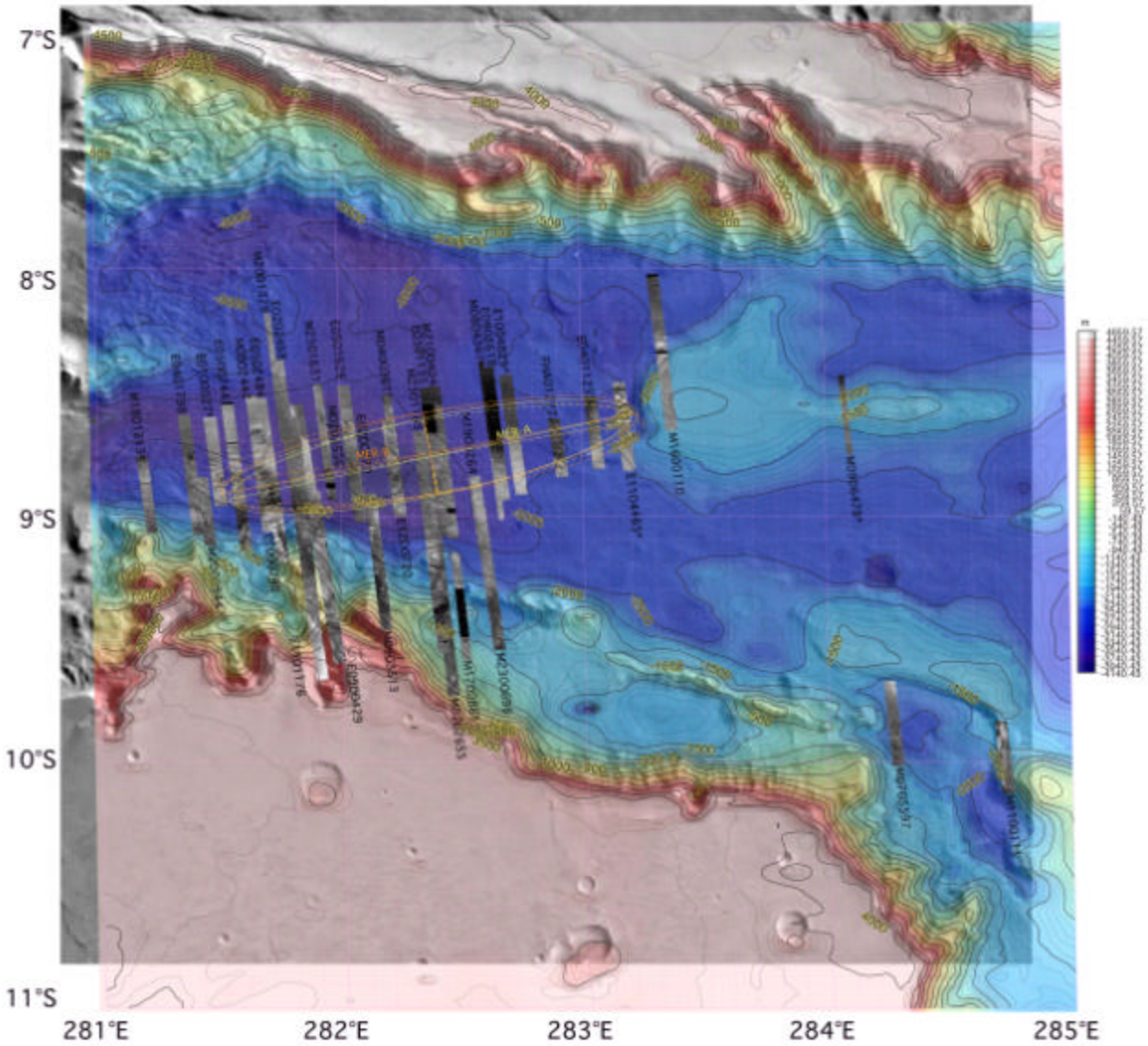
HEMATITE - TERRA MERIDIANI



MELAS CHASMA

Valles Marineris Melas Site(TCM-5 DeltaDOR, -2Day:
MER-A=Yellow; MER-B=Orange; Open of window=dashed, Close=solid)

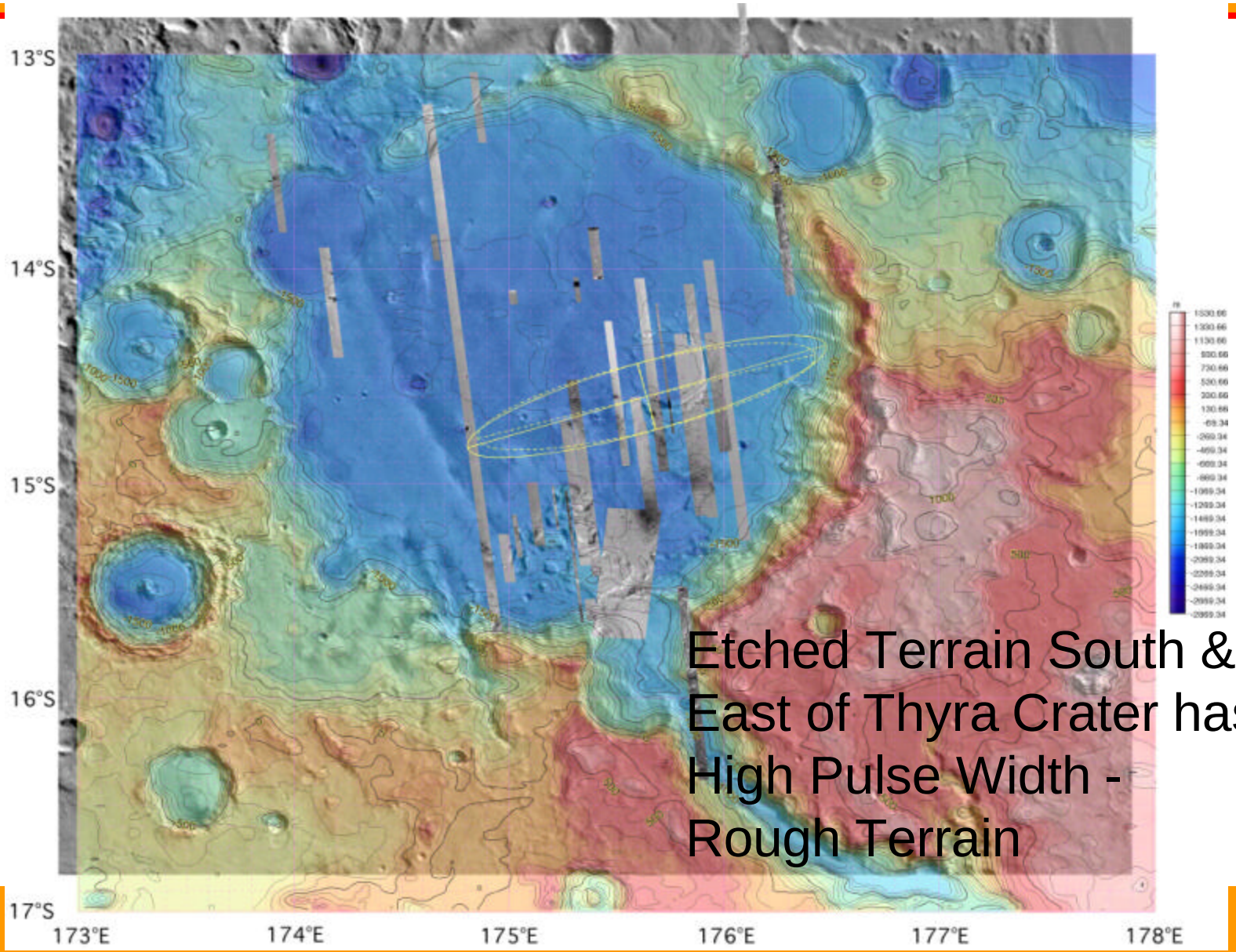
T. J. Parker, JPL



No Changes

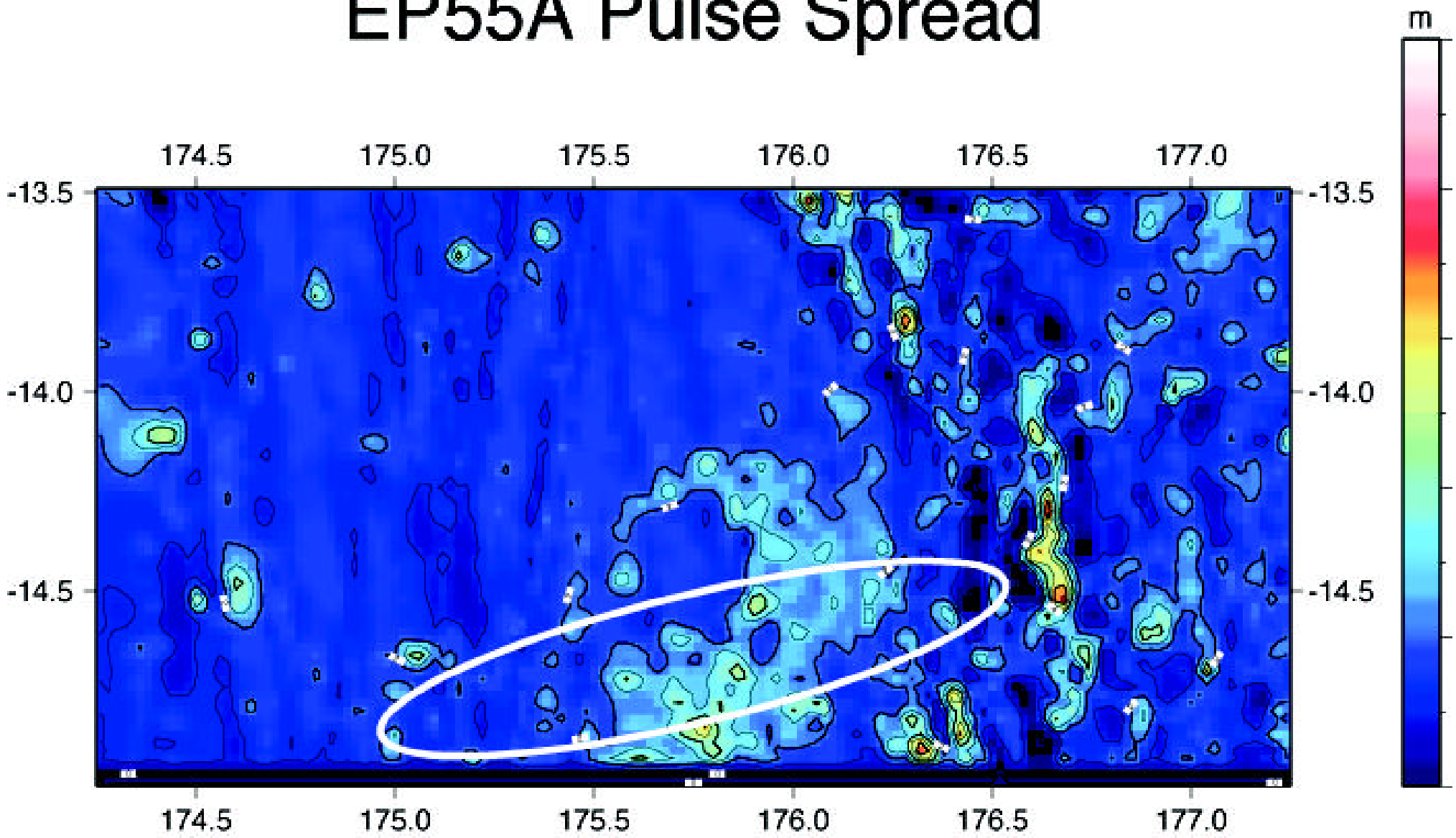
Ellipse Wedged
MOC Coverage
Highest

OLD GUSEV ELLIPSE

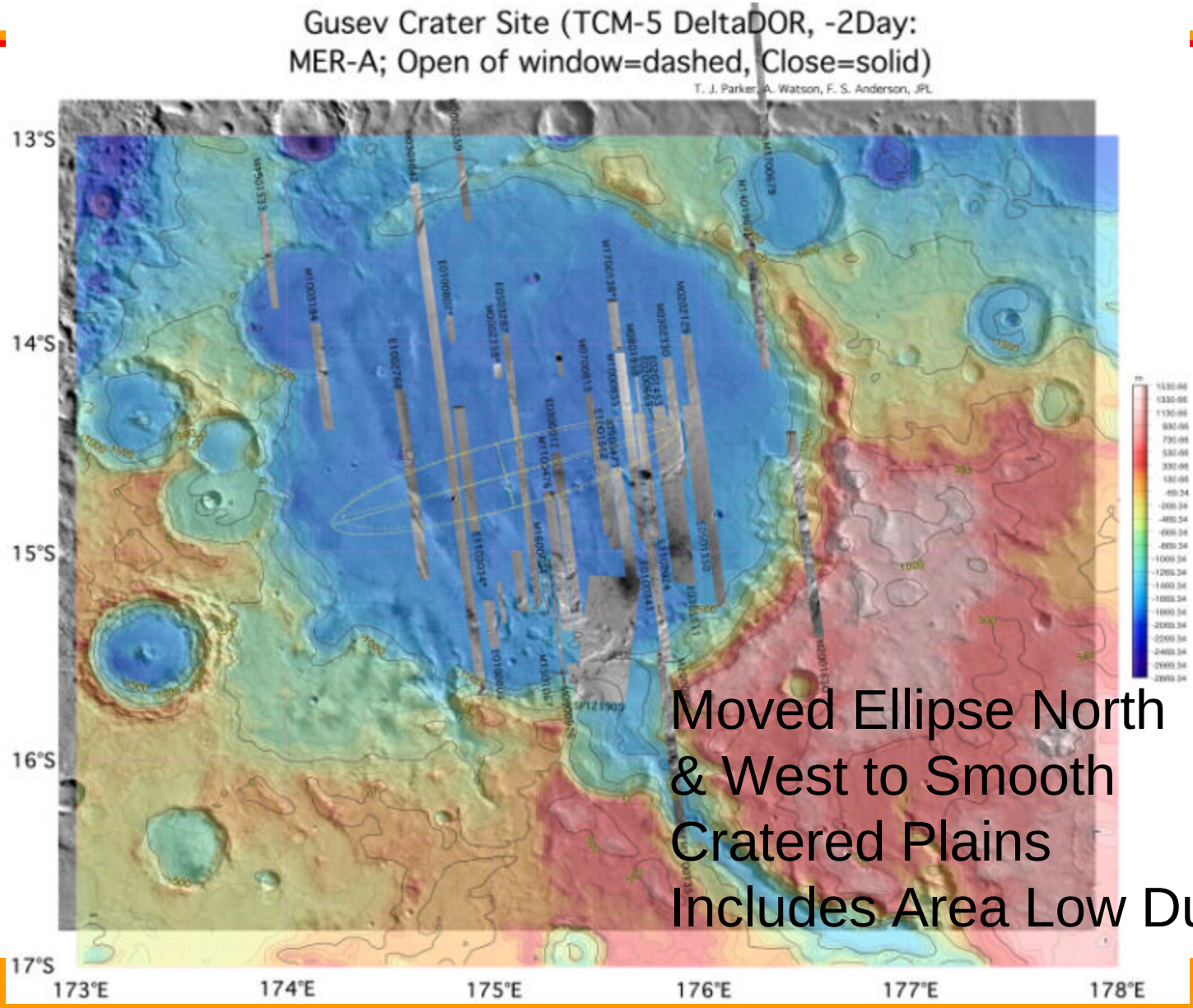


Etched Terrain South & East of Thyra Crater has High Pulse Width - Rough Terrain

EP55A Pulse Spread

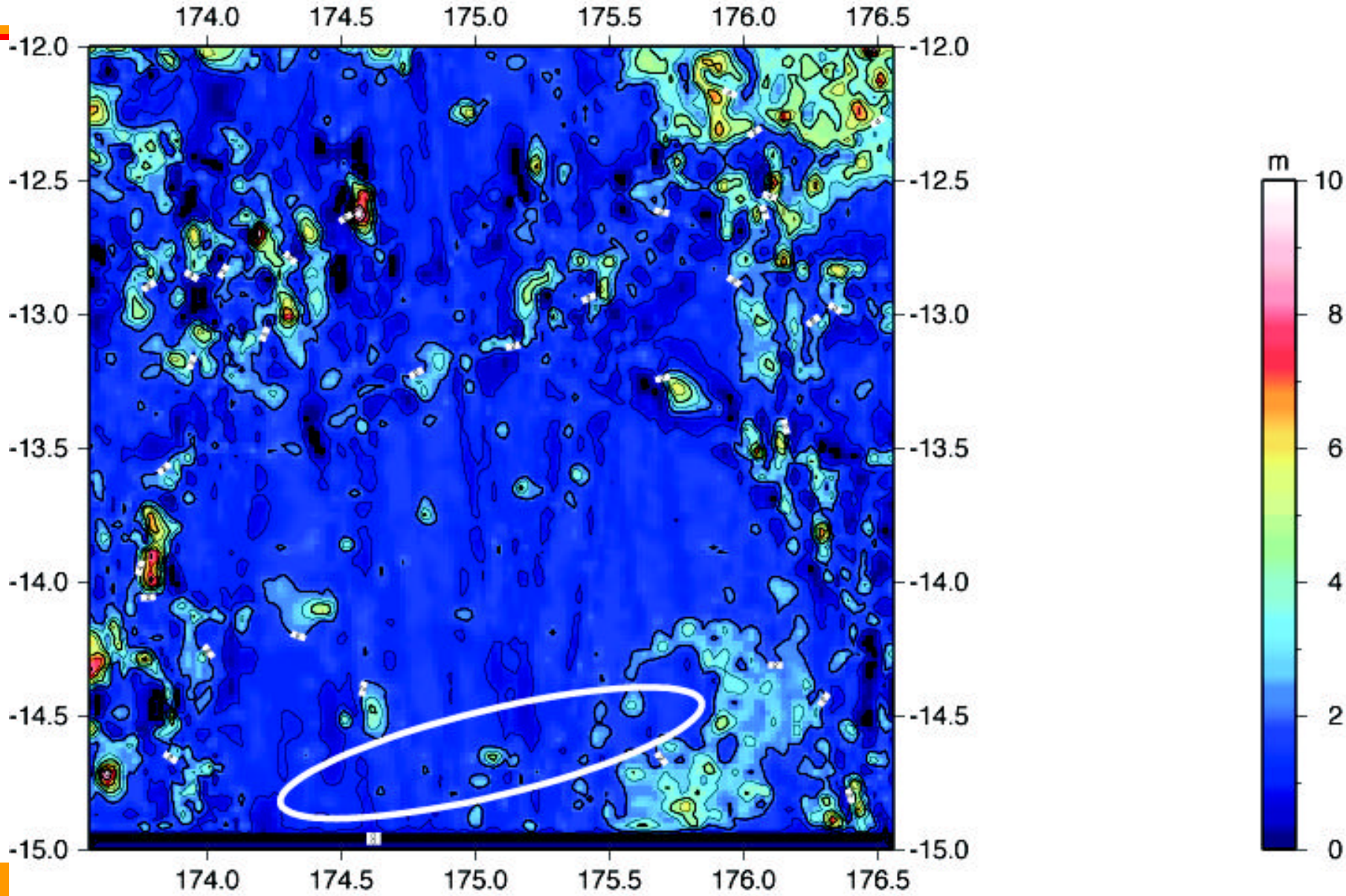


GUSEV CRATER

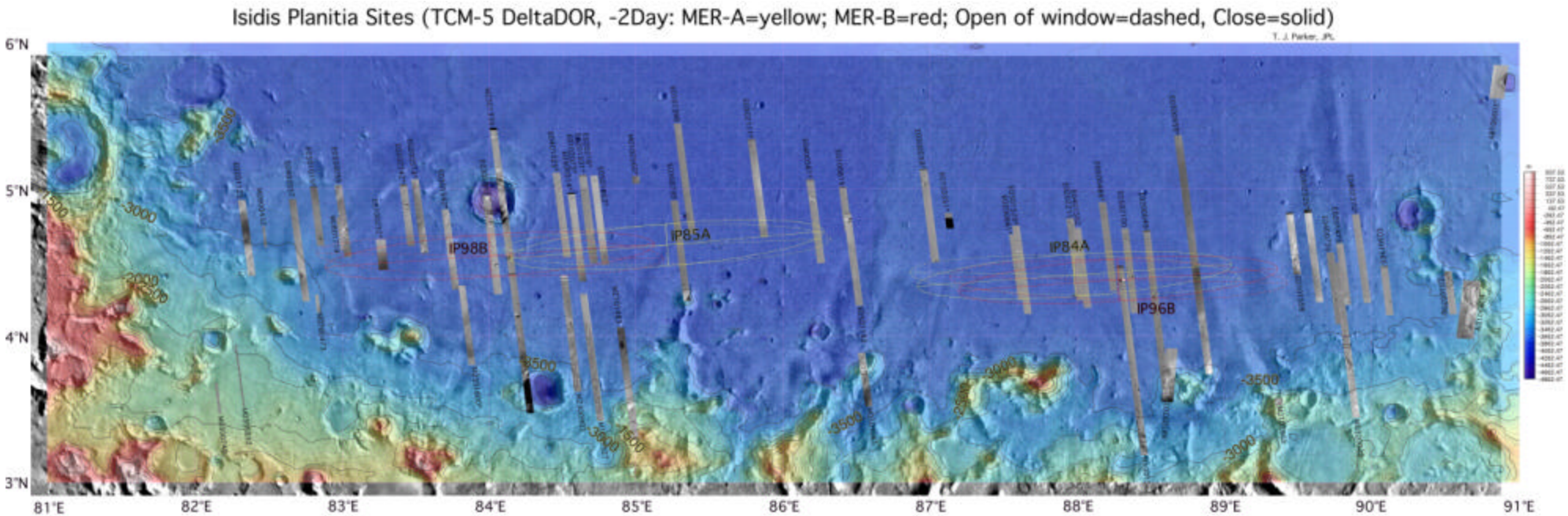


Moved Ellipse North
& West to Smooth
Cratered Plains
Includes Area Low Dust [Ruff]

Gusev Pulse Spread



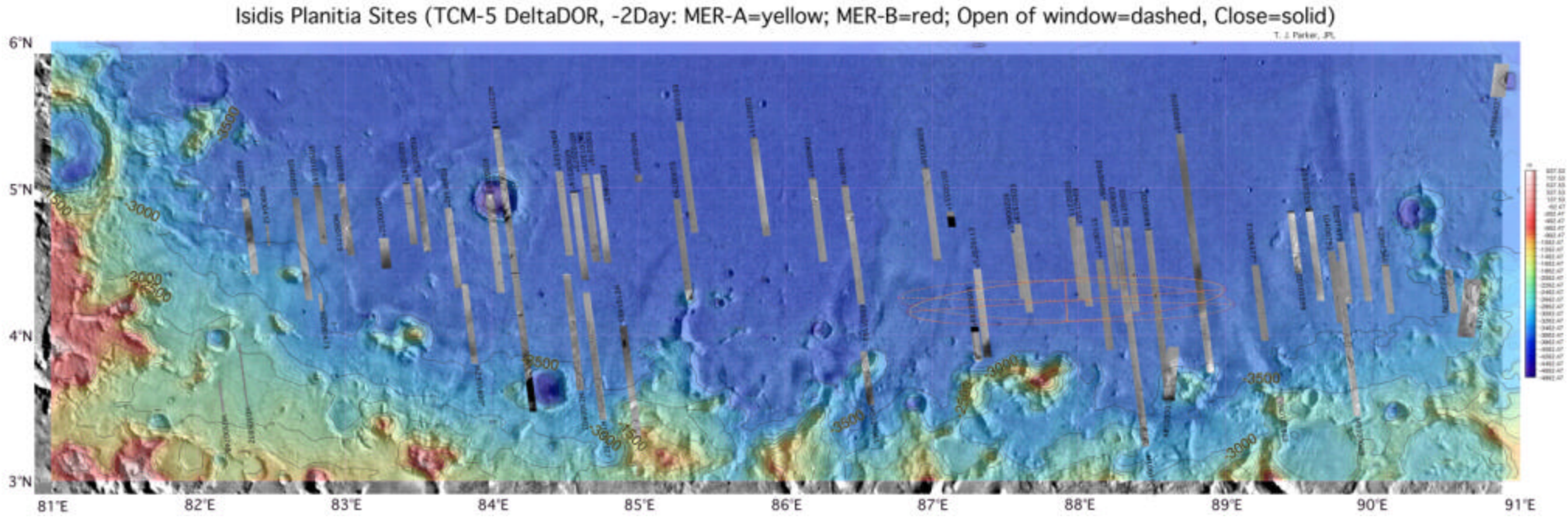
OLD ISIDIS ELLIPSES



IP98B - Rough, Crater Ejecta
IP98B, 85A Concern Over High Thermal Inertia

IP84A, 96B Smoother Closer to Highlands & Channels

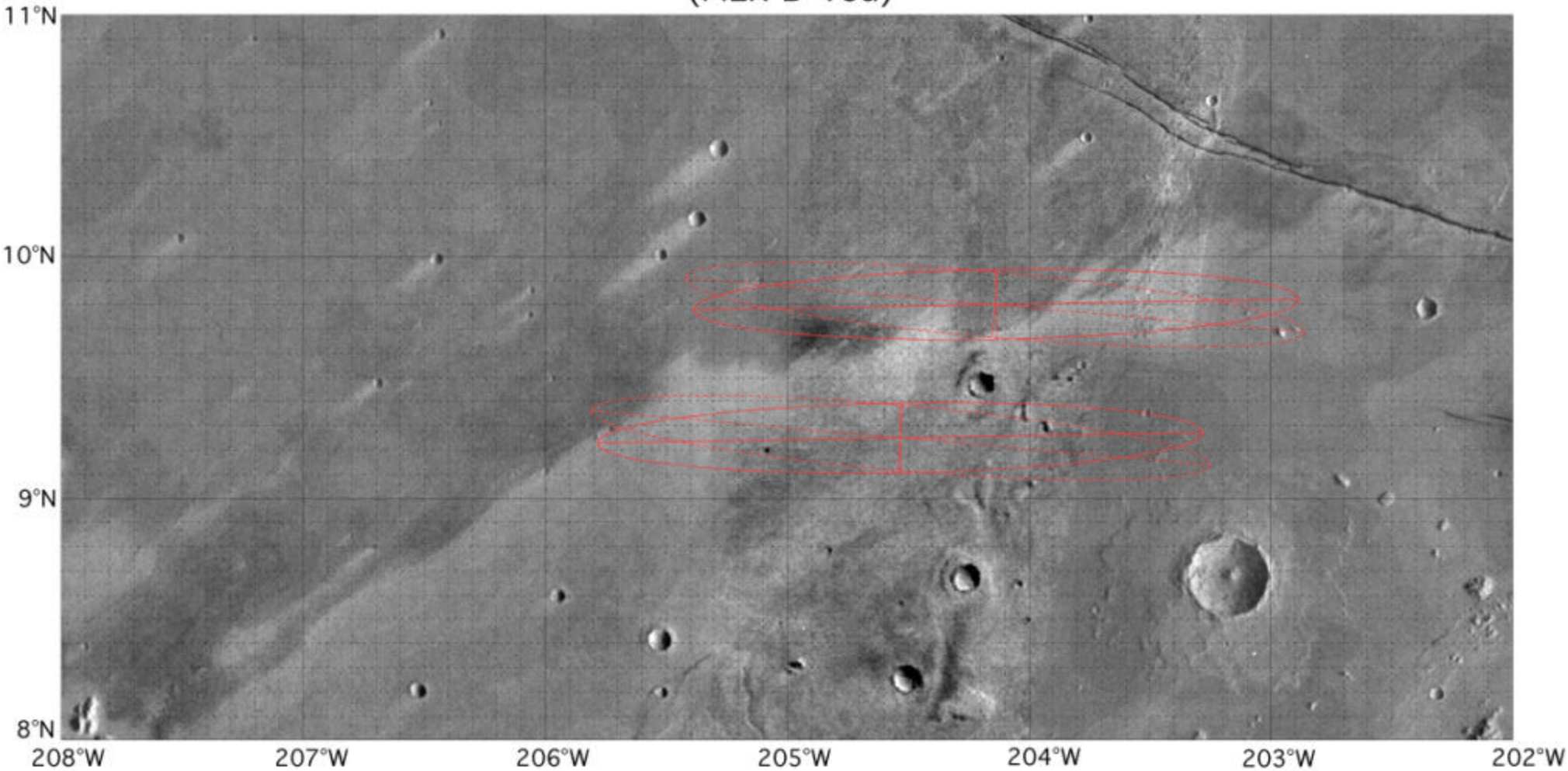
ISIDIS PLANITIA



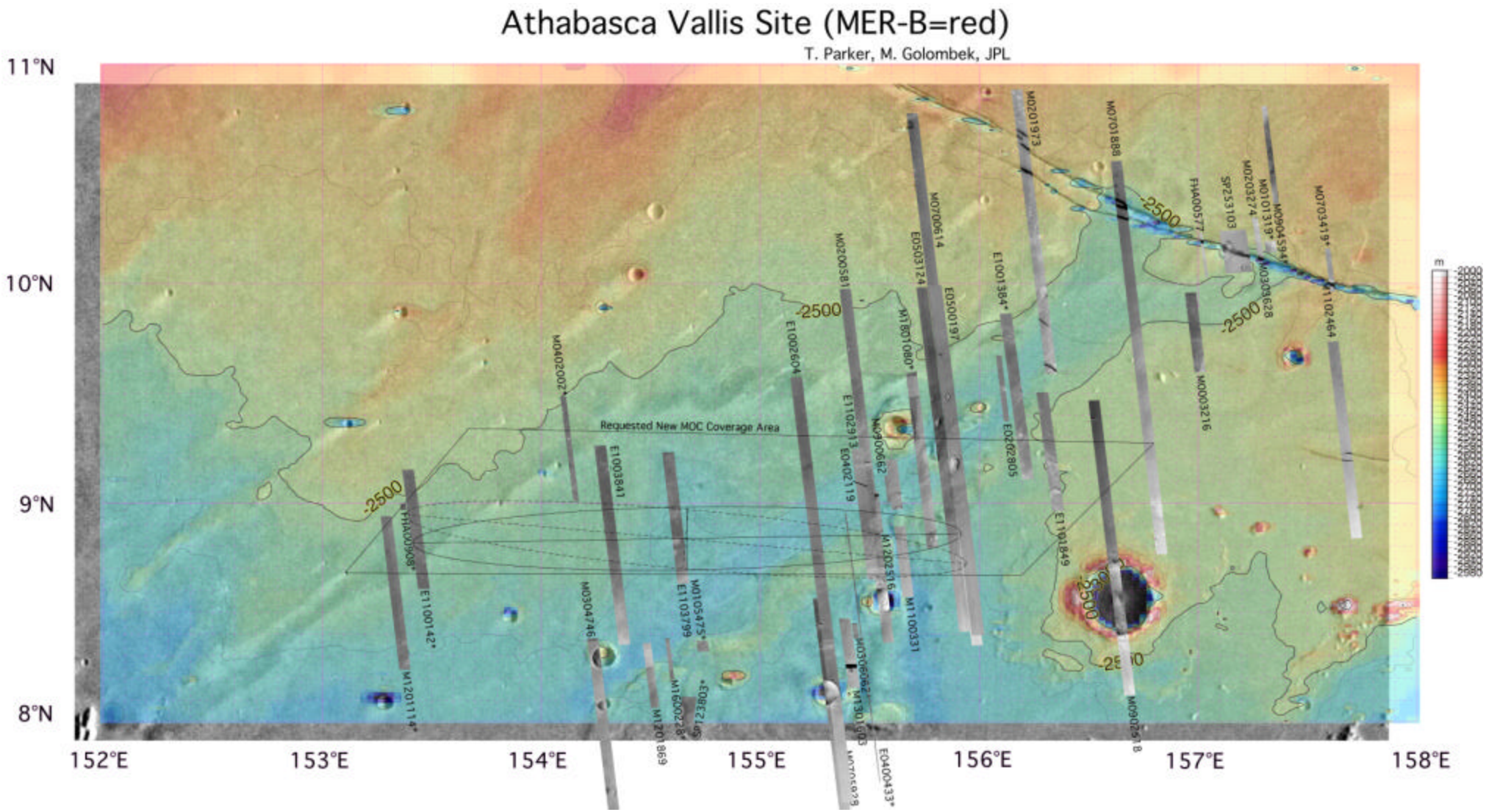
Moved IP84A, 96B to South
From Knobby Material
Close to Highlands
Area of Lower Thermal Inertia
& Low Slopes and Relief

Ellipses Mostly in Ht [Crumpler]
Fan Material from Valley
Networks just to South
Maintained MOC Coverage

Elysium Planitia Flows/Channel Site
(MER-B=red)

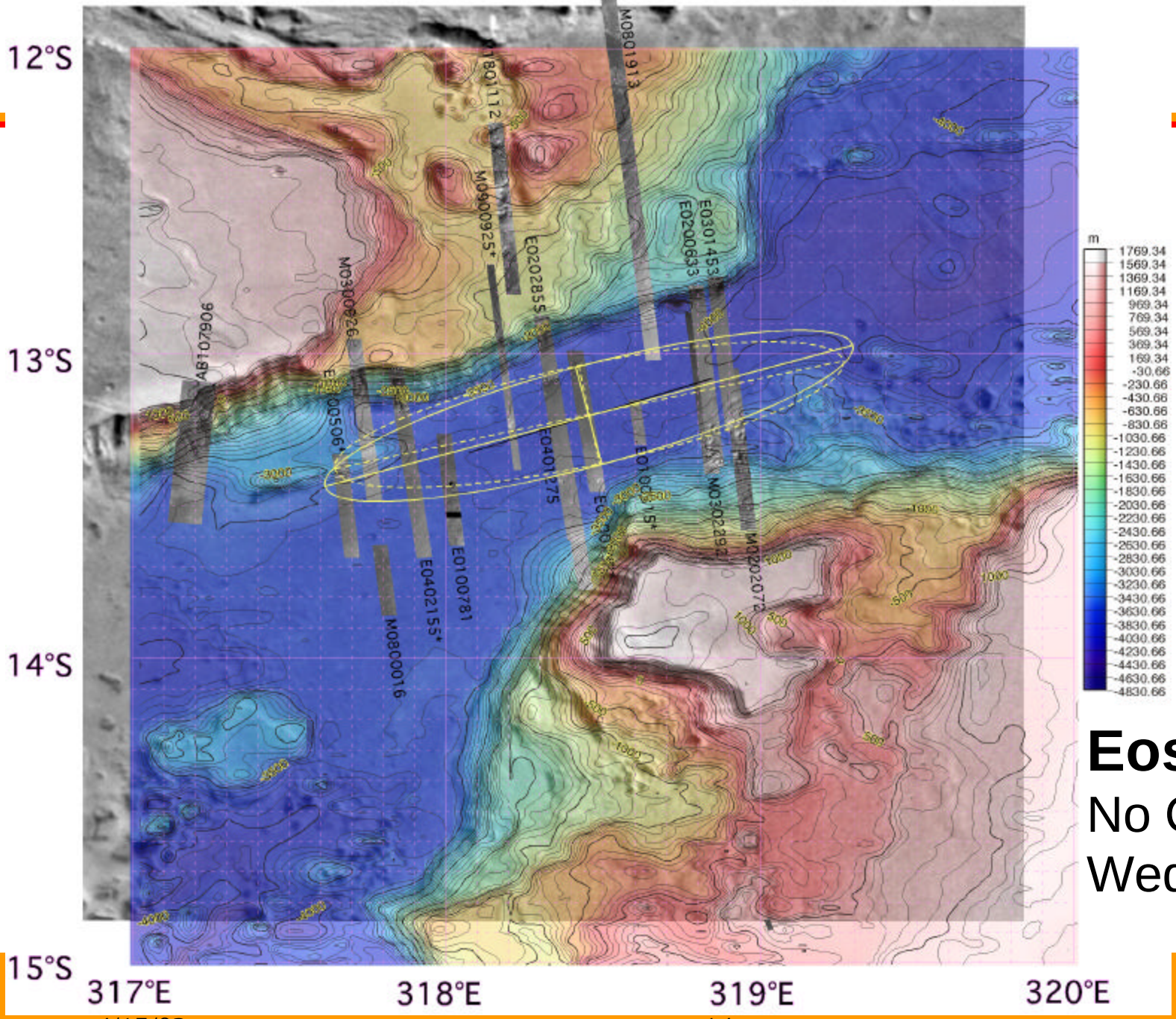


Southern Ellipse Preferred on Science and Safety Grounds
Shifted Ellipse West to Avoid Scarps & Ejecta
Access Possible Depositional Area Behind Ridge



Requested MOC Images Over Entire Quadrilateral to Gain Geologic Context - Allow Better Ellipse Placement Later

Valles Marineris Outflow Site (MER-A)



Eos Chasma

No Change

Wedged

MER Landing Site Ellipse Data

Landing Site, Ellipse #	MDIM2 Lat. Long. W	MOLA Lat. Long. E	Ellipse Length km	Ellipse Width km	Ellipse Azimuth* deg
Hematite, TM20B2	2.07S	2.06S	117	18	86
TM10A2	6.08	353.77	119	17	84
Melas, VM53A2	8.88S	8.75S	103	18	80
B2	77.48	282.36	105	20	82
Gusev,	14.82S	14.64S			
EP55A2	184.85	175.06	96	19	76
Isidis, IP84A2	4.31N	4.22N	132	16	88
IP96B2	271.97	87.91	135	16	91
Eos,	13.34S	13.20S			
VM41A2	41.39	318.46	98	19	78
Athabasca,	8.92N	8.83N			
EP49B2	205.21	154.67	152	16	95

*Ellipse Azimuth Measured Clockwise from North for Beginning of Launch Period

Average Thermophysical Properties

Landing Site	TES I	TES Alb	IRTM FC I	IRTM Rock
Hematite	232	0.170	307	5
Melas	310	0.148	246	11
Gusev	274	0.222	248	7
Isidis	454	0.228	384	14
Eos	386	0.136	305	20
Athabasca	313	0.245	272	11
VL1	320	0.255	250	16
VL2	240	0.235	175	17
MPF	425	0.218	344	18

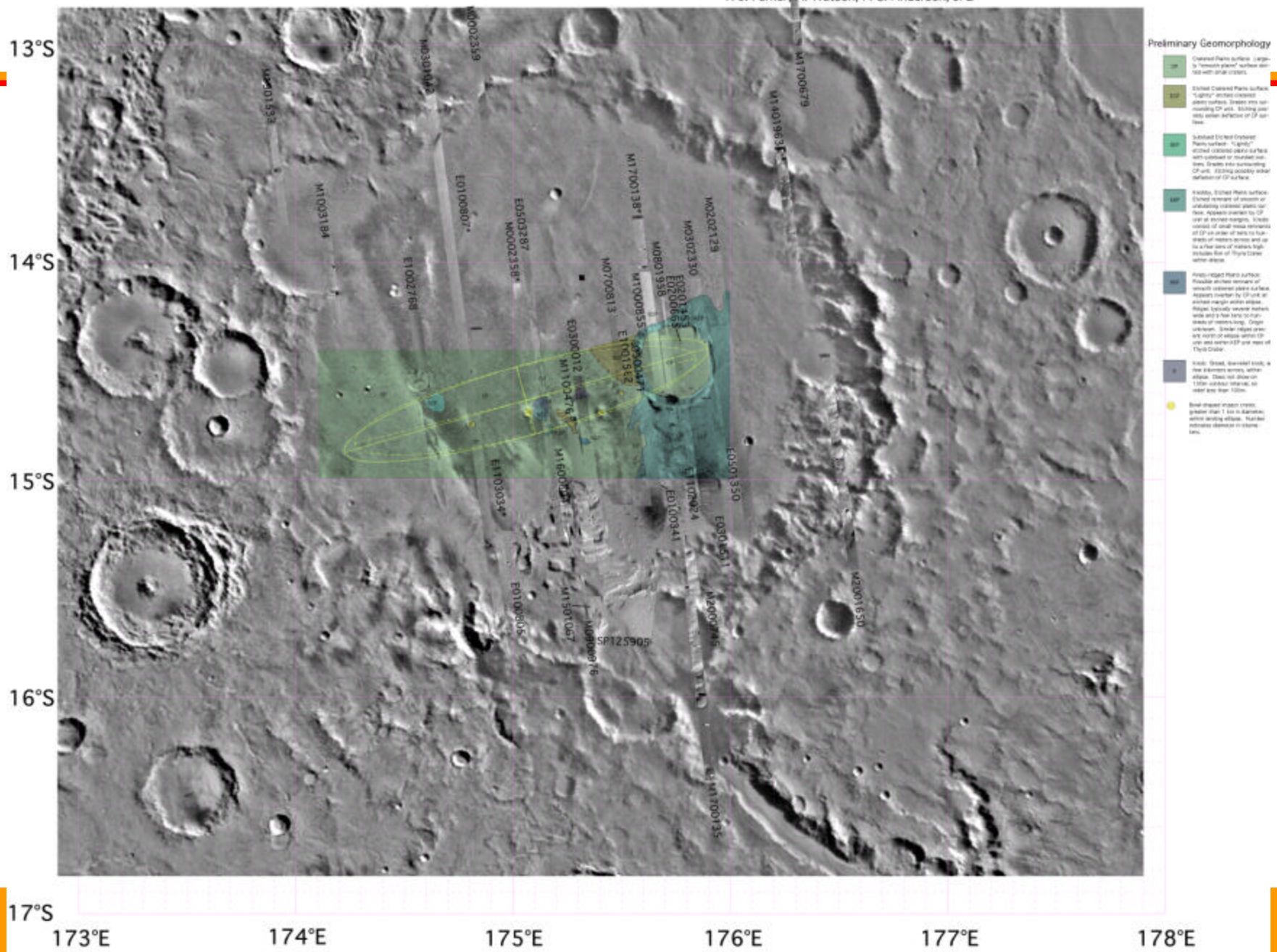
Thermal inertia (I) and fine component (FC) thermal inertia in SI units, J m^{-2} $s^{-0.5}$ K^{-1}. Rock abundance (Rock) - percent of surface covered.

Coarse Interpretation of Landing Sites

- **Hematite Sites**
  - Moderate I and Fine Component I, Low Albedo, Few Rocks
  - Completely Unlike the 3 Landing Sites, Few Rocks & Little Dust
- **Gusev Crater**
  - Similar to VL & MPF Landing Sites, Less Rocky and Moderately Dusty
- **Isidis Sites**
  - High I & High Fine Component I, Mod. Albedo, Rocky, [High Red/Blue Ratio, (to N)]
  - Rocky Sites with Possibly Weathered Crusty Surface or Dust
- **Melas Chasma Sites**
  - Moderate I (Bulk and Fine Component), Moderate Rocks, Low Albedo
  - Moderately Rocky Sites with Little Dust, Unlike 3 Landing Sites
- **EOS Chasma**
  - High Bulk I & Moderate Fine Component I, Rocky, Low Albedo
  - Rocky and Crusty Surface with Little Dust
- **Athabasca Vallis**
  - Moderate Thermal Inertia, High Albedo, Moderate Rocks
  - Moderately Rocky and Dusty

Gusev Crater Site (TCM-5 DeltaDOR, -2Day: MER-A; Open of window=dashed, Close=solid)

T. J. Parker, A. Watson, F. S. Anderson, JPL



Valles Marineris Melas Site(TCM-5 DeltaDOR, -2Day: MER-A=Yellow; MER-B=Orange; Open of window=dashed, Close=solid)

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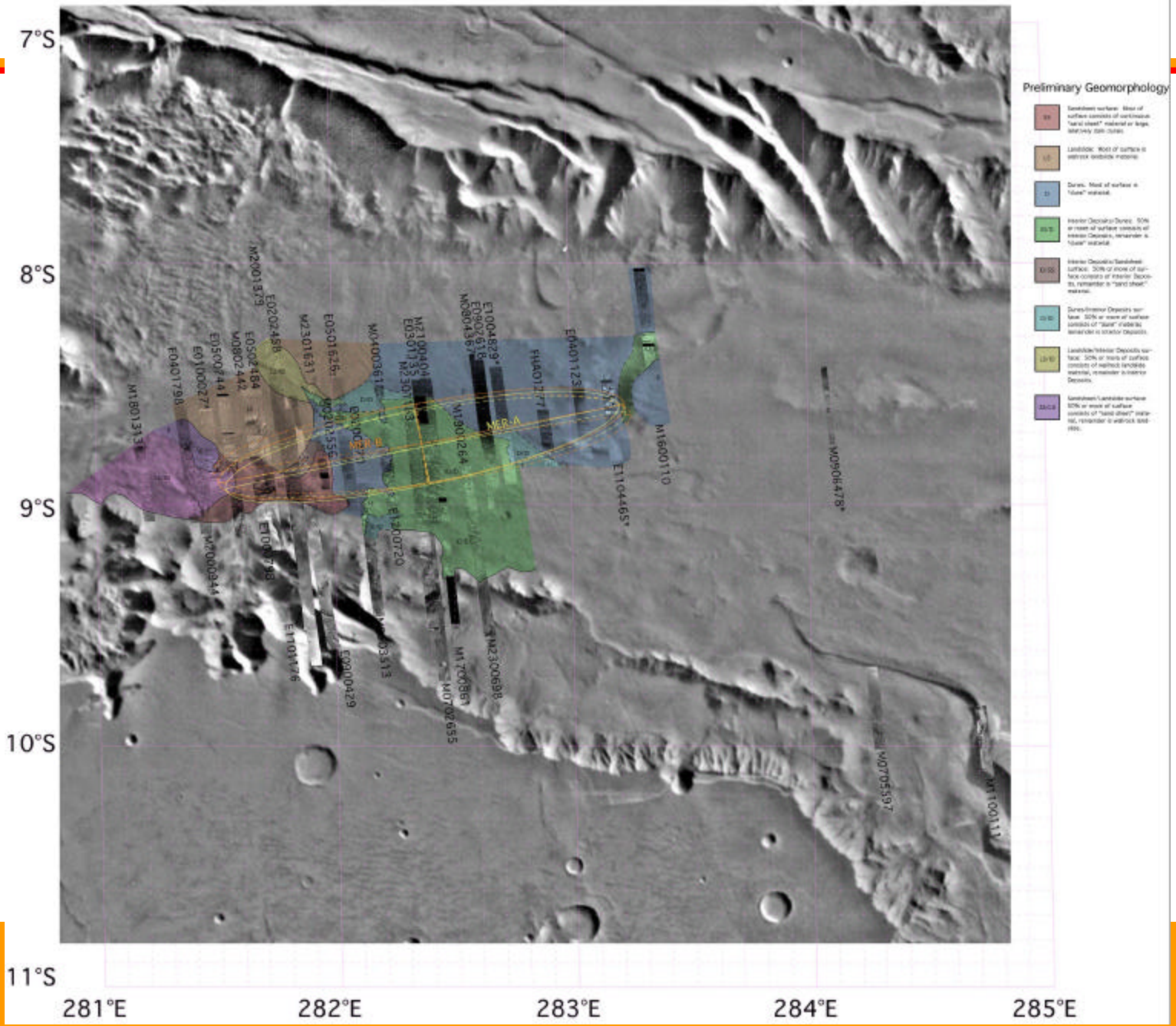
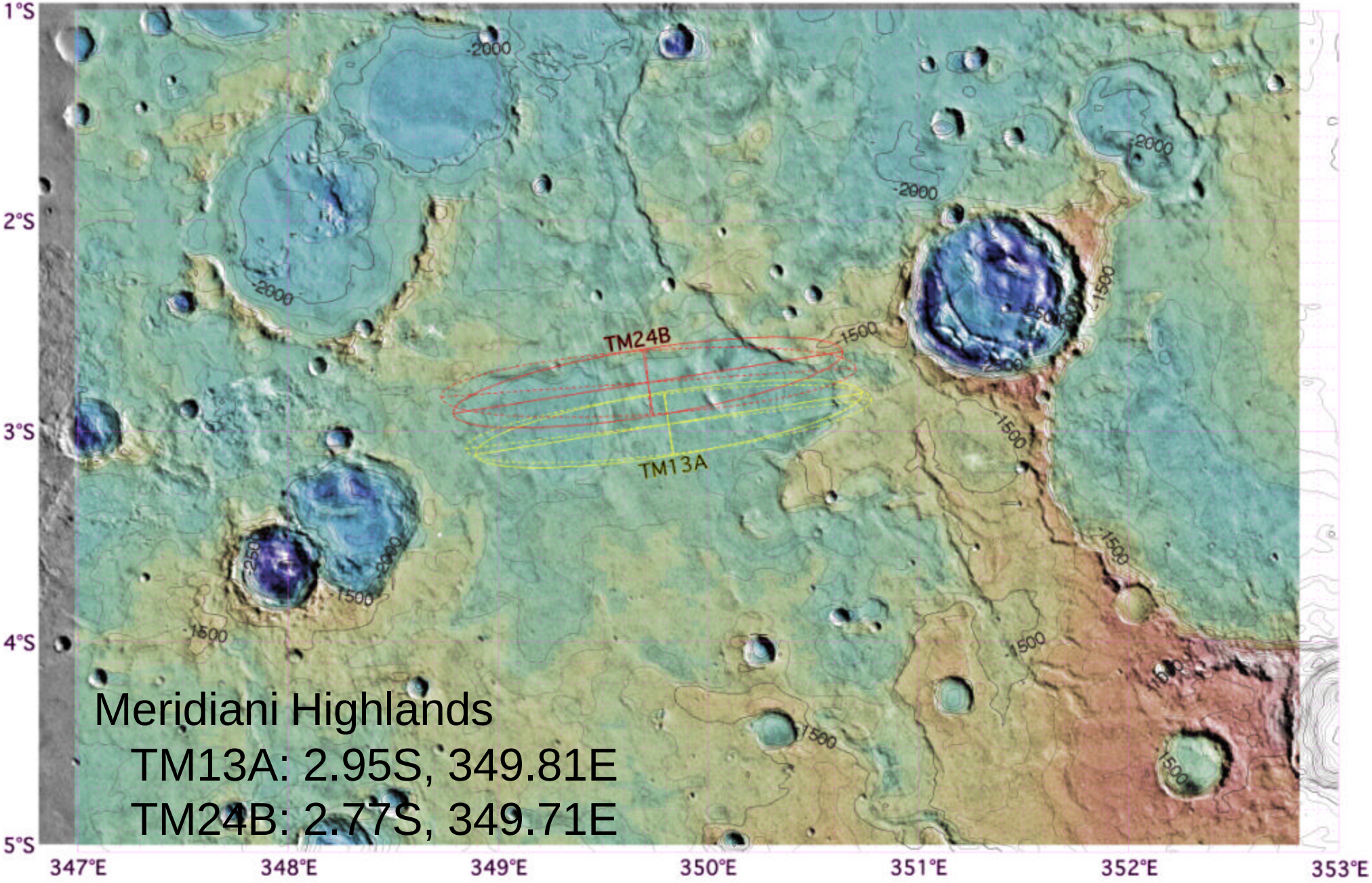


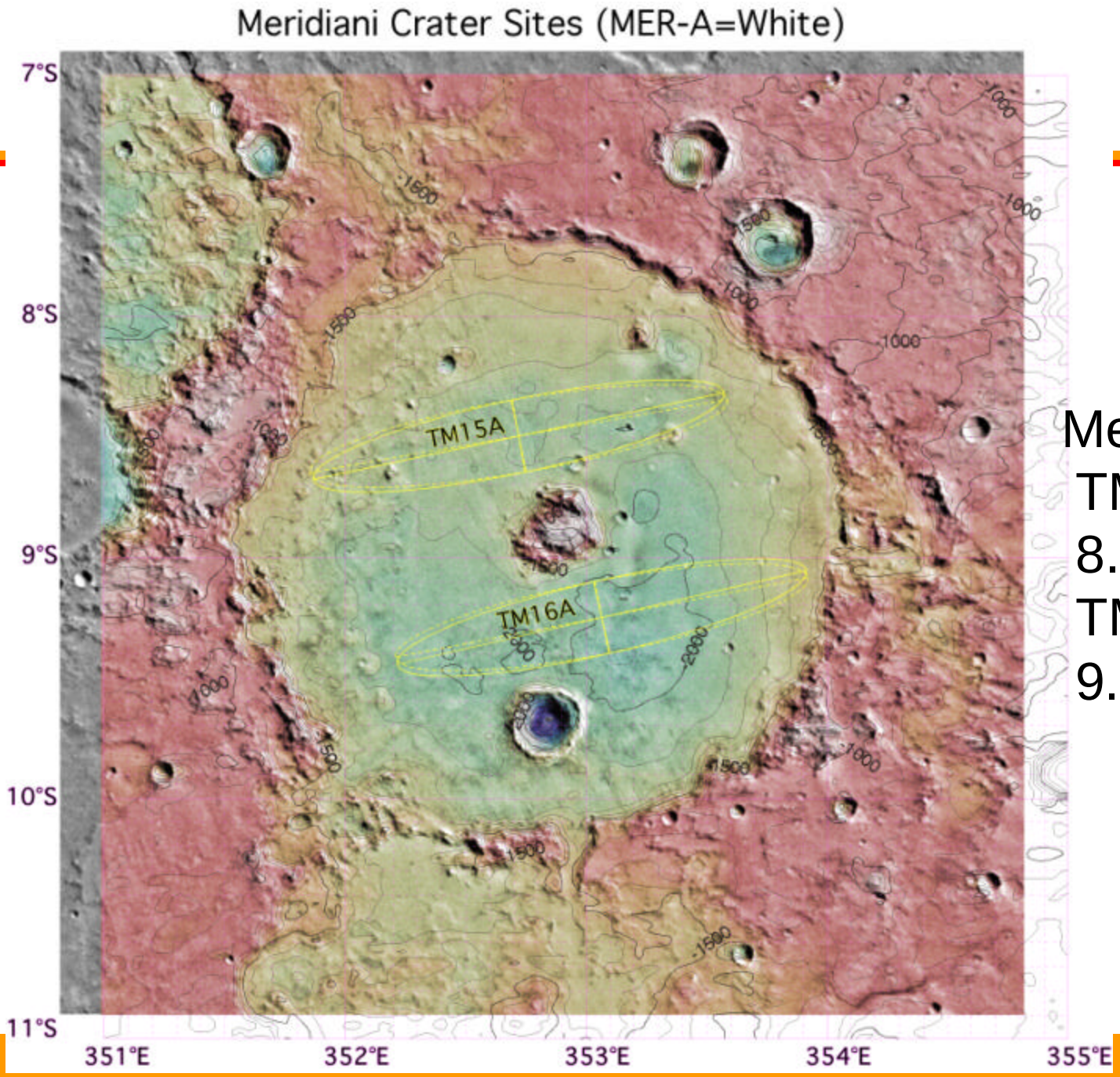
M. Golombek

Potential New Landing Sites?

- MER Project Identified Propellant Margin
  - Target Any Landing Site at First TCM
  - Delay Landing Site Decision Until Before Launch
- "There is No Perfect Landing Site"
  - Are There Other Sites that Should be Considered (New Flexibility)?
- From Science Point of View - No
  - Considered All Sites Suggested based on Science
- Looked at All Sites from 2nd Workshop
  - Not Removed for Cause: Meridiani Highlands, Meridiani Crater, Ares Vallis tributary, Sinus Meridiani, Highlands
  - All Compete with Hematite [Cannot Select with Hematite]
- Possible to Consider New Sites "Discovered" by THEMIS
  - If Found Would Need to Target MOC Images to Certify
- Asked THEMIS to Image Sites and Inform us of Discoveries

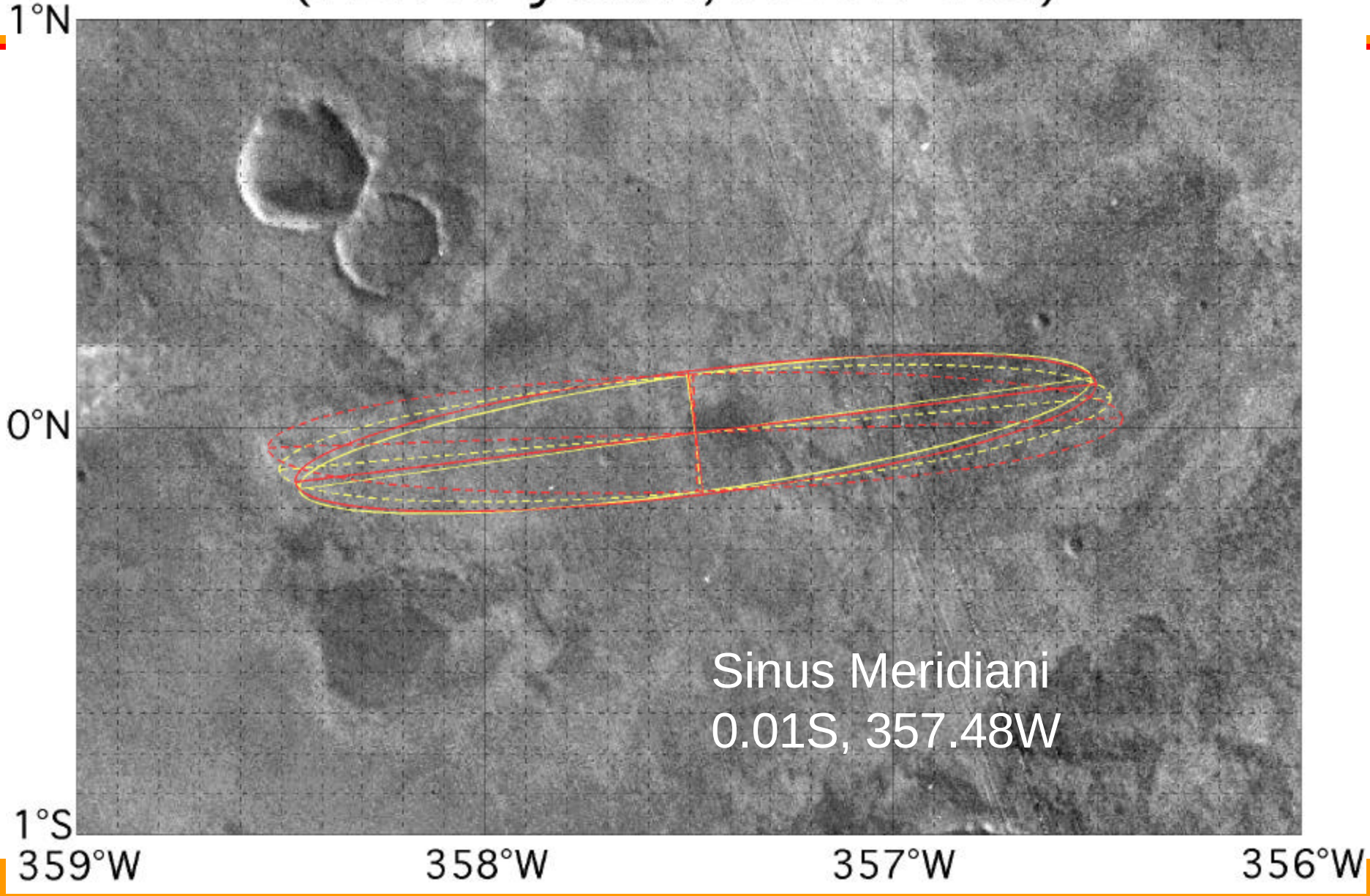
Meridiani Highlands Site (MER-A=White; MER-B=Black)



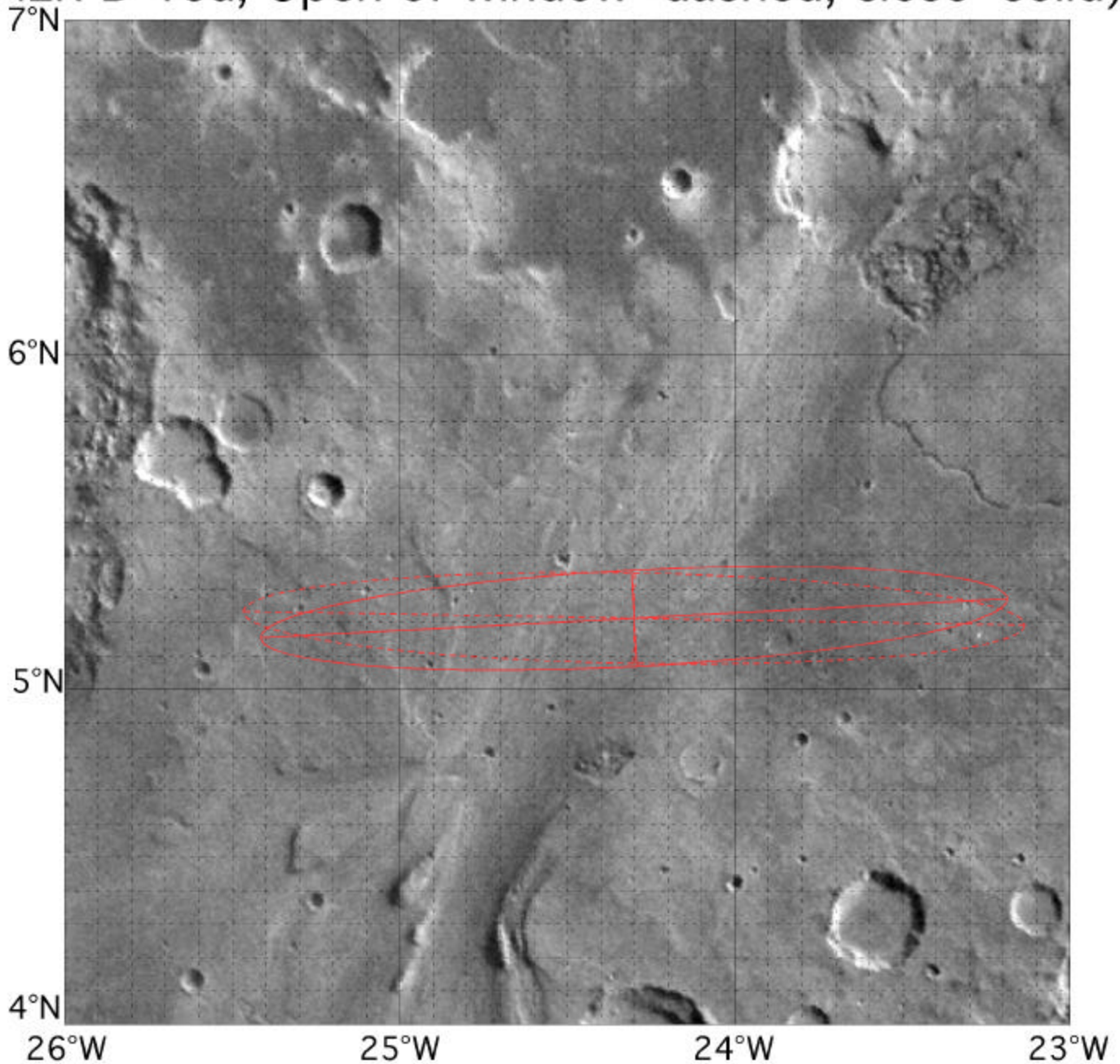


Meridiani Crater
TM15A:
8.5S, 352.72E
TM16A
9.25S, 353.06E

North Meridiani Sinus Site
(MER-A=yellow; MER-B=red)

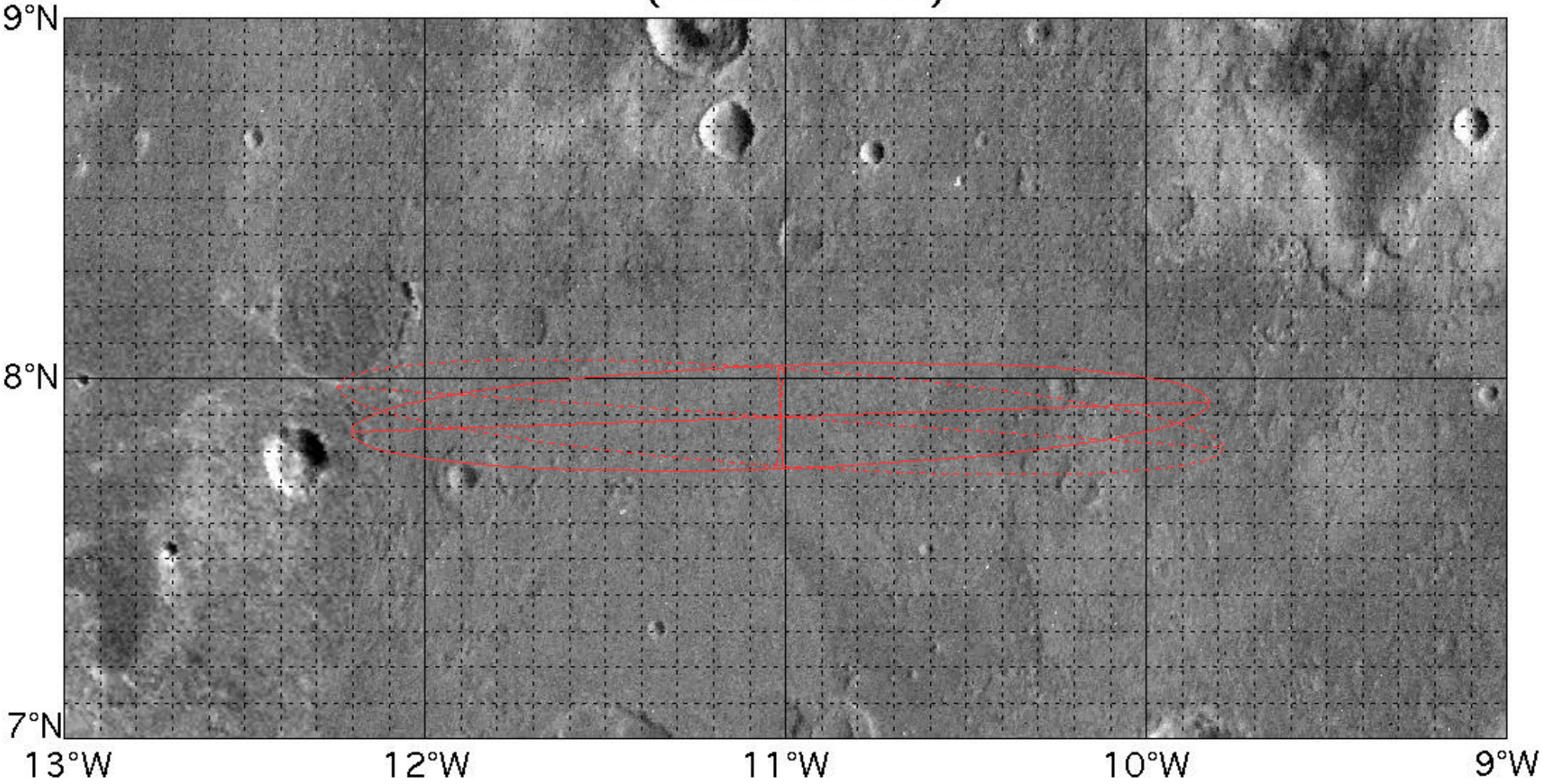


Ares Vallis Highlands Tributary Site
(MER-B=red; Open of window=dashed, close=solid)



Ares Vallis Tributary 5.2N, 24.3W

Oxia Palus Highlands Site
(MER-B=red)



Highlands: 7.9N, 11.01W