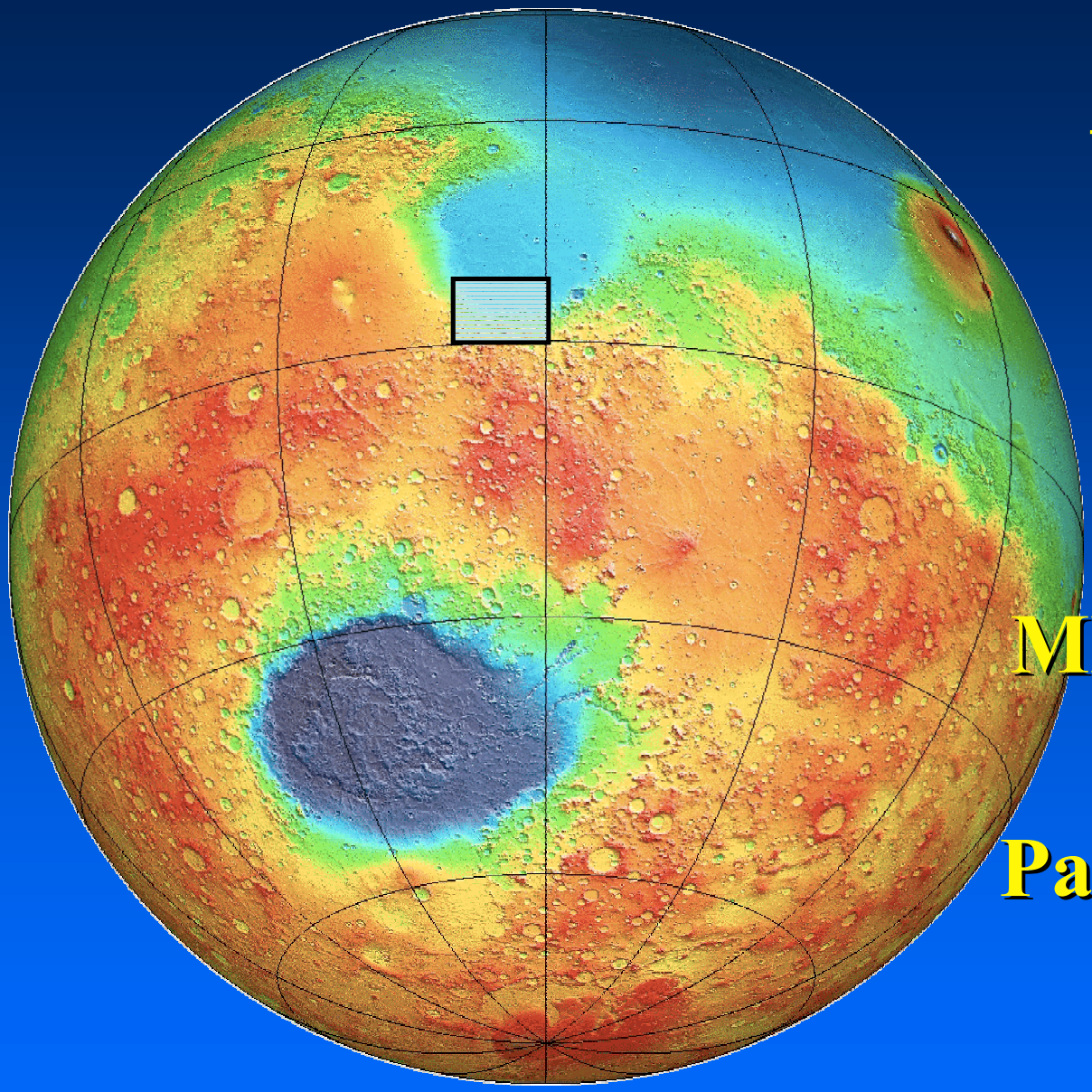


Isidis

Target Sites

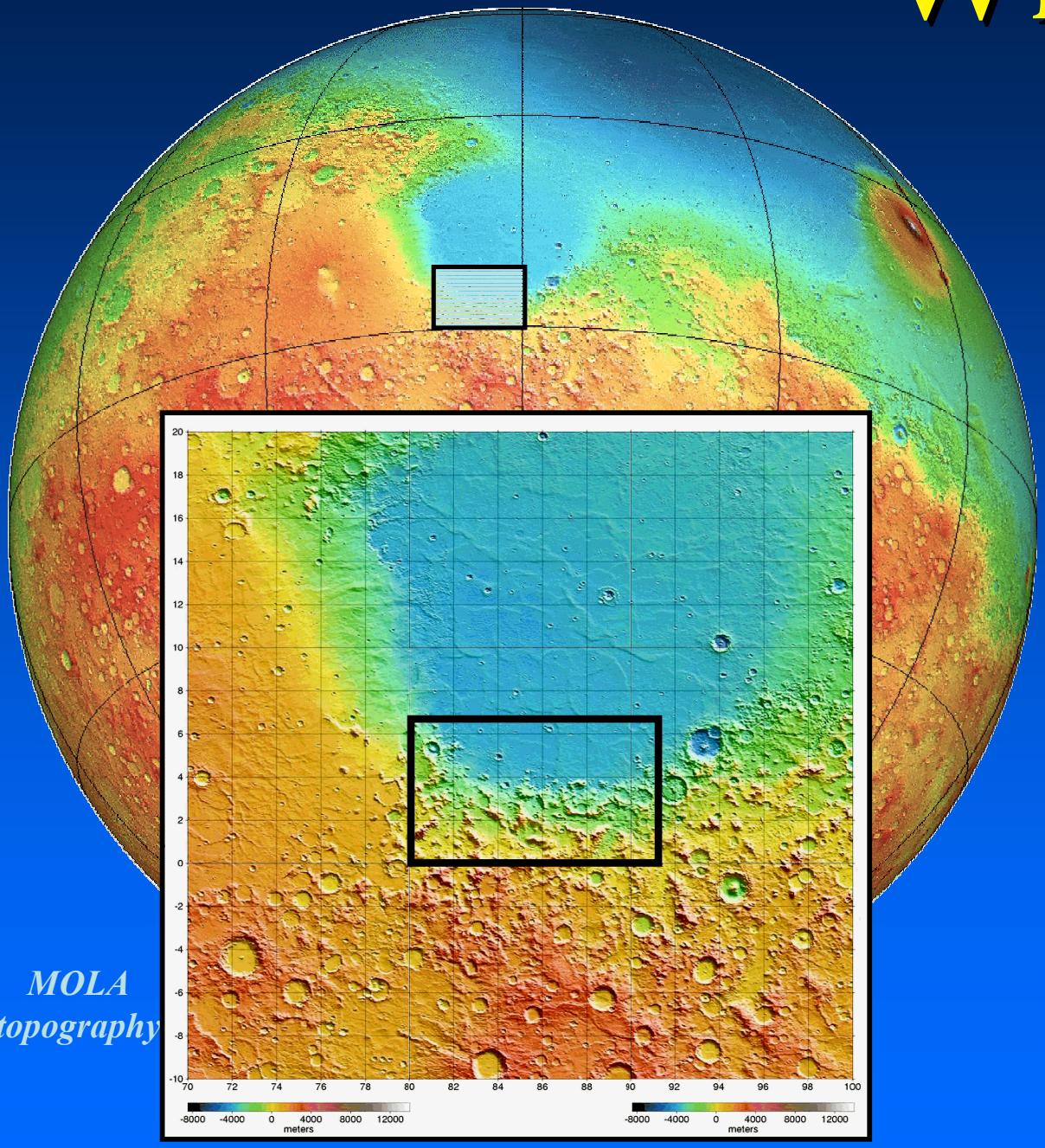
L. Crumpler
Isidis Site Science
Spokesperson*

MER Landing Site Meeting

Pasadena, October, 2001

* Contributions from: Golombek, Tanaka, Hare

Why Isidis?



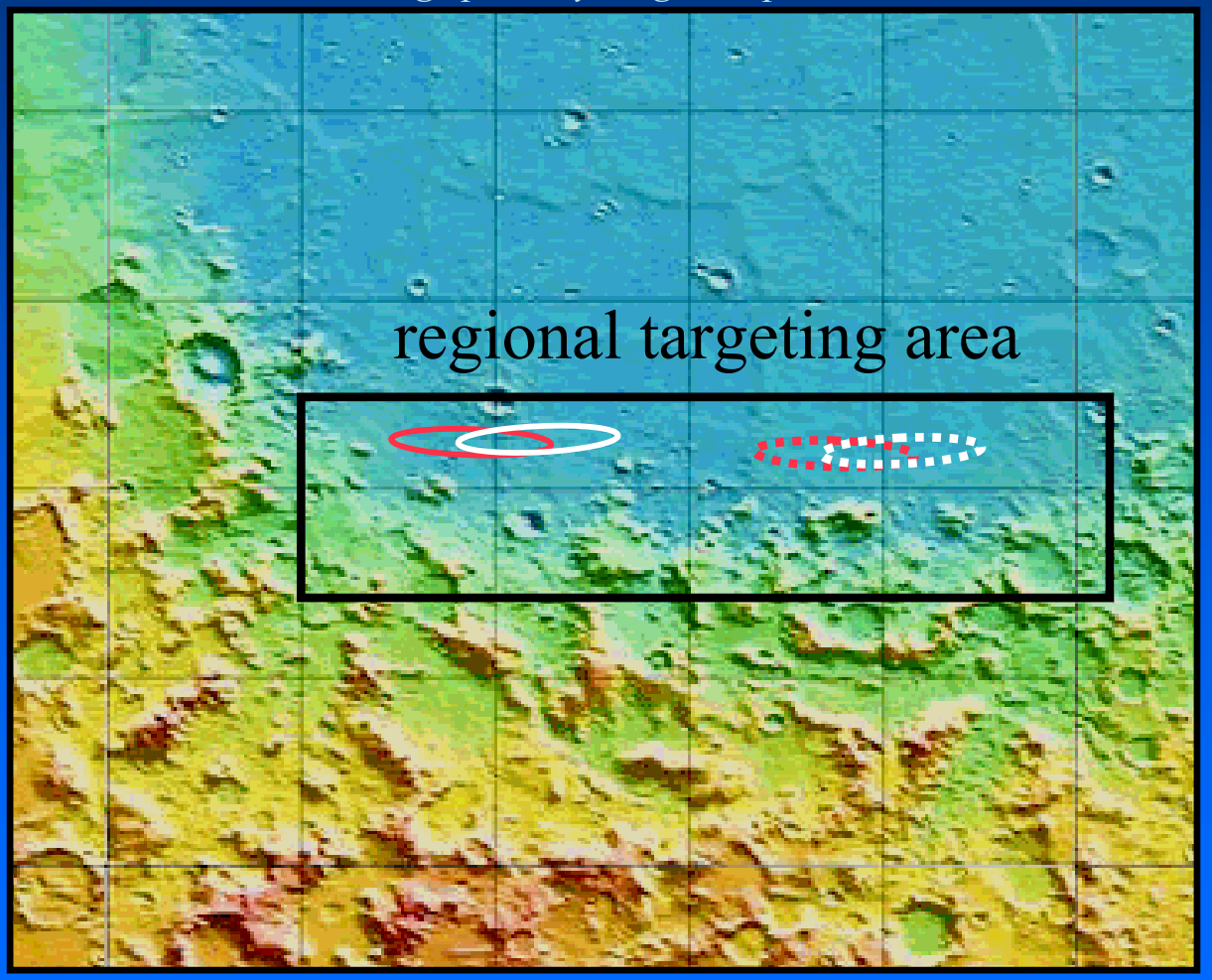
MOLA topography

- fluvial fans
- highland materials
- valley networks
- paleolakes
- long fluvial history
- safe

Points to be Discussed

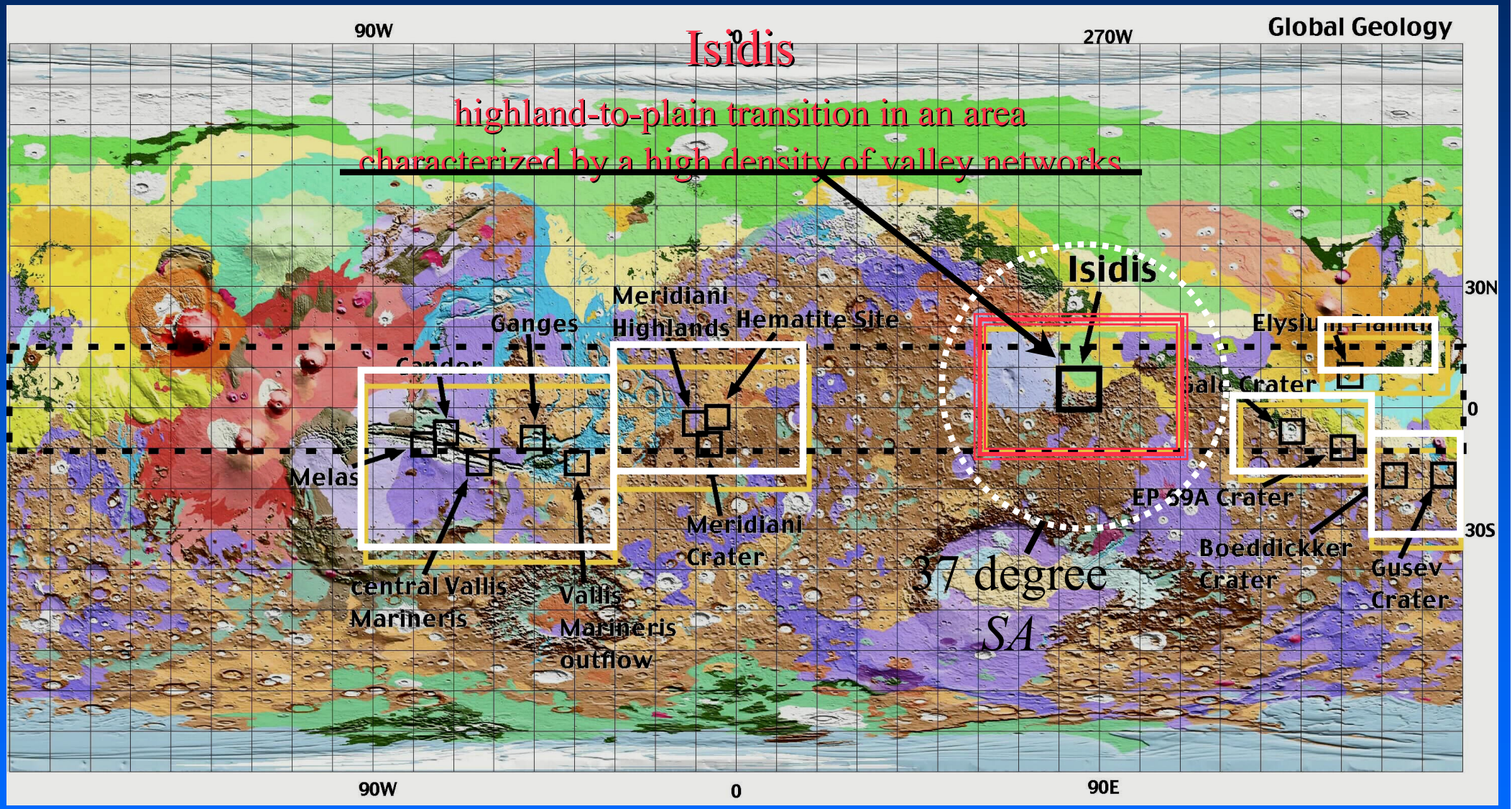
- location/ comparison of geologic setting with other sites
- geology of the source area
  - influence on target
  - influence on science
- geology of the target areas
- surface properties
- Athena science
- Zoomable MOC database

"large primary target ellipses" on shaded MOLA



Location of MER Sites in Context of Global Geology

[Location of Isidis site in relation to other proposed MER sites]

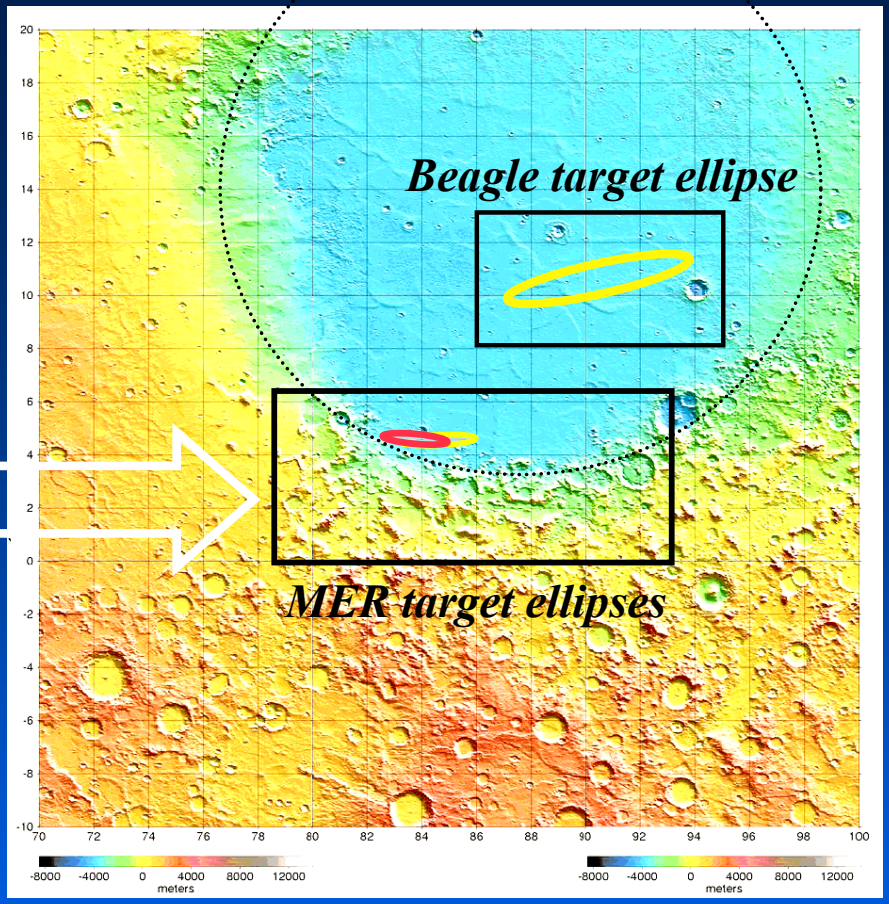


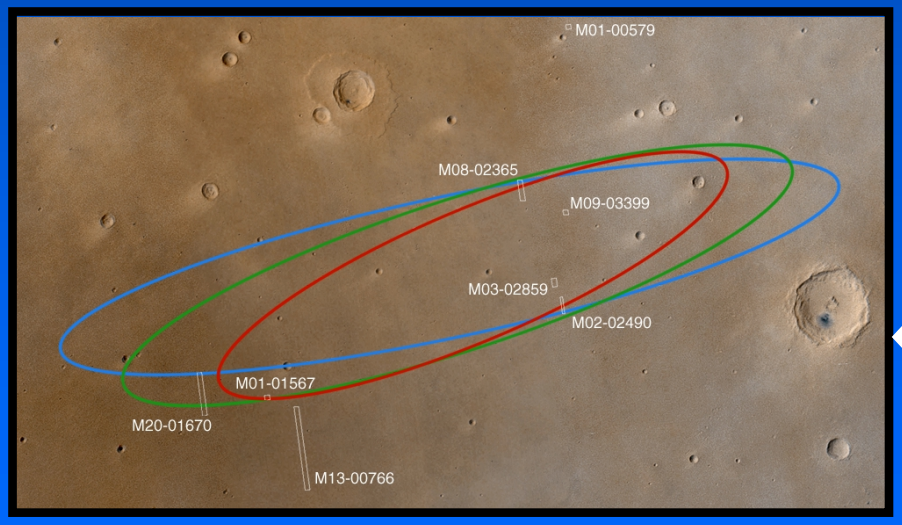
Location of MER Sites compared with Beagle Site

- *Major opportunity to characterize a basin laterally across hundreds of kilometers.*

MER Isidis site

- basin rim
- fluvial fans
- transition zone



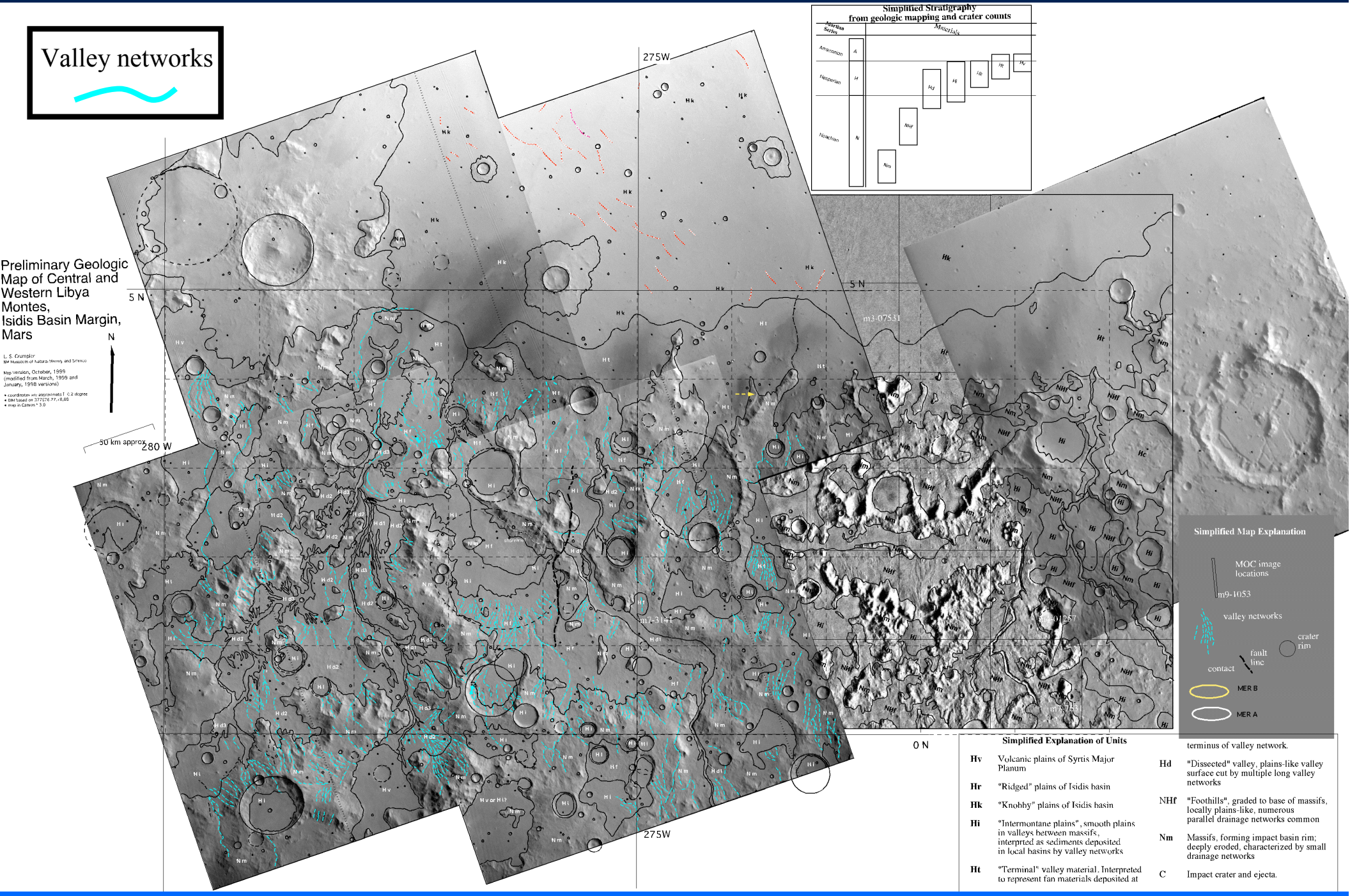


Beagle site

- basin interior
- plains
- low point

Site Geology: Map Contacts on Viking EDRs

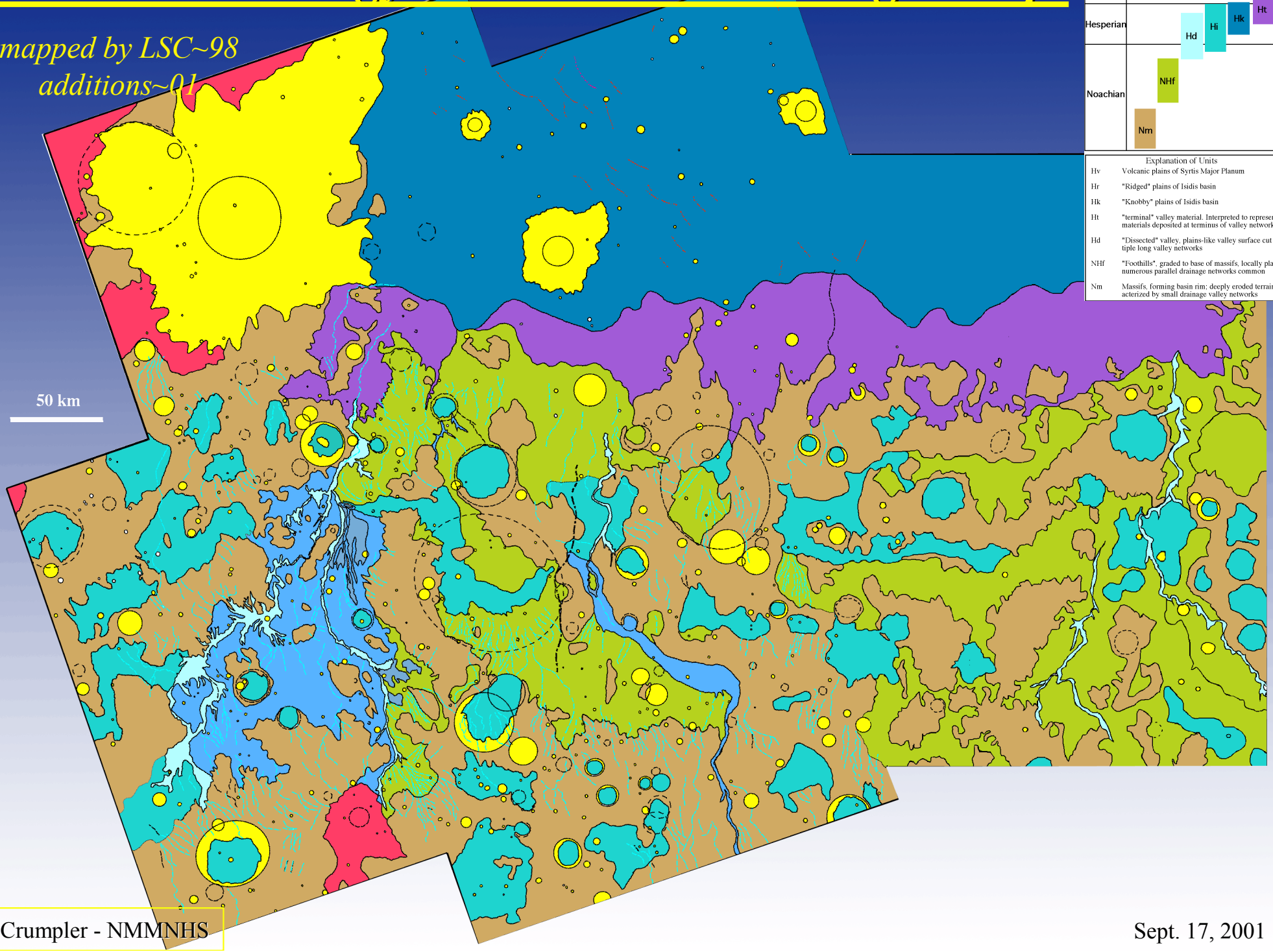
Isidis Site Science



Isidis Site Science

Site Geology: Color-Coded Geologic Map

mapped by LSC~98
additions~01



Stratigraphy Based on geology & Crater Counts

Series	Materials
Amazonian	Hv
Hesperian	Ht, Hk, Hi, Hd
Noachian	NHf, Nm

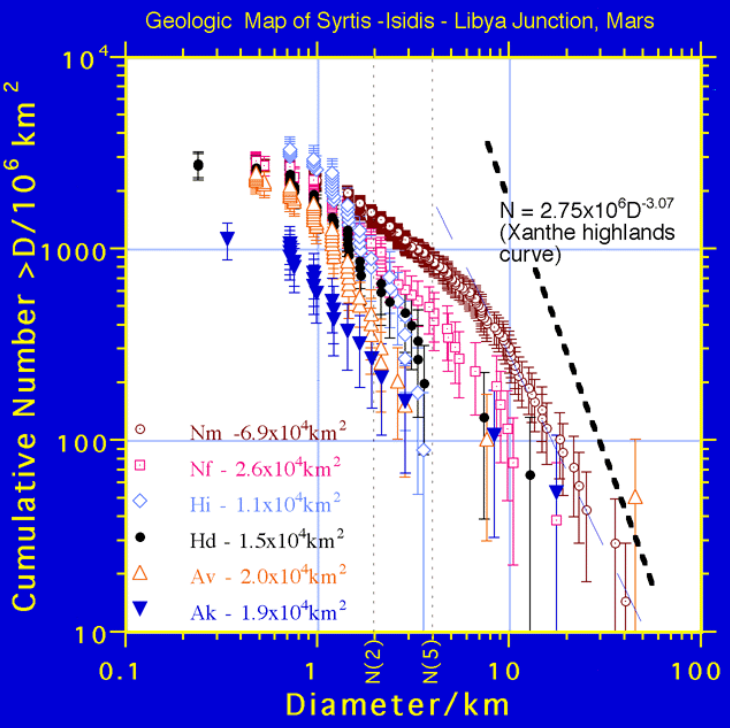
Explanation of Units

Hv	Volcanic plains of Syrtis Major Planum
Hr	"Ridged" plains of Isidis basin
Hk	"Knobby" plains of Isidis basin
Ht	"terminal" valley material. Interpreted to represent fan materials deposited at terminus of valley networks
Hd	"Dissected" valley, plains-like valley surface cut by multiple long valley networks
NHf	"Foothills", graded to base of massifs, locally plains-like, numerous parallel drainage networks common
Nm	Massifs, forming basin rim; deeply eroded terrain, characterized by small drainage valley networks

L. Crumpler - NMMNHS

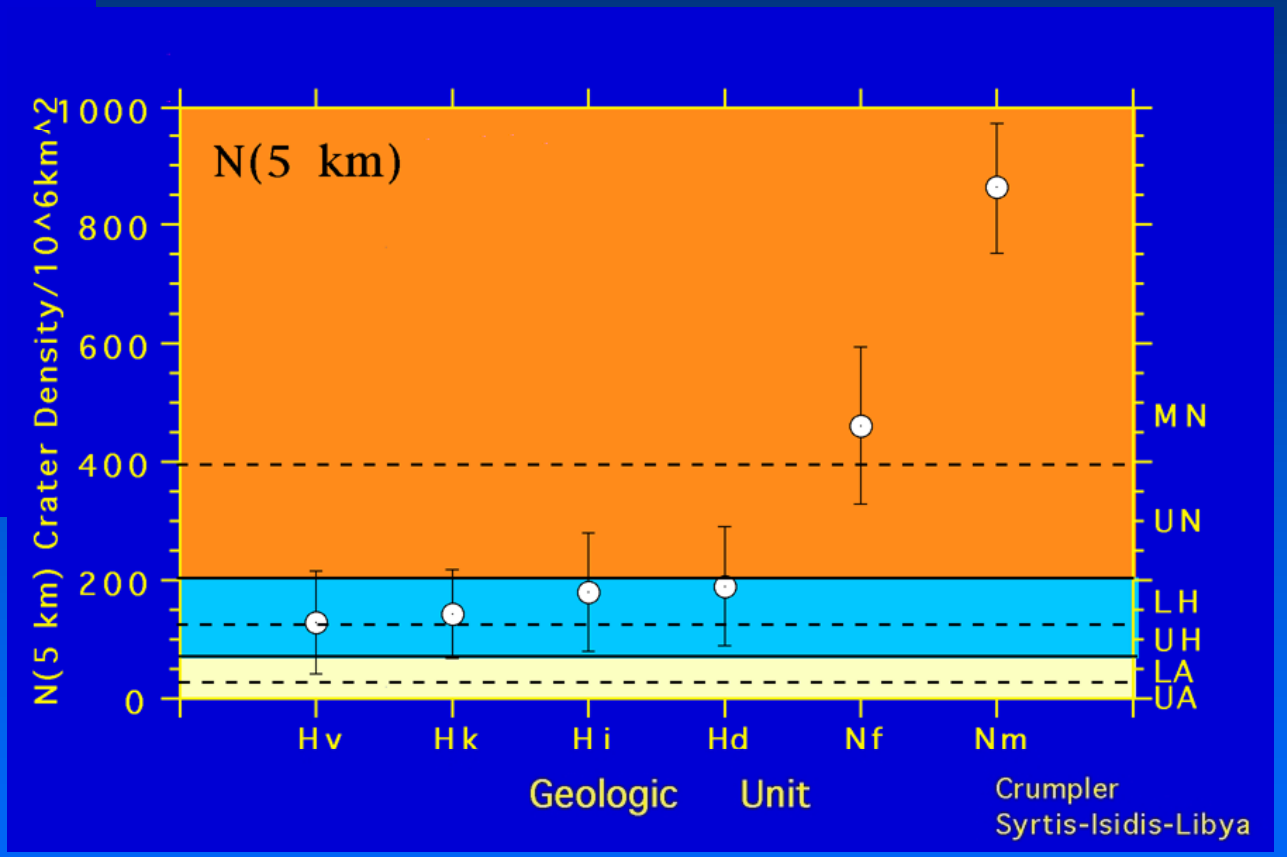
Sept. 17, 2001

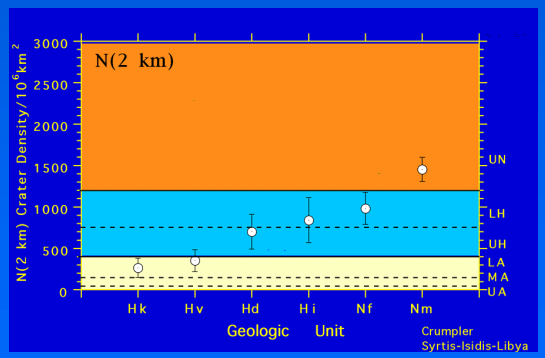
Site Geology: Southern Isidis Basin Rim & Libya Montes



Crater Ages of Units

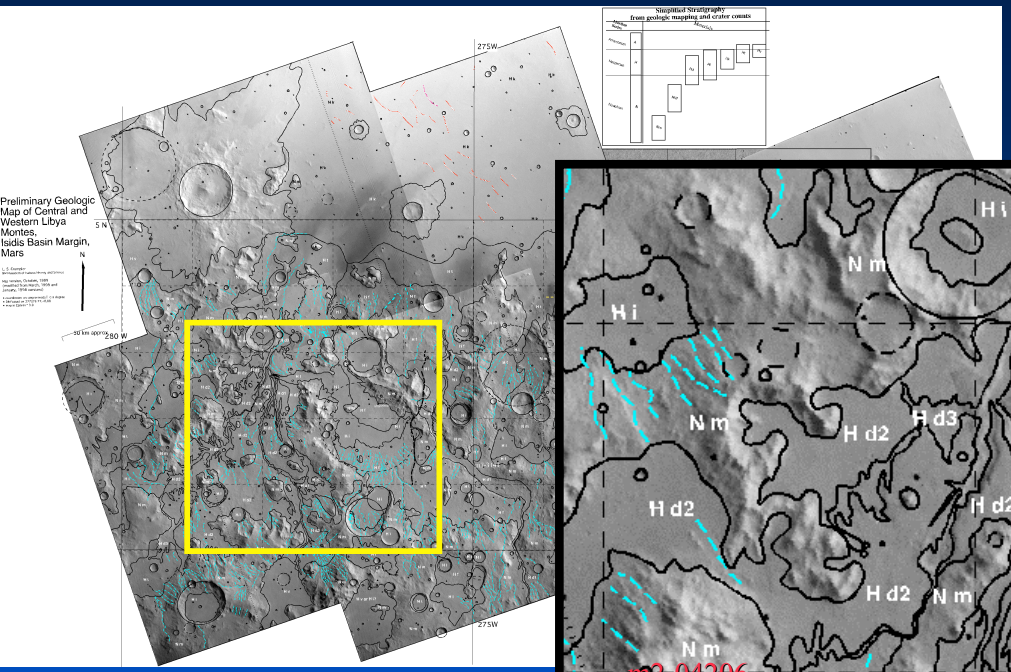
- Noachian through late Hesperian

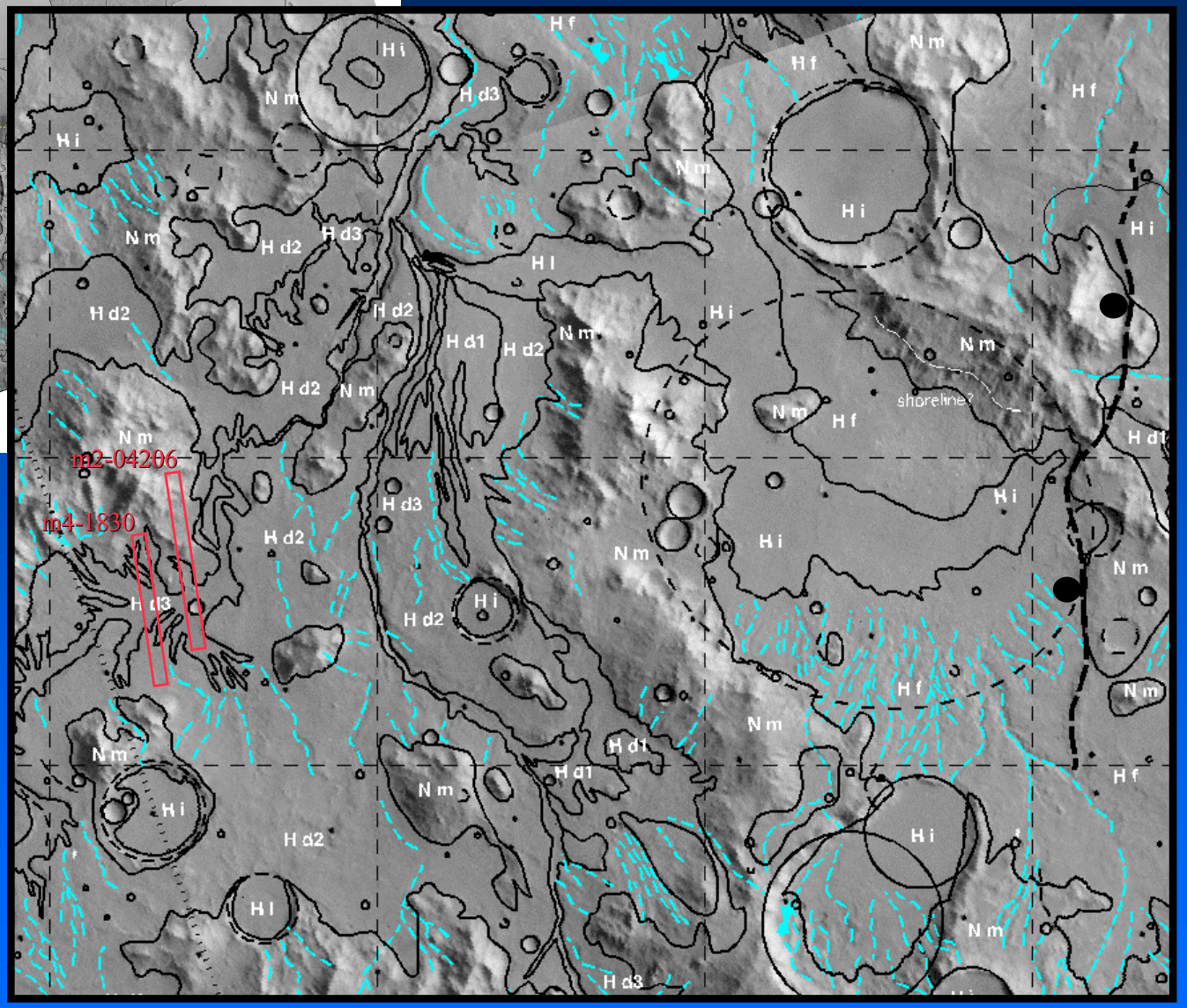




Geologic Map Contacts on Viking EDRs

Isidis Site Science



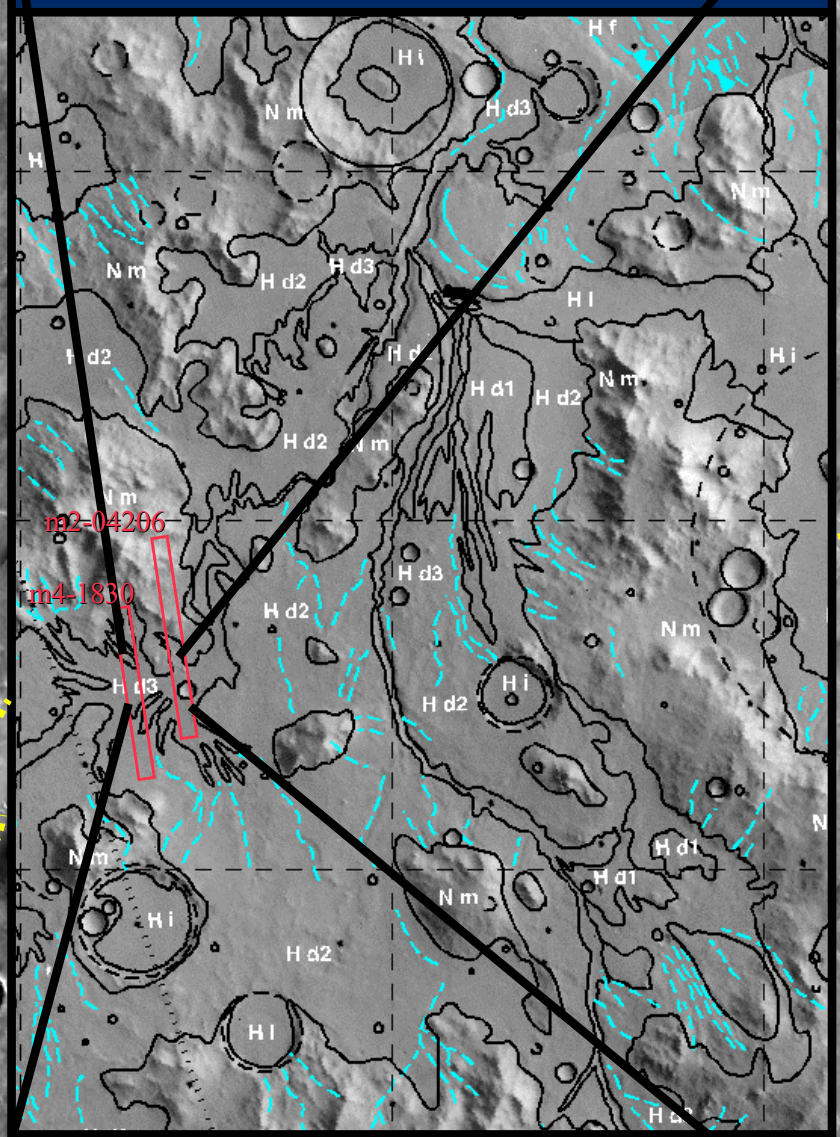


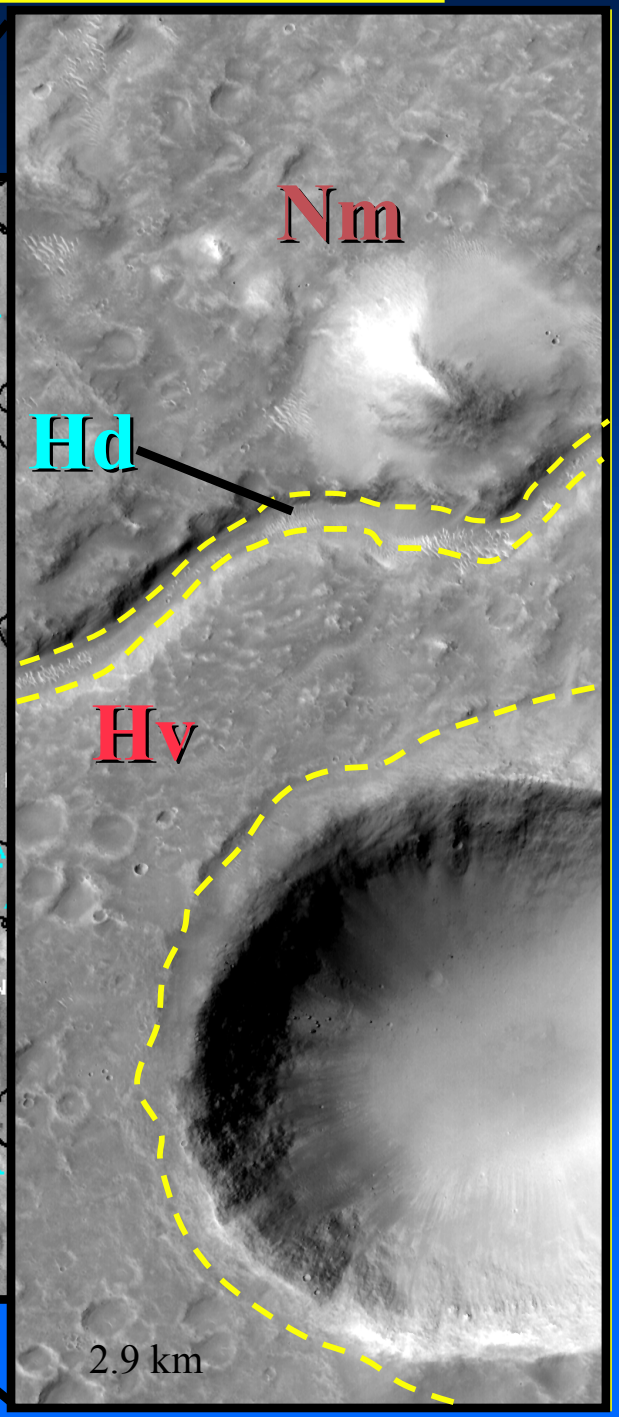
- broad valley floors
- "hanging gardens"
- extensive dendritic patterns

Geologic Map Contacts on Viking EDRs

Isidis Site Science

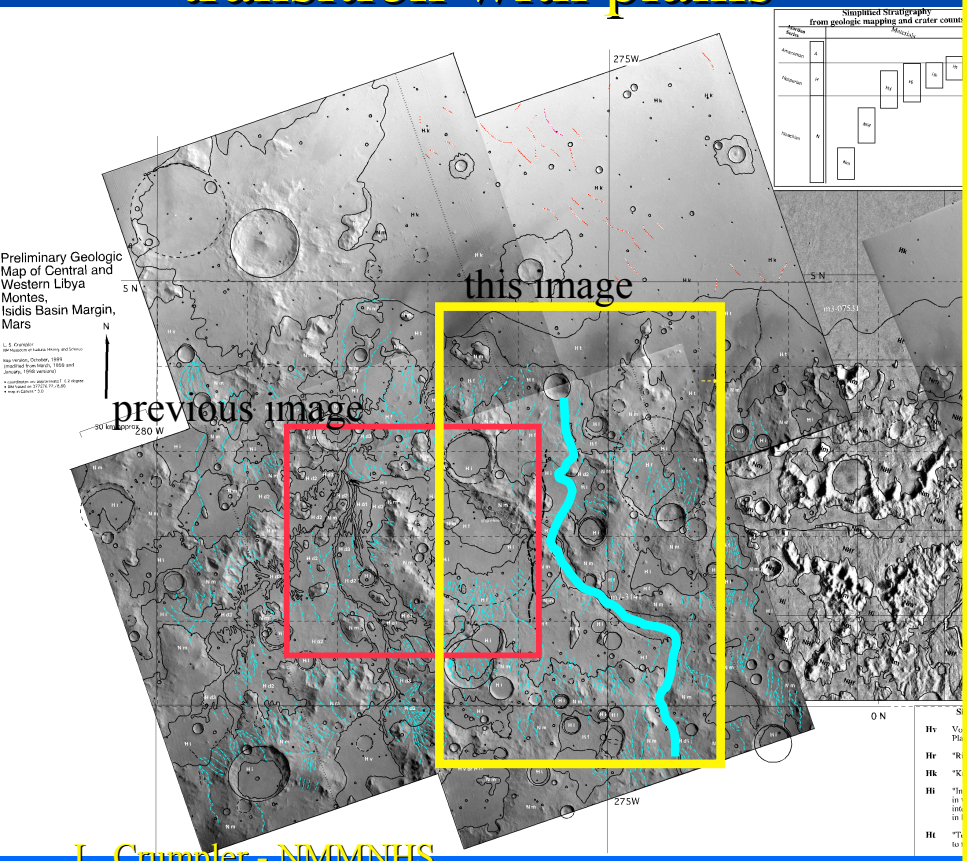
Sequence: broad valley ->lava flow -> renewed valley erosion

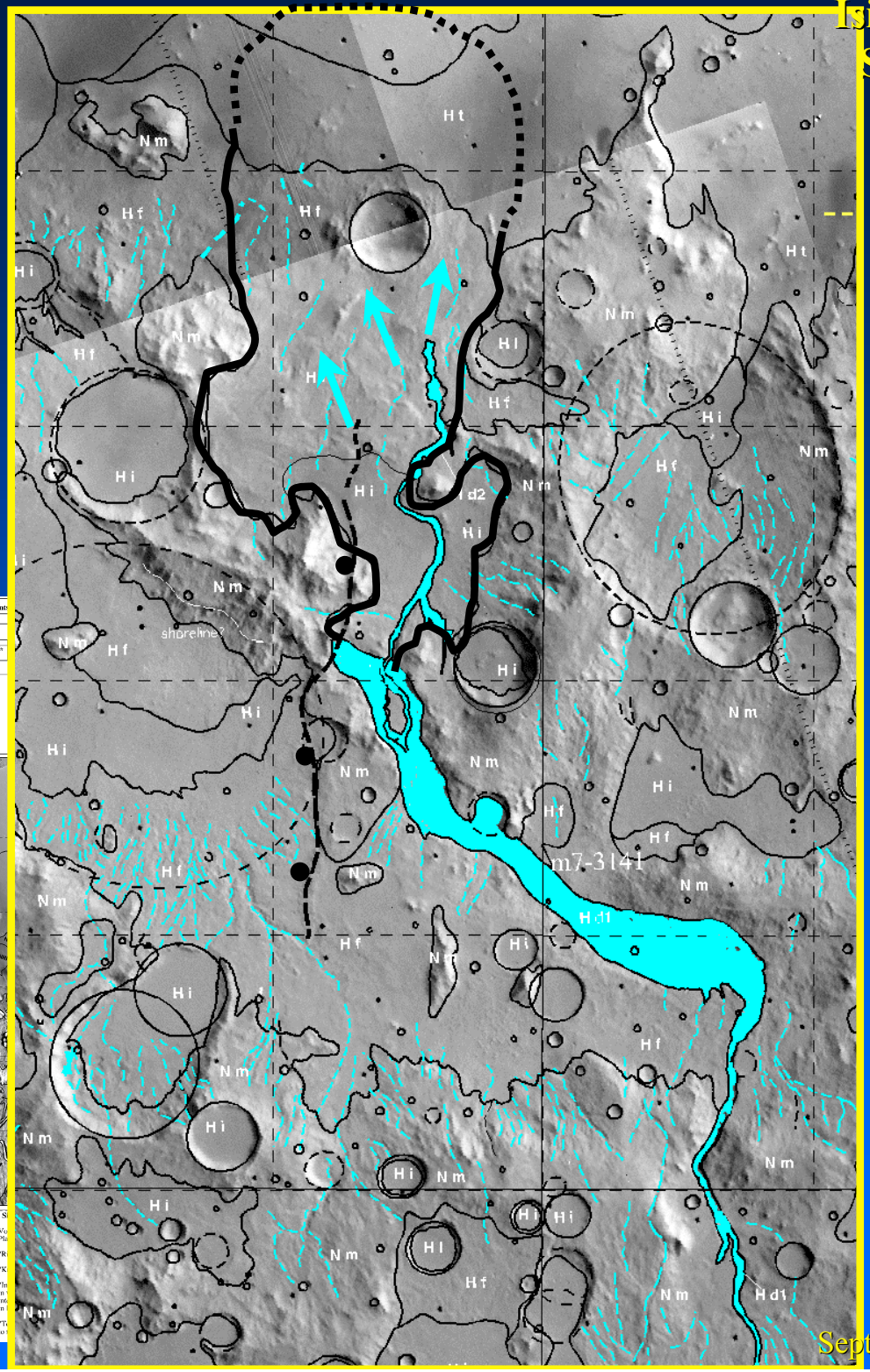




Geologic Map Contacts on Viking EDRs

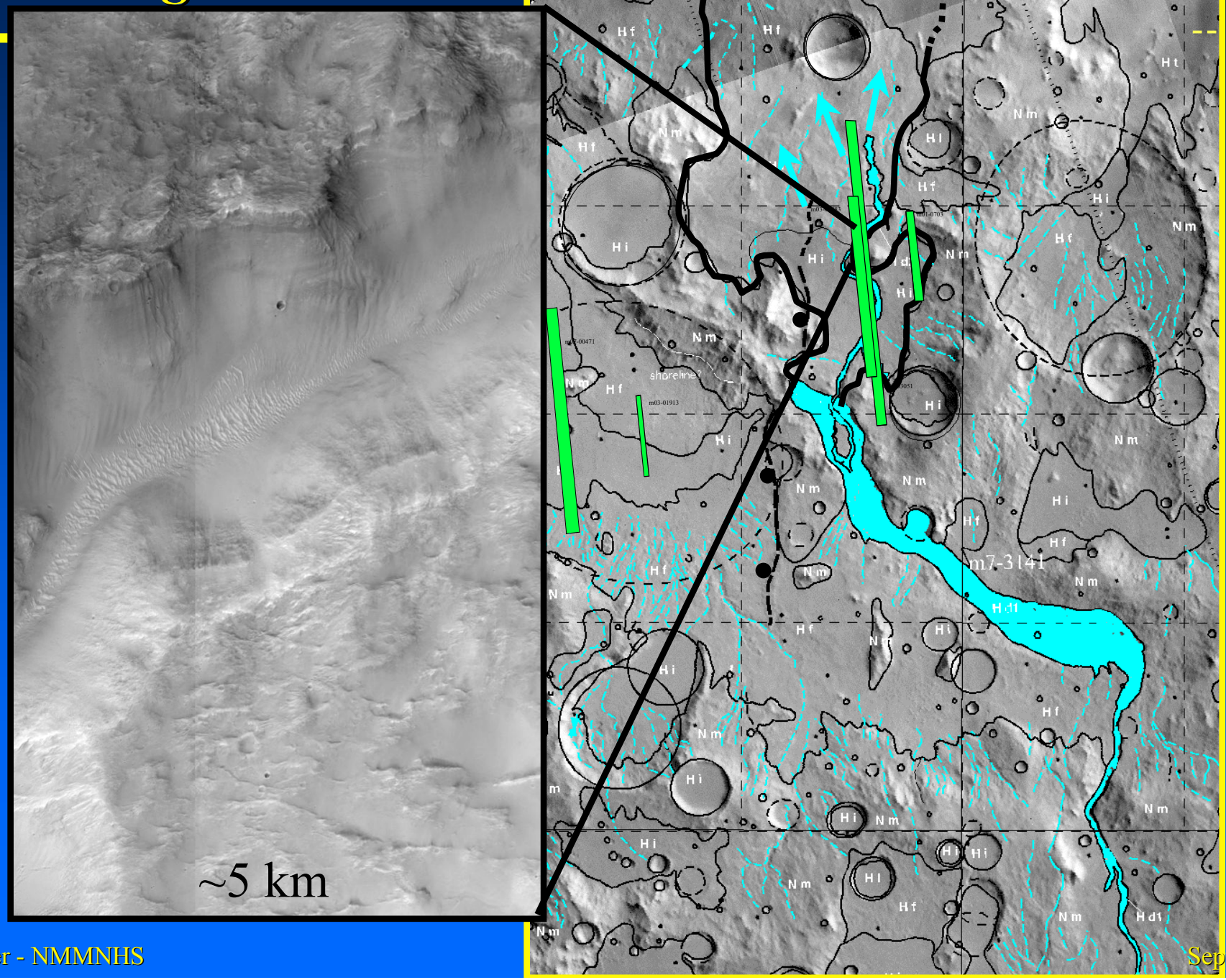
- major valley
- diverted by faulting
- cut new valley
- terminal deposits near transition with plains

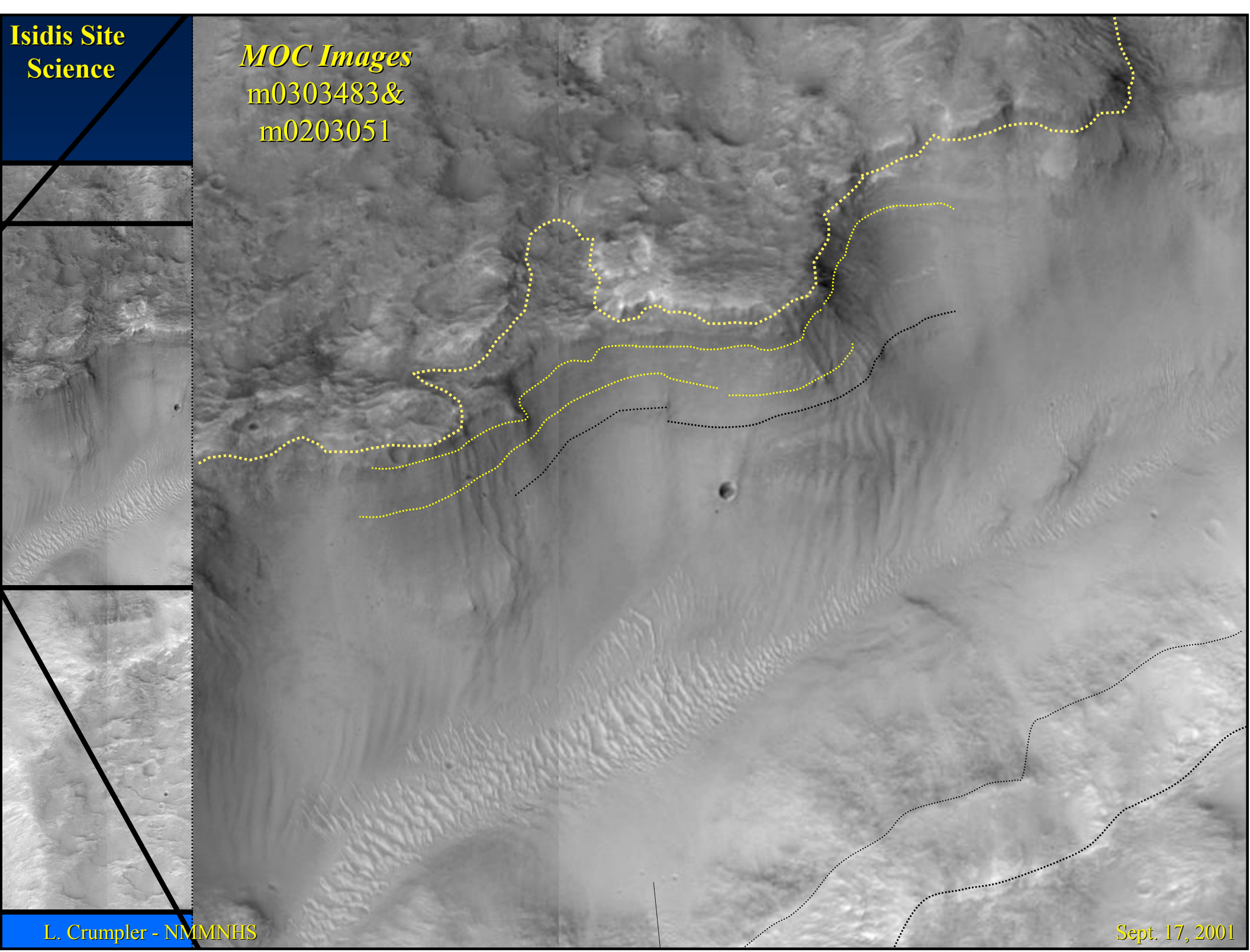




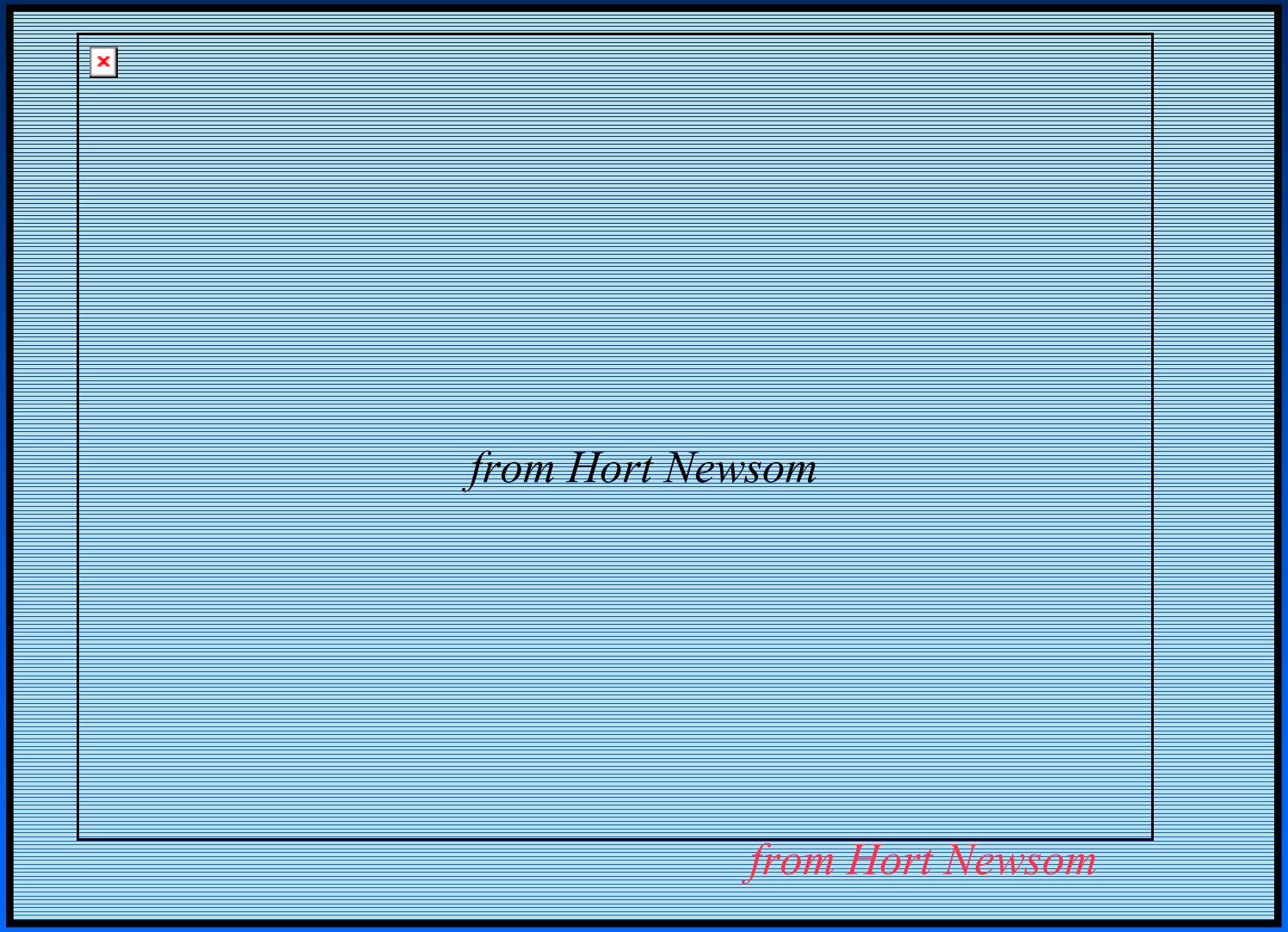
Isidis Site Science

Geologic Map Contacts on Viking EDRs

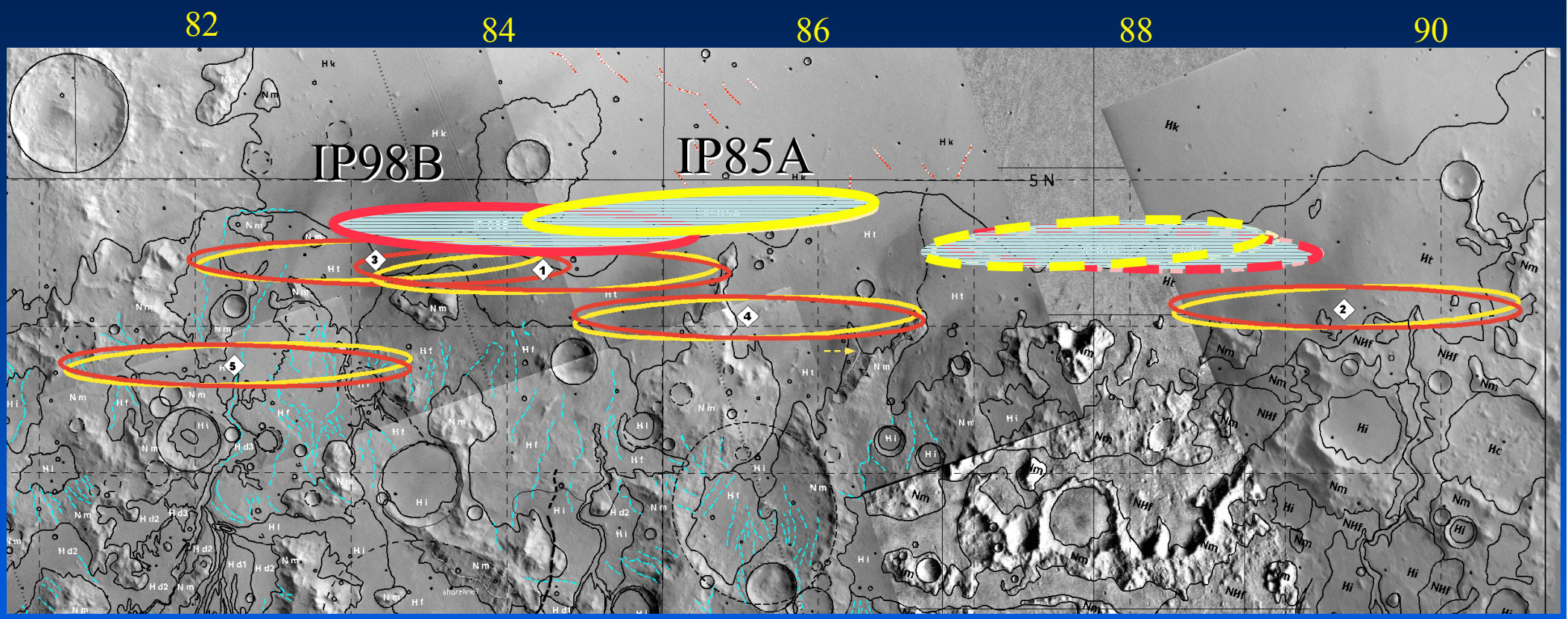



Isidis Site
Science
MOC Images
m0303483&
m0203051
L. Crumpler - NMMNHS
Sept. 17, 2001

Craters as Thermal Sources



Five Proposed Target Ellipses - Image Context

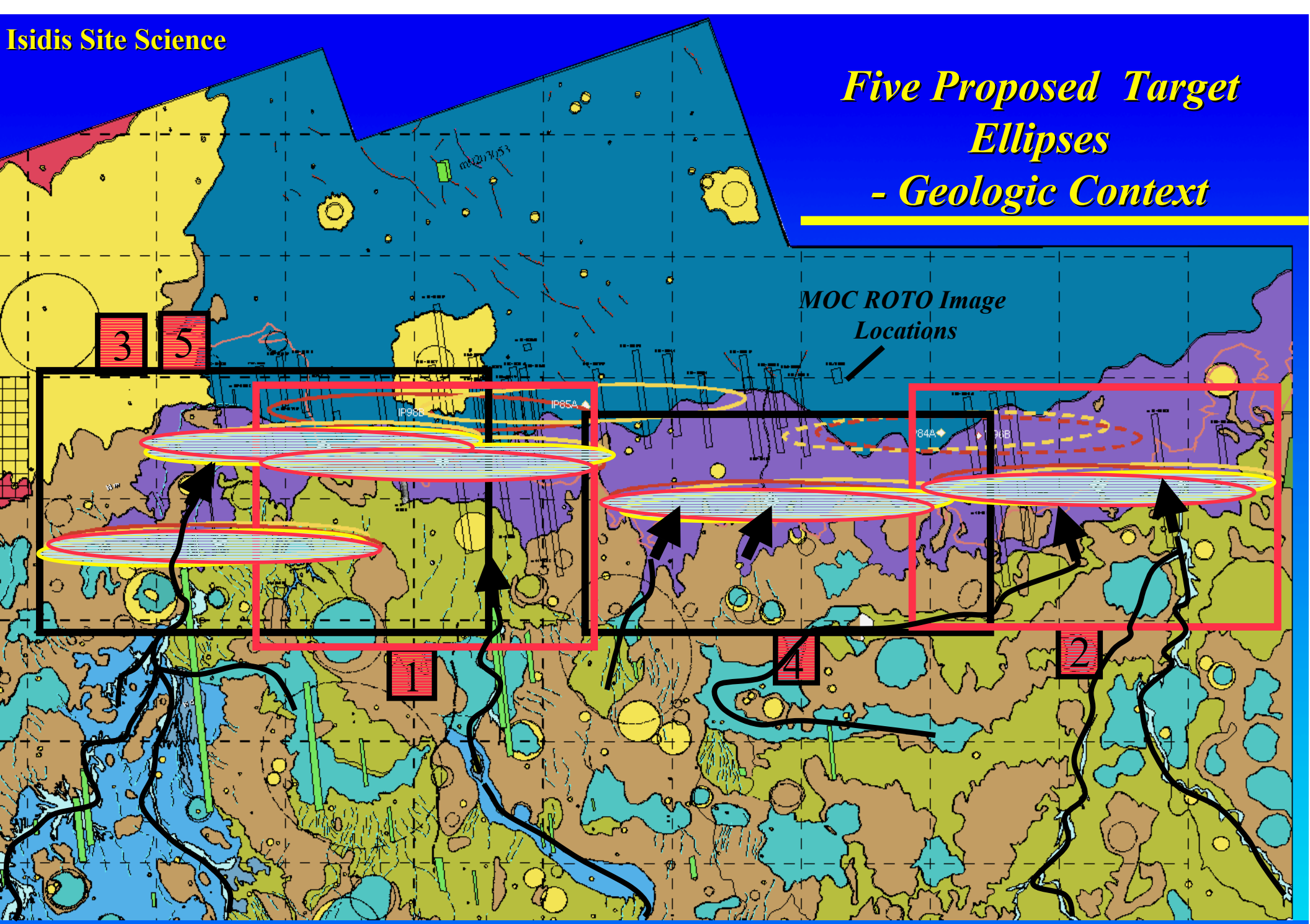


Rover	Site No.	Current
MER A	IP85A	4.62/85.21
MER B	IP98B	4.55/84.01

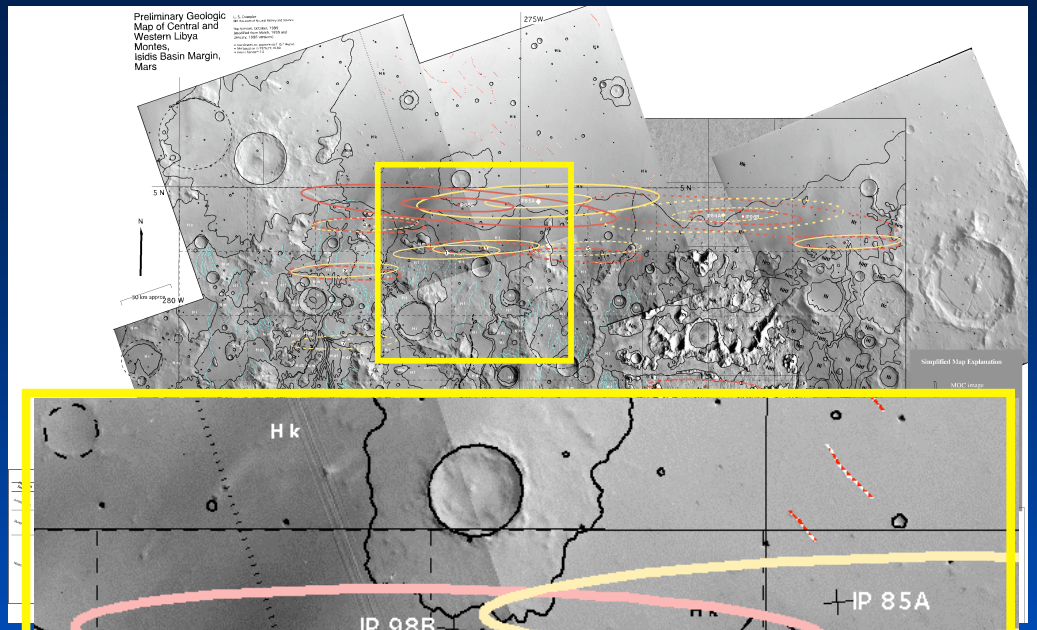
Proposed	
1	4.3/84.3
2	4.1/89.6
3	4.4/83.2
4	4.0/85.6
5	3.7/82.3

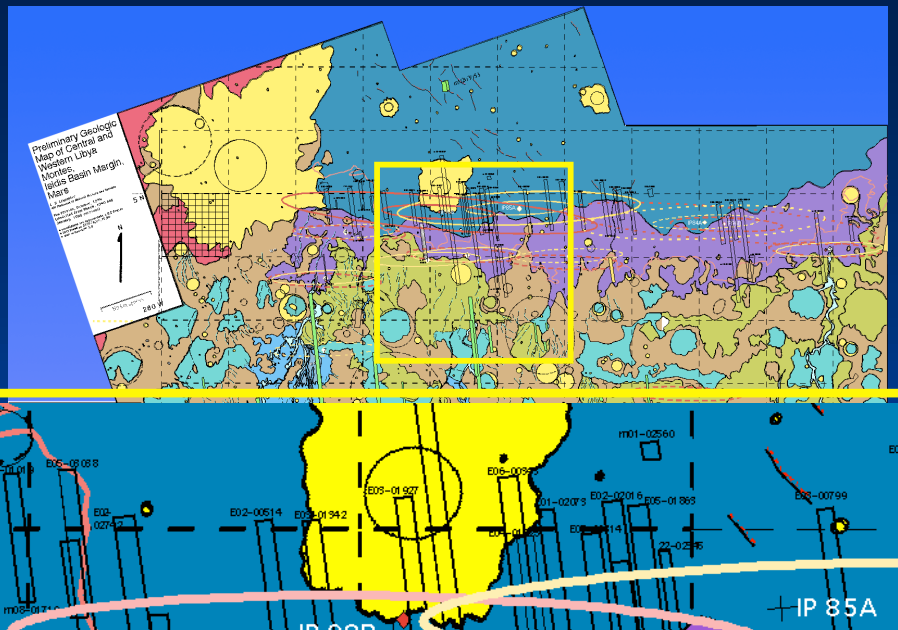
Isidis Sites

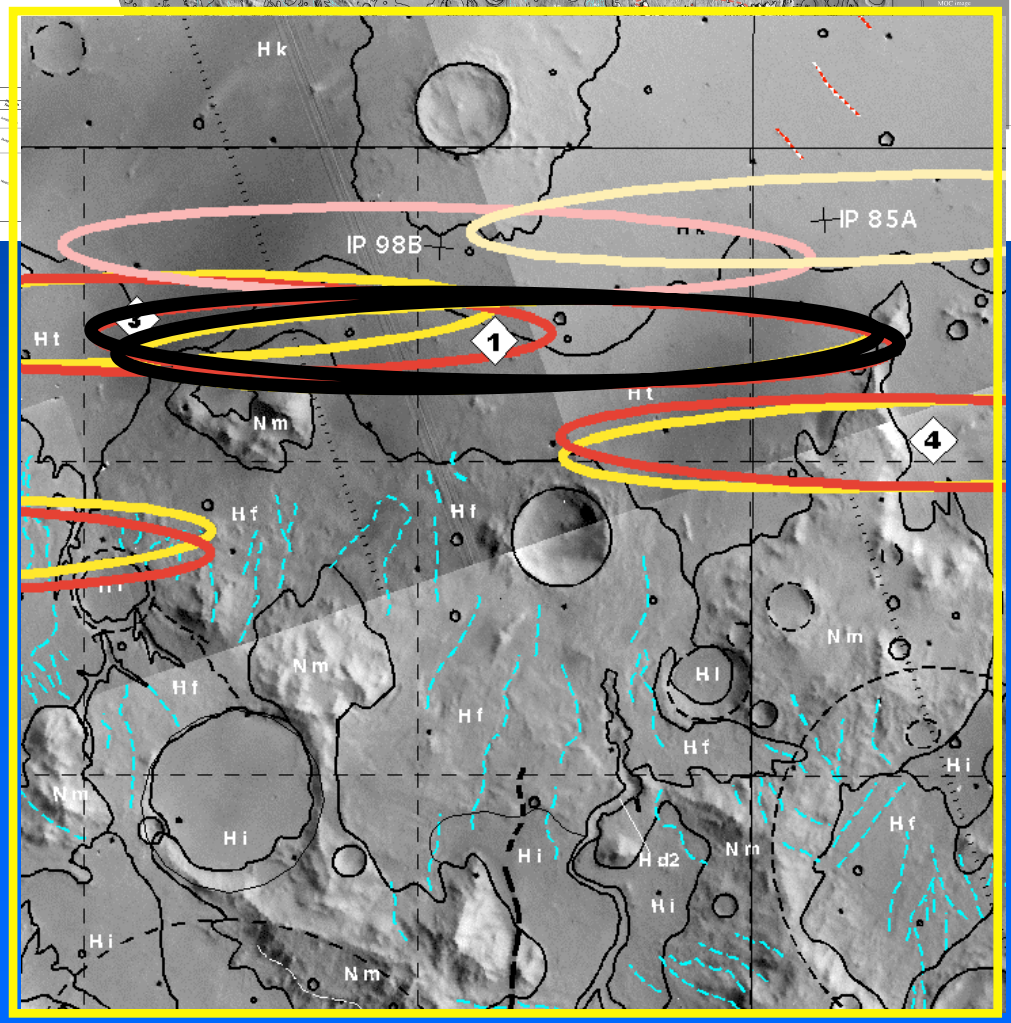
Five Proposed Target Ellipses - Geologic Context

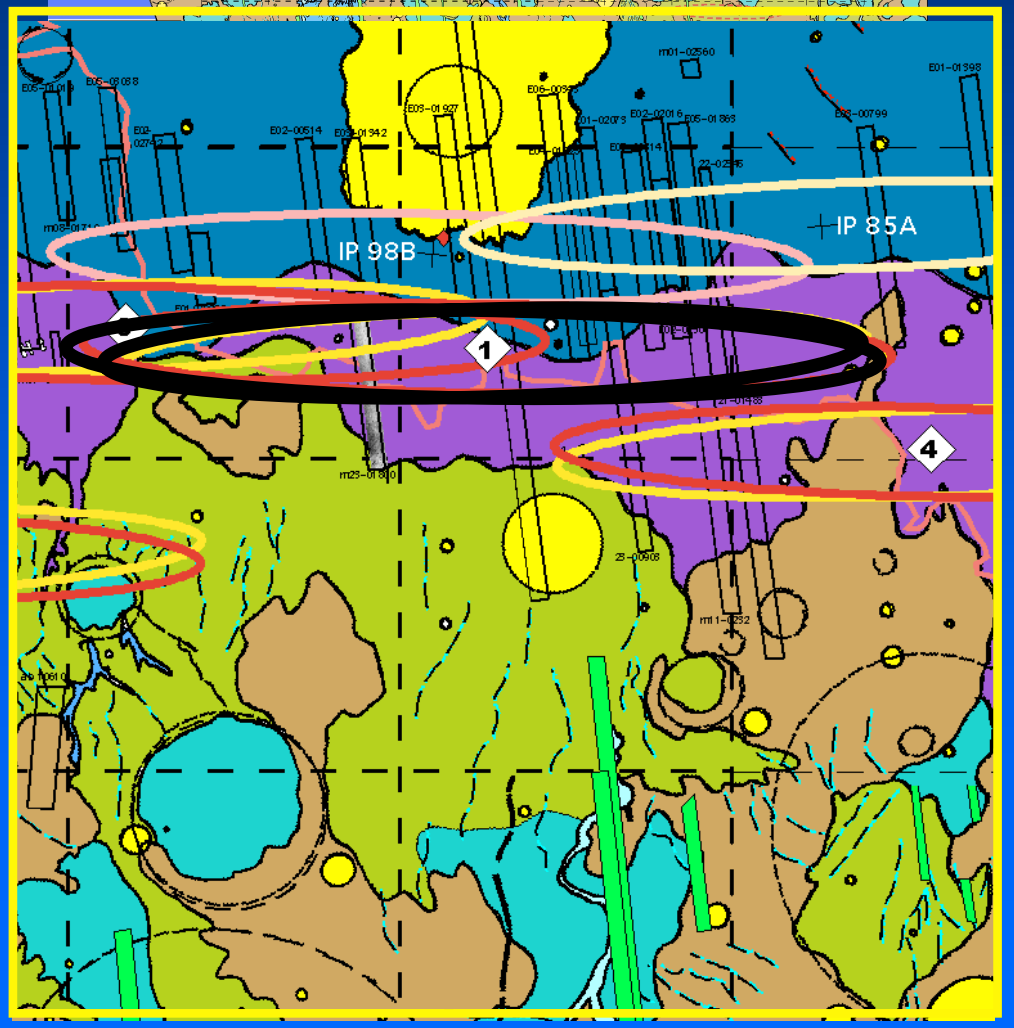


Proposed Target Ellipses - Site 1: 4.3N / 84.3E



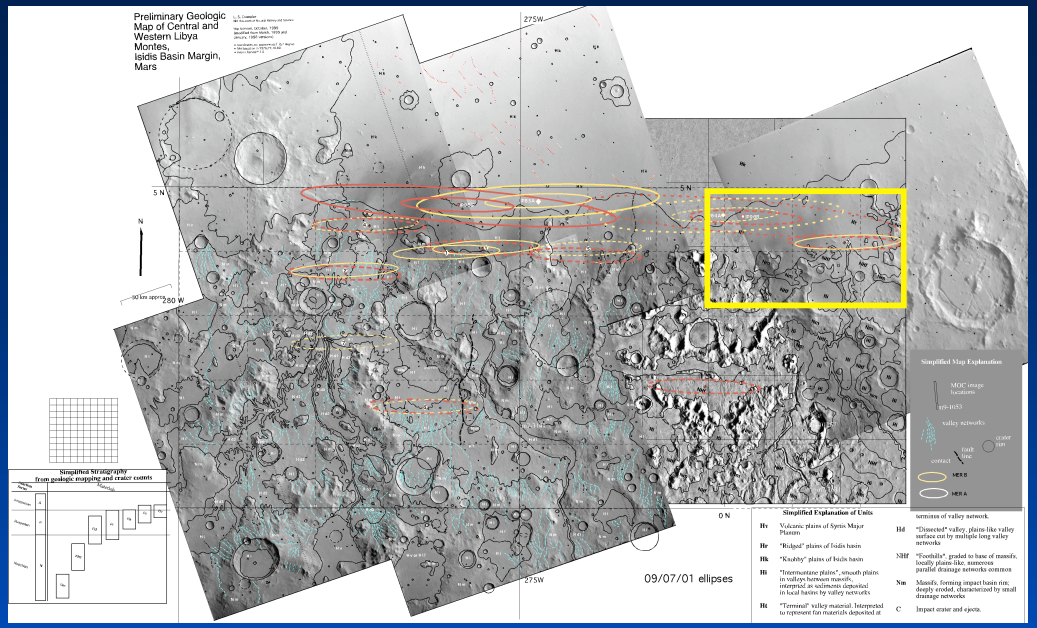


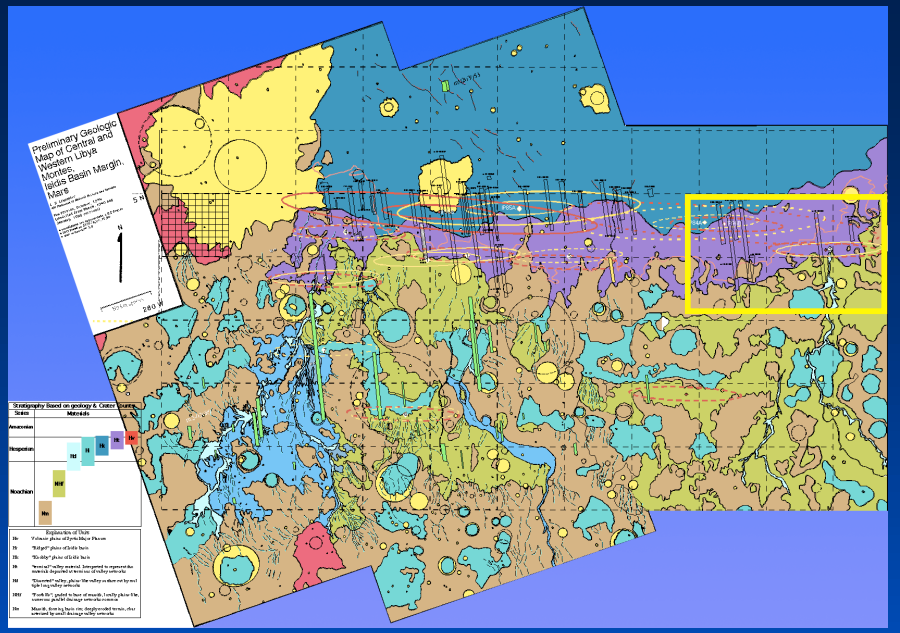


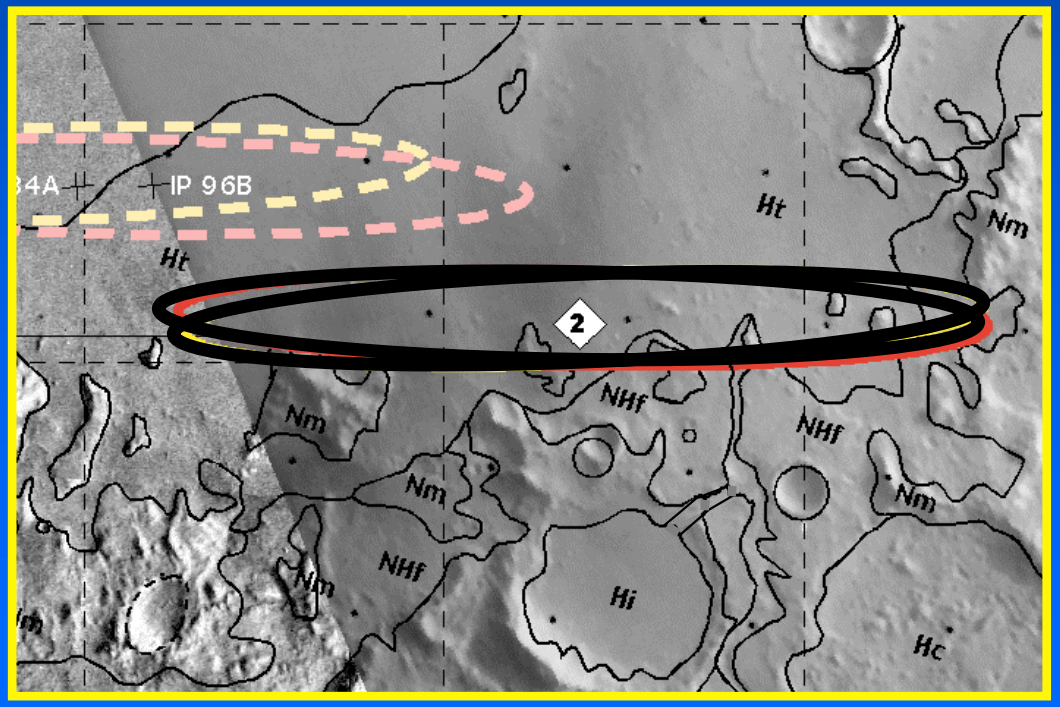


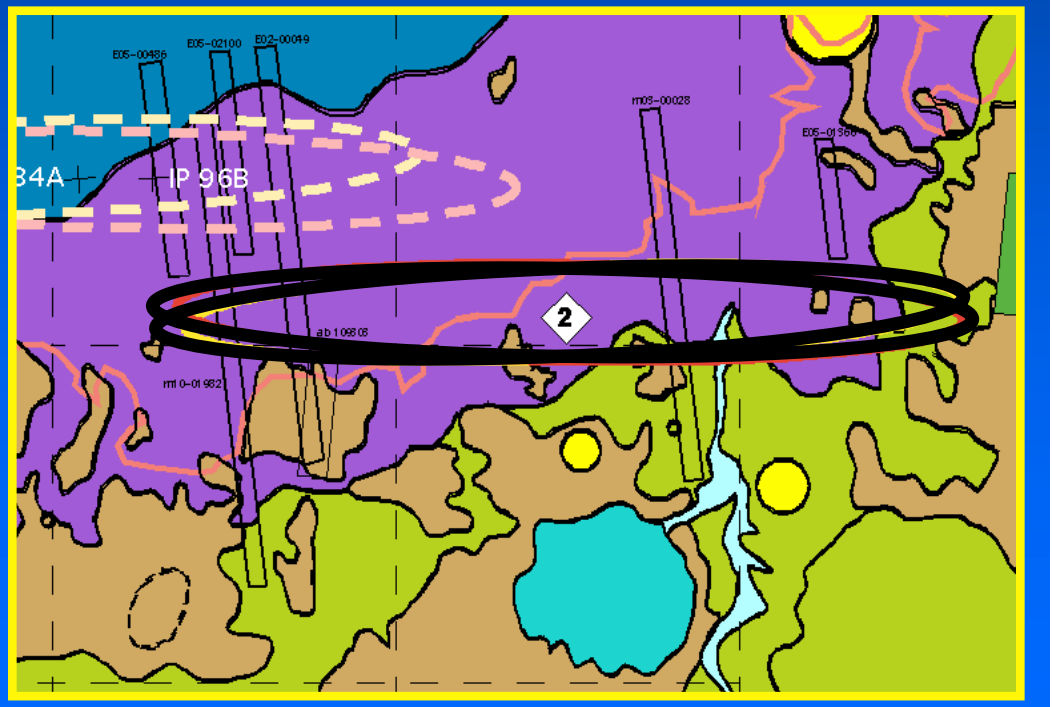
Isidis Site Science

Proposed Target Ellipse - Site 2: 4.1N / 89.6E

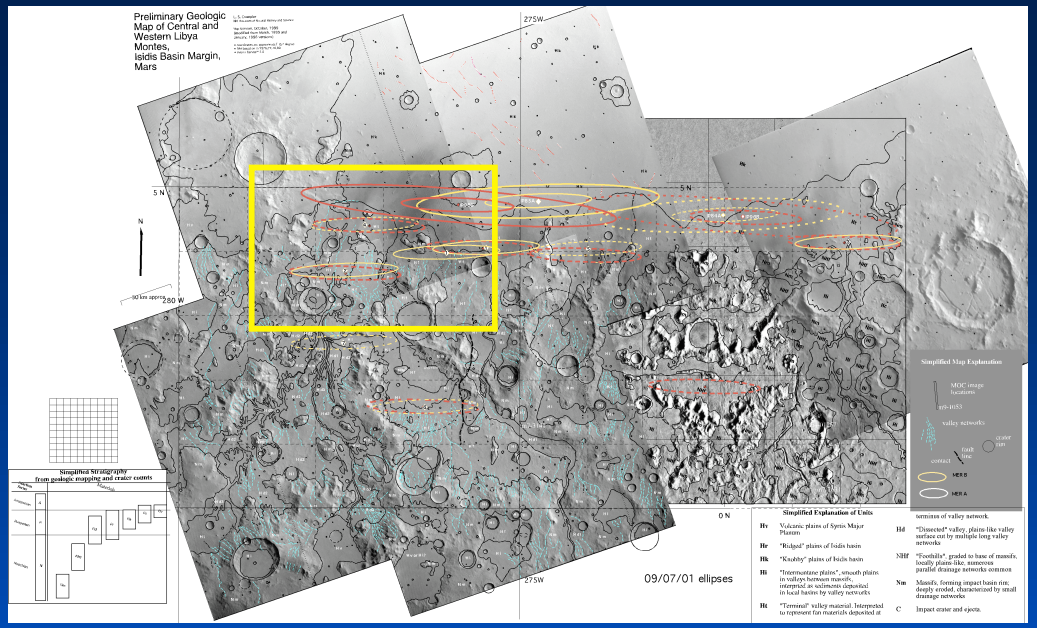


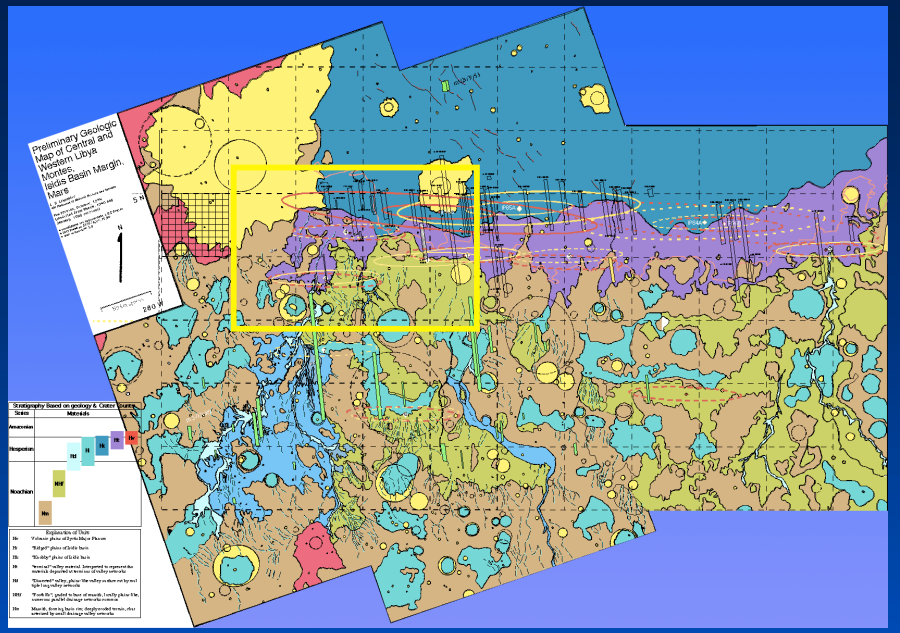


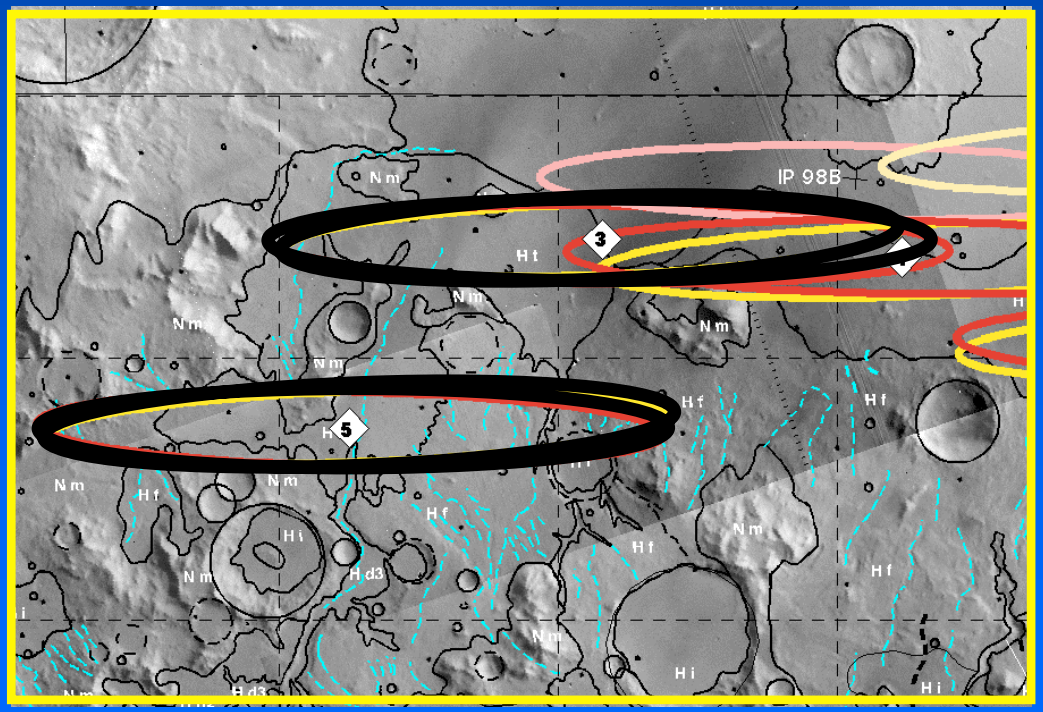


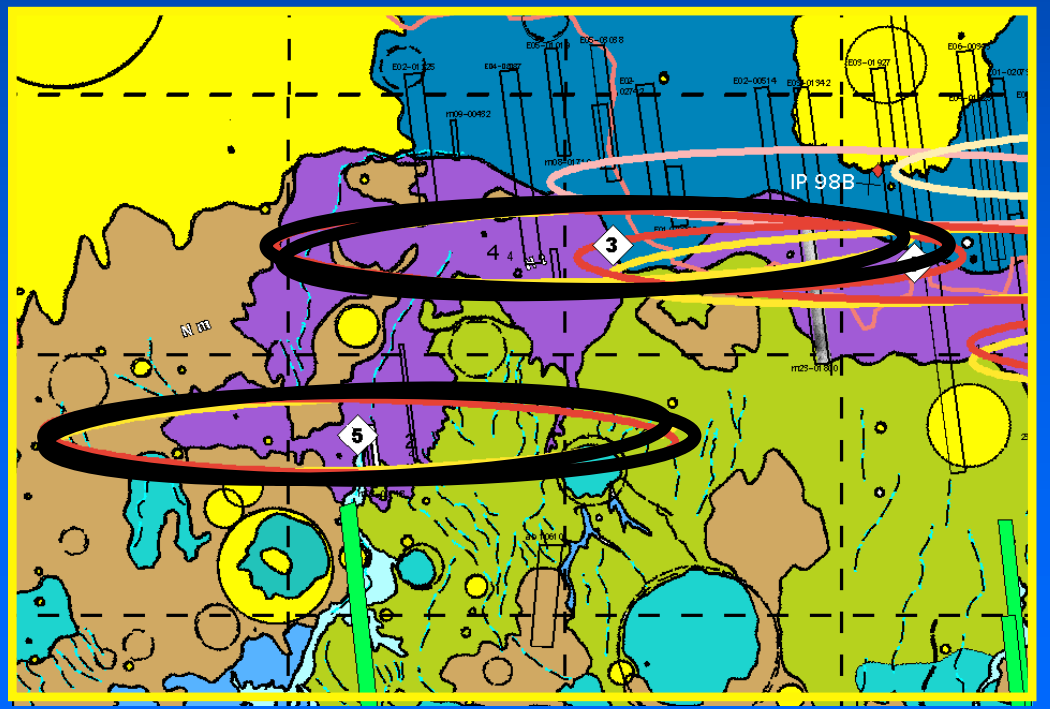


Proposed Target Ellipses -Site 3 & 5:4.4N / 83.2E & 3.7N / 82.3E

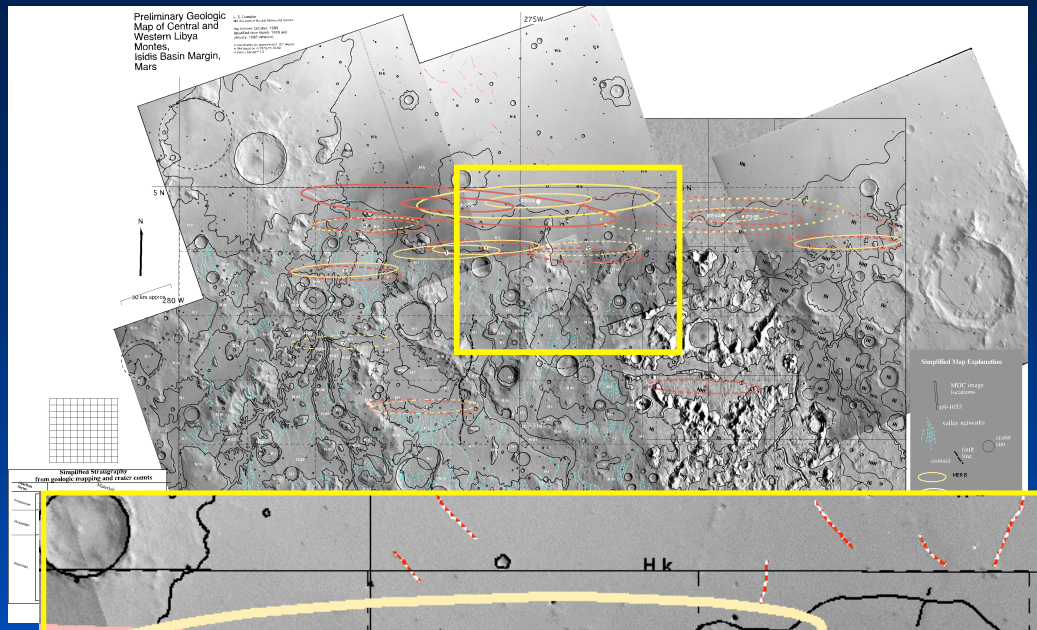


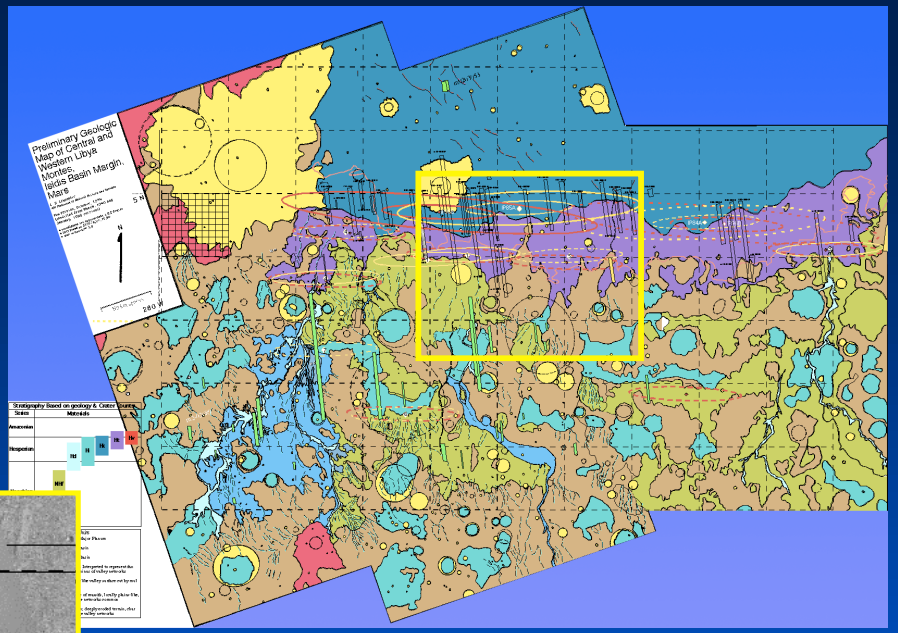


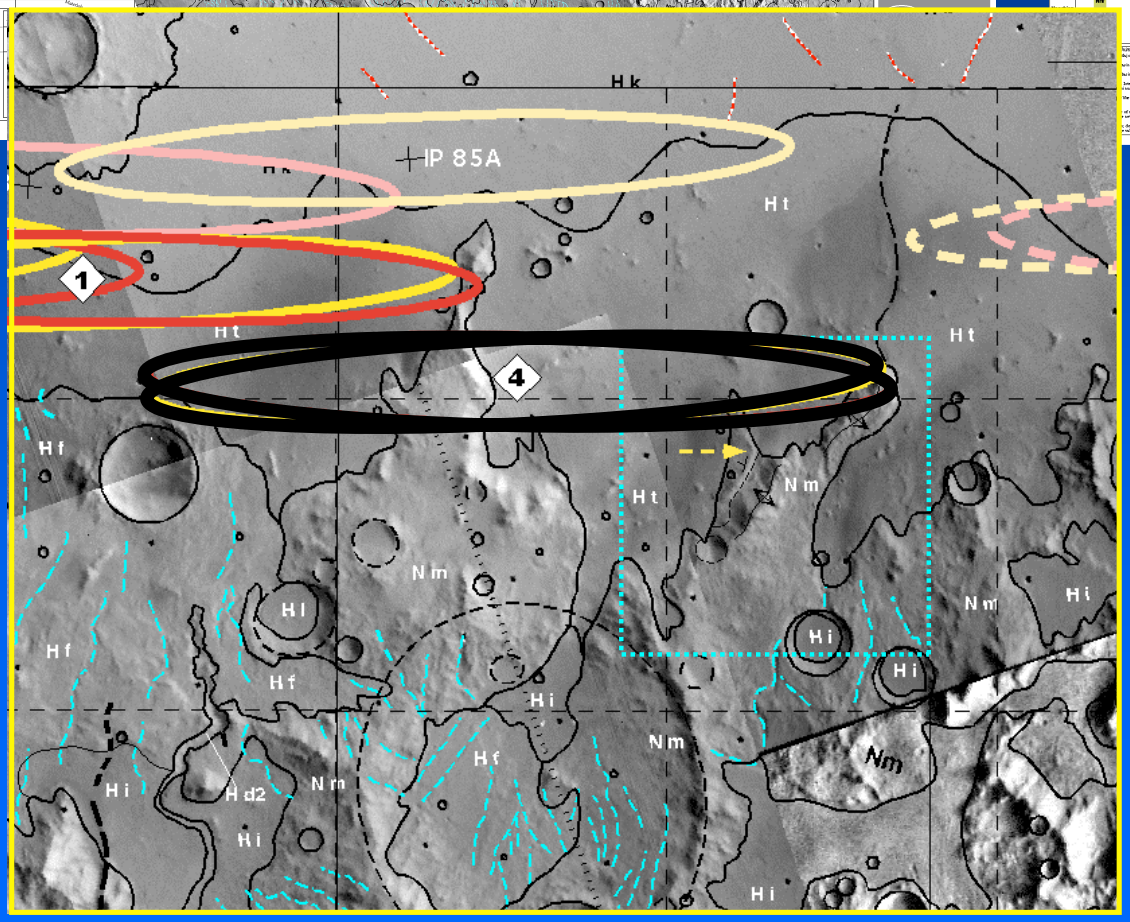


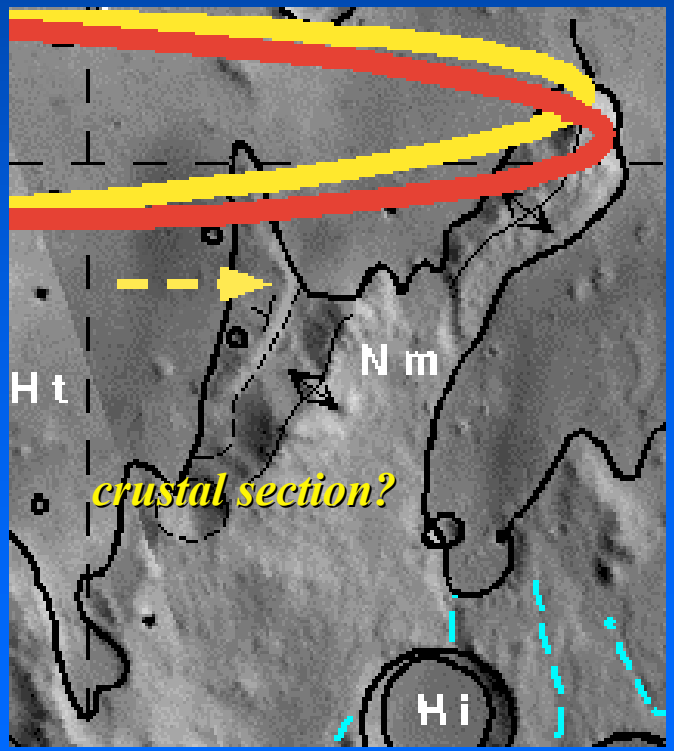


Proposed Target Ellipse - Site 4: 4.0N / 85.6E

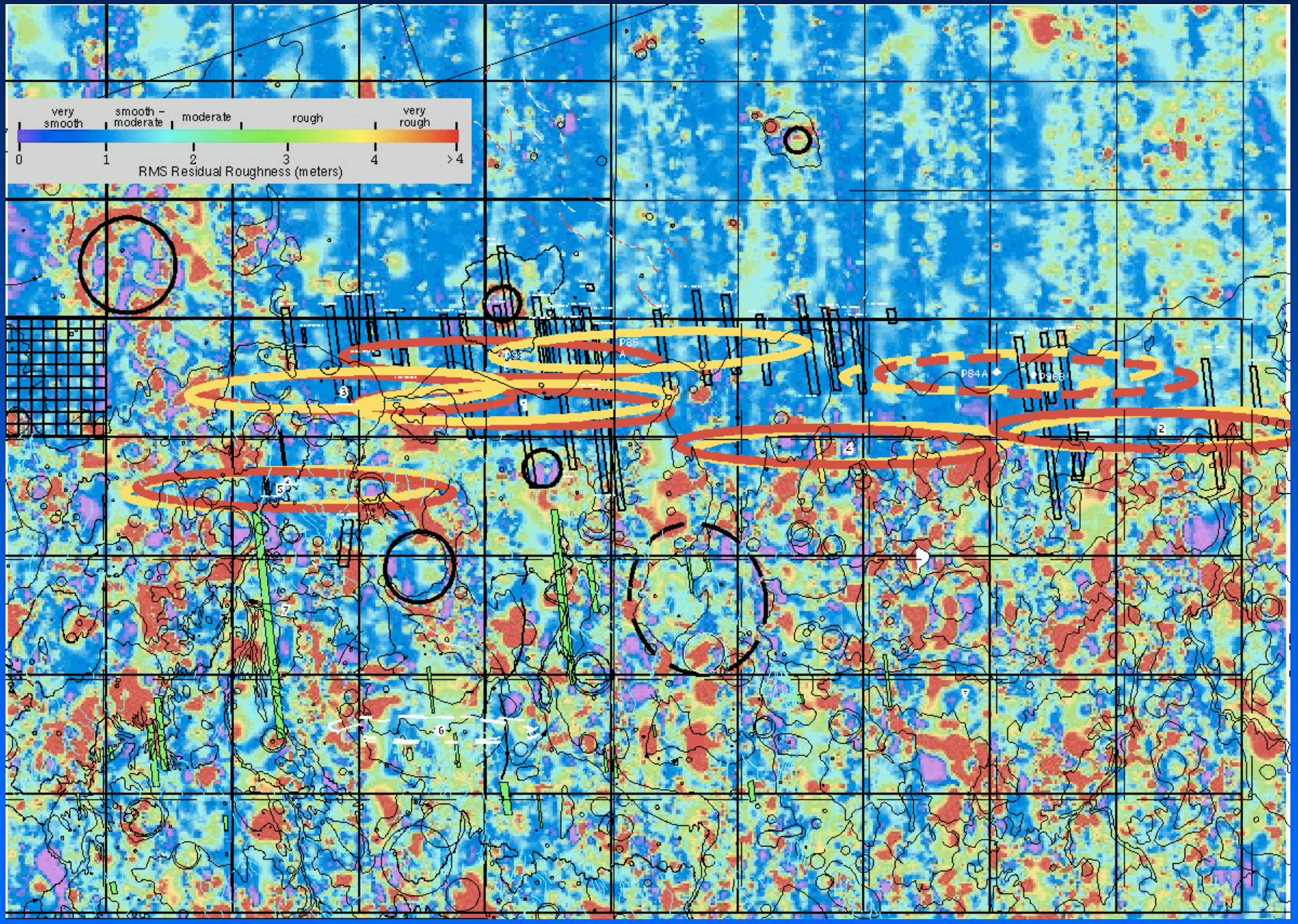




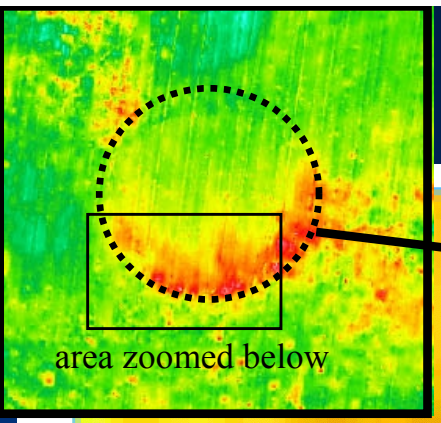




MOLA vertical roughness

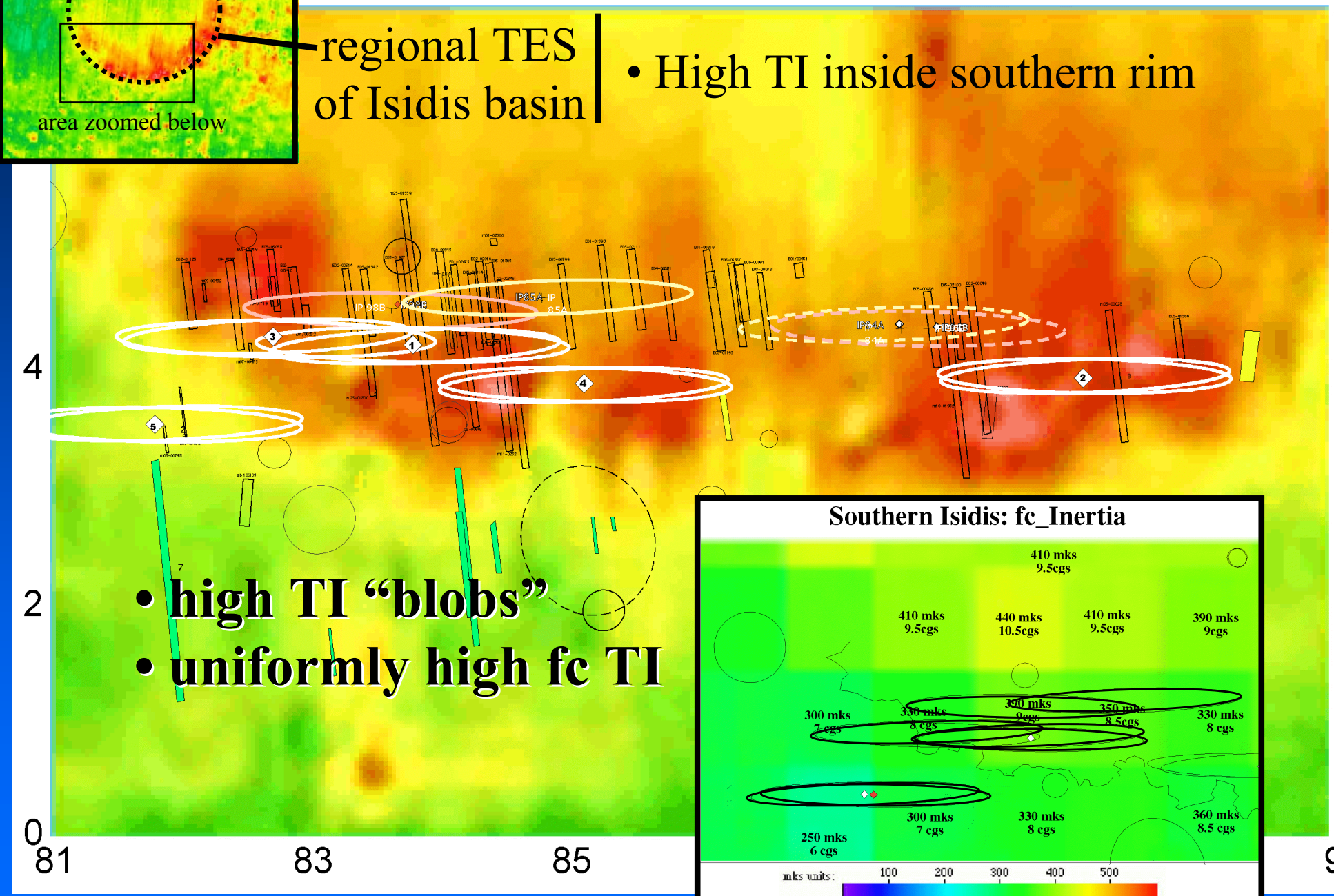


TES Thermal Inertia



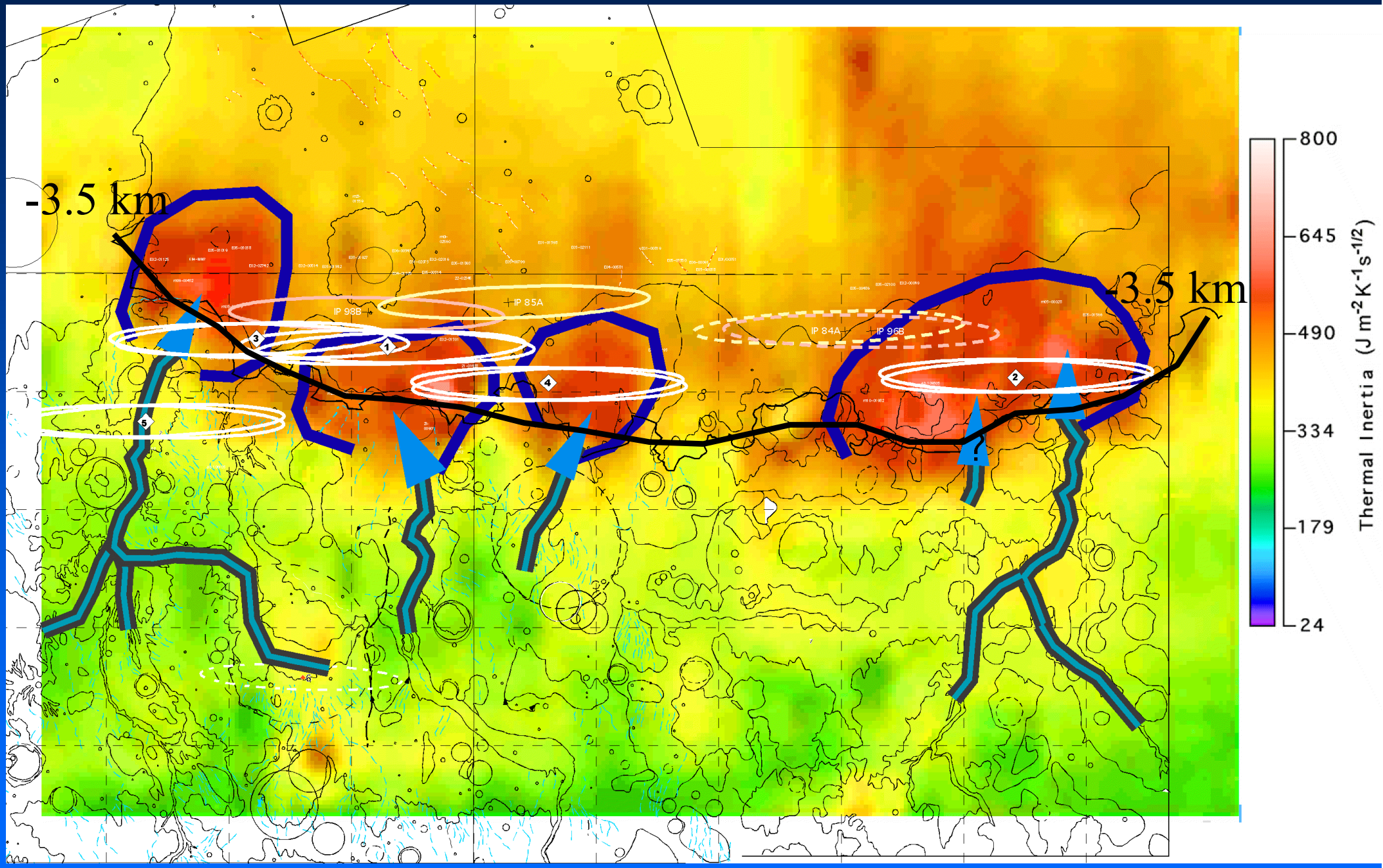
regional TES of Isidis basin

- High TI inside southern rim

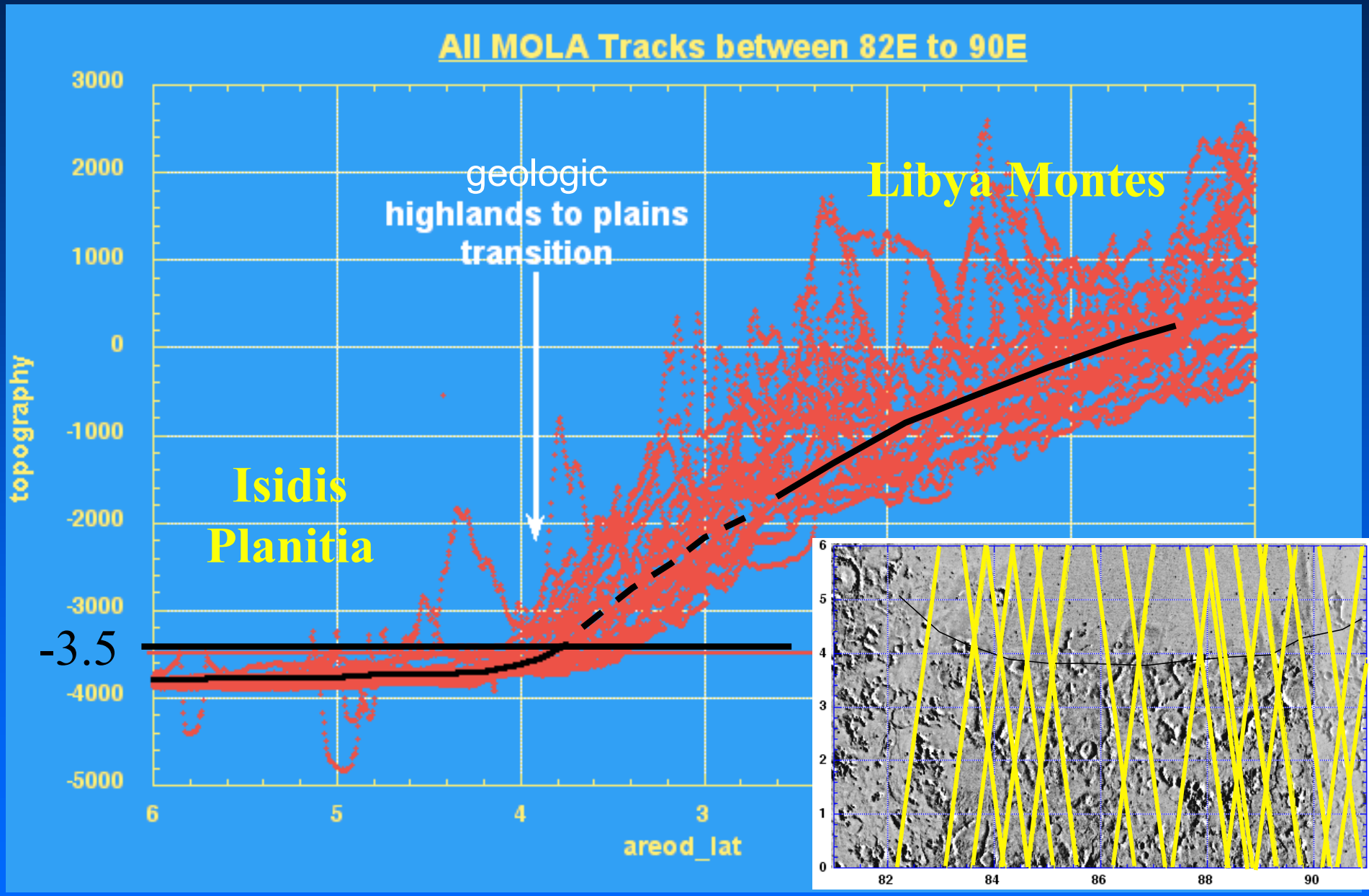


- **high TI "blobs"**
- **uniformly high fc TI**

Geolines on TES Thermal Inertia



MOLA Data Tracks Across Isidis-Libya Transition

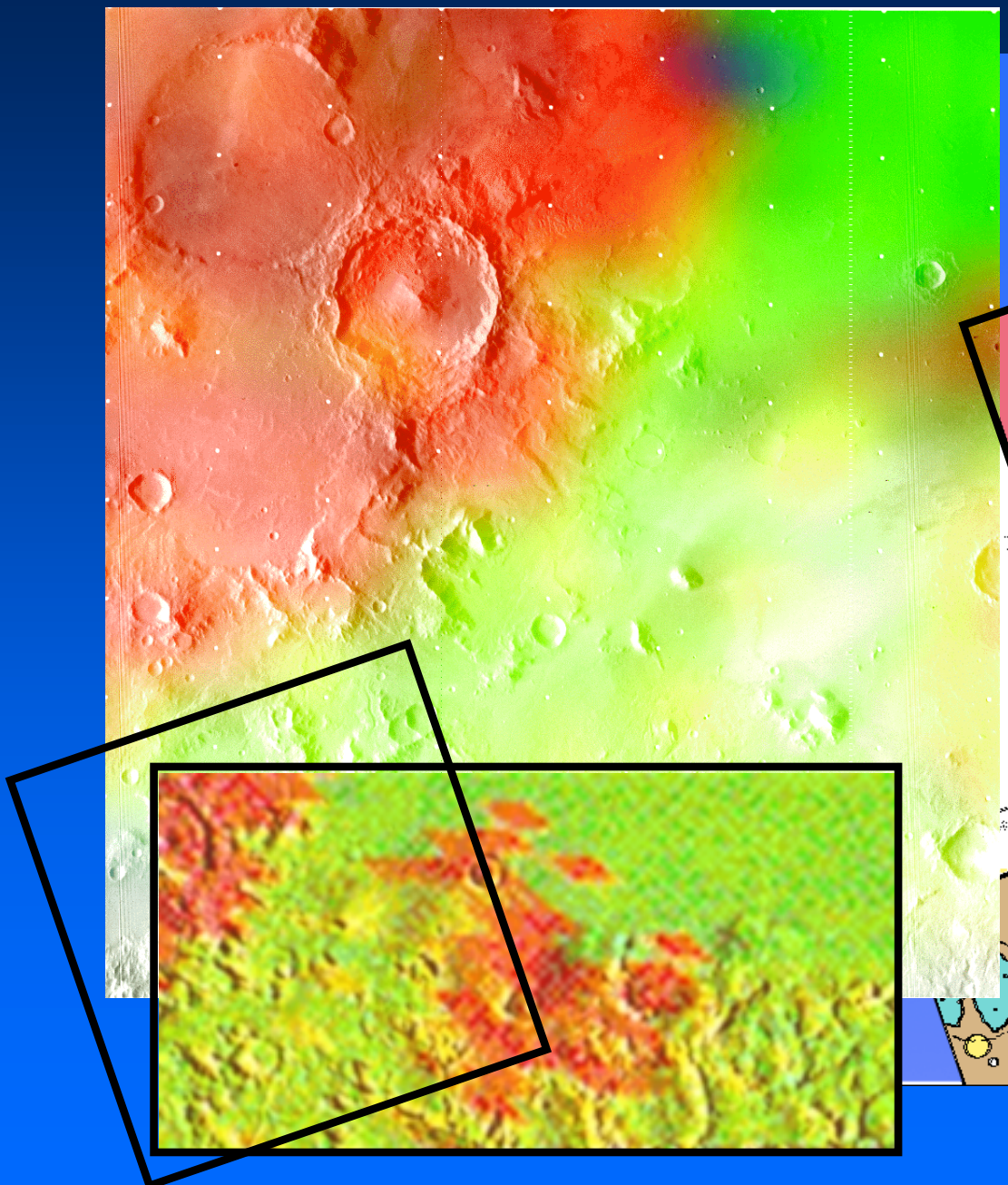


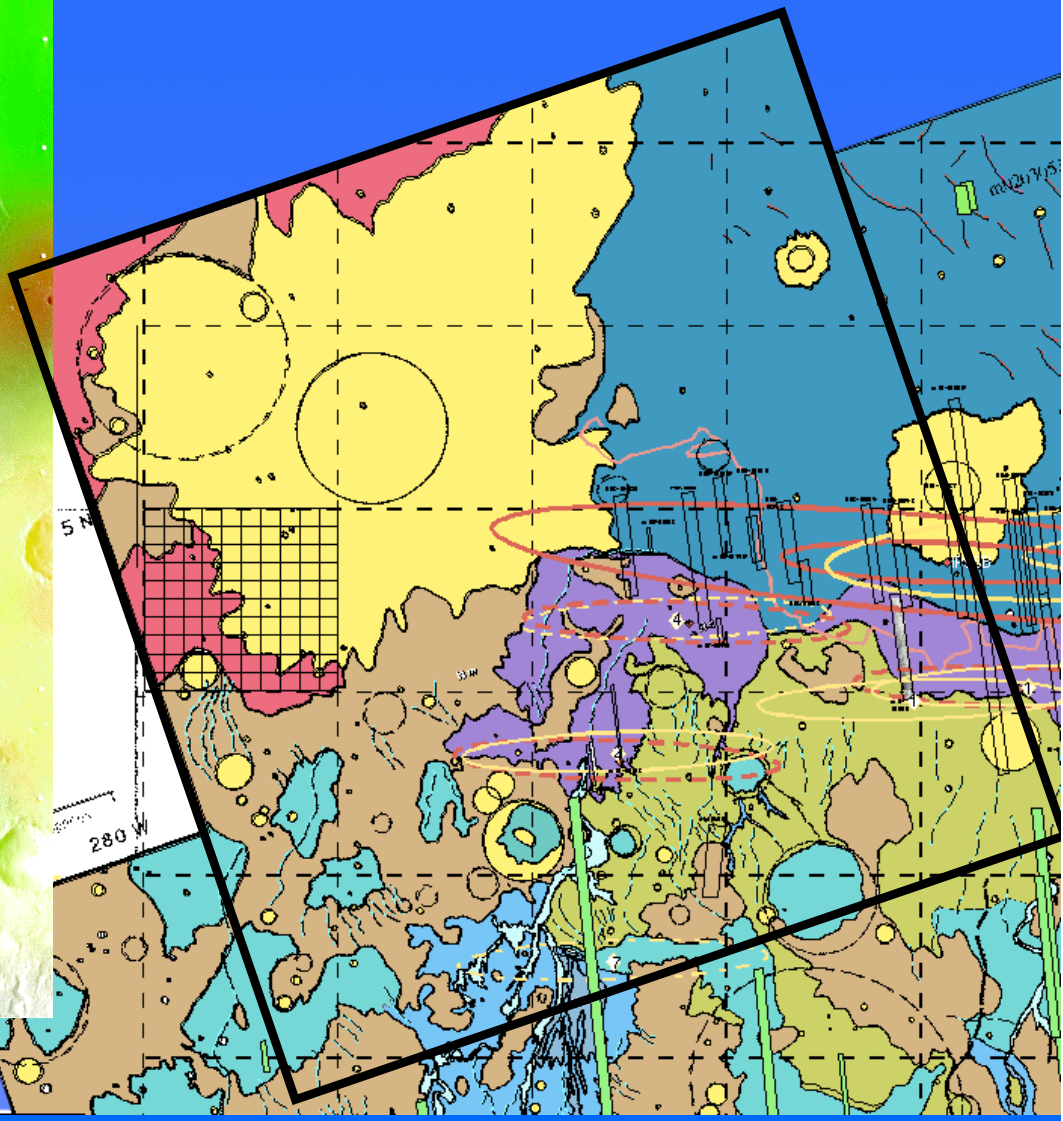
Spectral Minimum, Phobos:

Mustard et al., 1993

Isidis Site Science

Geologic Map





Target Surface Properties for Isidis Sites

Site No. [rank]	LAT LONG	IRTM Bulk TI	IRTM Fc TI	TES TI	IRTM Rock Abund	MOLA Vert rough
MER A	**133 km x 16 km / 82 degrees (window opening)**					
1	4.3 275.7	460 - 490 mks 11.0 - 11.5 cgs	330 - 390 mks 8.0 - 9.0 cgs	400 - 500 mks	12 - 16 %	0 - 2 m
2	4.1 270.4			550 - 600 mks	15 -17 %	1 - 2 m
3	4.4 276.8	400-460 mks 9.5-11.0cgs	300-39 0 mks 7.0 - 8.0 cgs	400 - 500 mks	15 - 19 %	0 - 1 m
4	4.0 274.4	490 mks 11.5 0 cgs	330 - 360 mks 8.0 - 8.5 cgs	400 - 640 mks	14 - 24 %	1 - 2 m
5	3.7 277.7	350 - 400 mks 7.5 - 9,5 cgs	250 - 300 mks 6.0 - 7.0 cgs	350 - 400 mks	15 - 17 %	1 - 2 m
MER B	**136 km x 16 km / 91 degrees (window opening)**					
1	4.3 275.7	460 - 490 mks 11.0 - 11.5 cgs	330 - 390 mks 8.0 - 9.0 cgs	400 - 500 mks	12 - 16 %	0 - 2 m
2	4.1 270.4			550 - 600 mks	15 -17 %	1 - 2 m
3	4.4 276.8	400-460 mks 9.5-11.0 cgs	300-39 0 mks 7.0 - 8.0 cgs	400 - 500 mks	15 - 19 %	0 - 1 m
4	4.0 274.4	490 mks 11.5 0 cgs	330 - 360 mks 8.0 - 8.5 cgs	400 - 640 mks	14 - 24 %	1 - 2 m
5	3.7 277.7	350 - 400 mks 7.5 - 9,5 cgs	250 - 300 mks 6.0 - 7.0 cgs	350 - 400 mks	15 - 17 %	1 - 2 m

Summary of Isidis Surface Properties

- **High Thermal Inertia**
- **High Fine Component Thermal Inertia**
- **Moderate Albedo**
- **High Rock Abundance & Fines**
- **[High Red/Blue Ratio, (to N)]**

"…..thermal inertia, albedo, rock abundance and fine component ……"[*can be interpreted as representing a*]"….. surface [that] has little dust, but a weathered duricrust surface that is bright (red)".. [*an example would be*]".. a cemented mud flat with rocks."-*Golombek*

• Rocky Sites with Possibly Weathered Crusty Surface

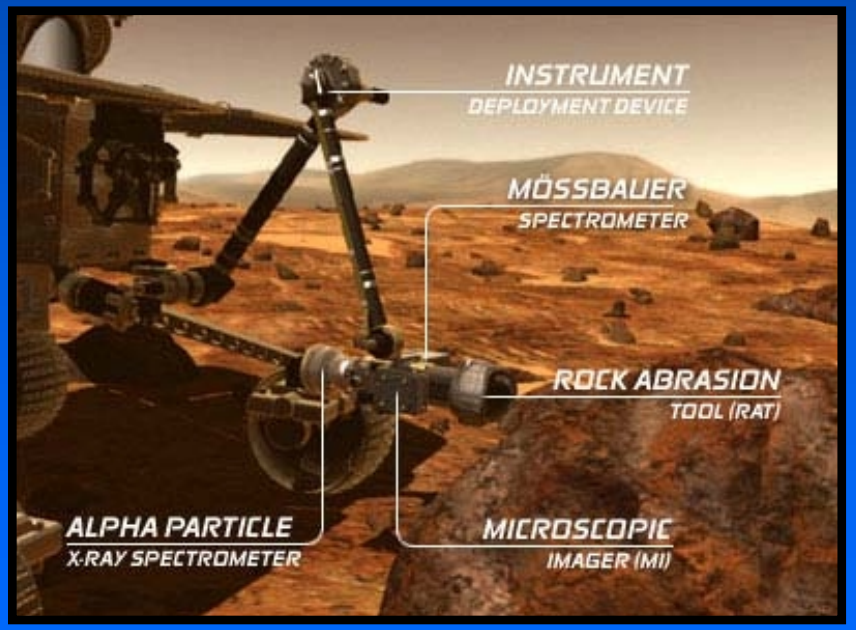
Summary of Isidis Geologic Properties

- Sediment fans
  - low energy environment (not catastrophic floods)
- Fines and rocks
  - Re-worked sediments from
    - previous deposition/paleolakes
    - highland rocks and fines
    - deep substrate mafic rocks
- weathered highland materials
- relatively unweathered mafic materials
- multiple "targets of opportunity" throughout all Isidis sites insuring high science value for any mission.

- "…..long-lived fluvial system representing multiple wetting and drying episodes carrying sediments from early paleolakes, highland massifs, and local volcanic rocks."

• semi-mature fluvial system from early martian geologic history through late Hesperian

Athena Science Potential at Isidis



PANCAM

MINI-TES

MÖSSBAUER
- diverse ferric/ferrous
- diverse weathering

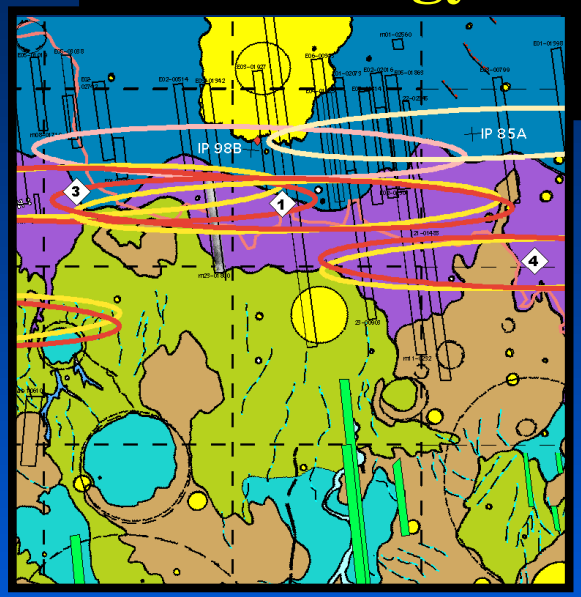
RAT
- abundant rocks
- Noachian weathering

APXS
- rocks
- sample diversity
- sediments?

Microscopic imager

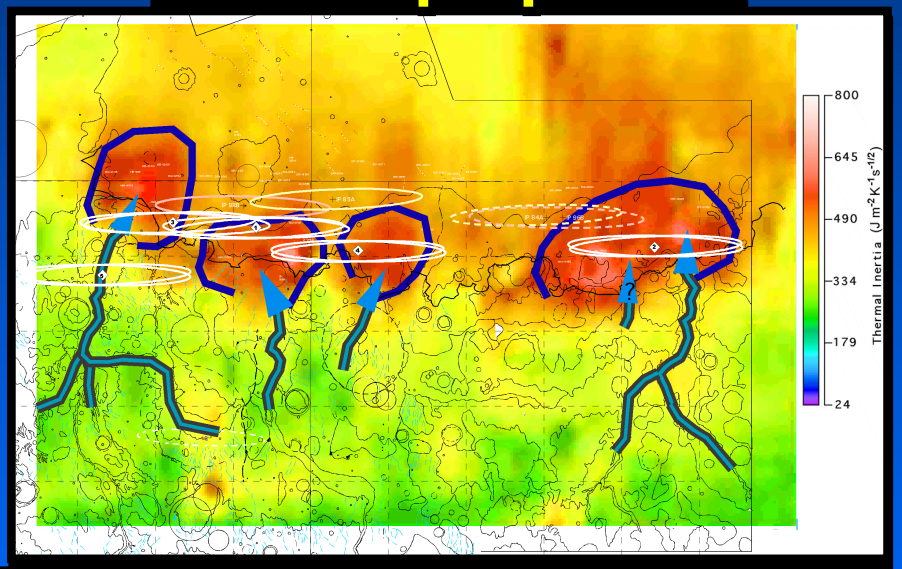
Summary of Isidis Target Sites

Site Geology



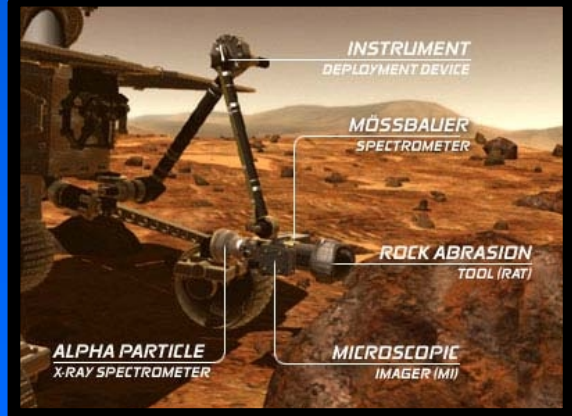
•*sediment fans of paleolake & valley network provenance*

Surface properties



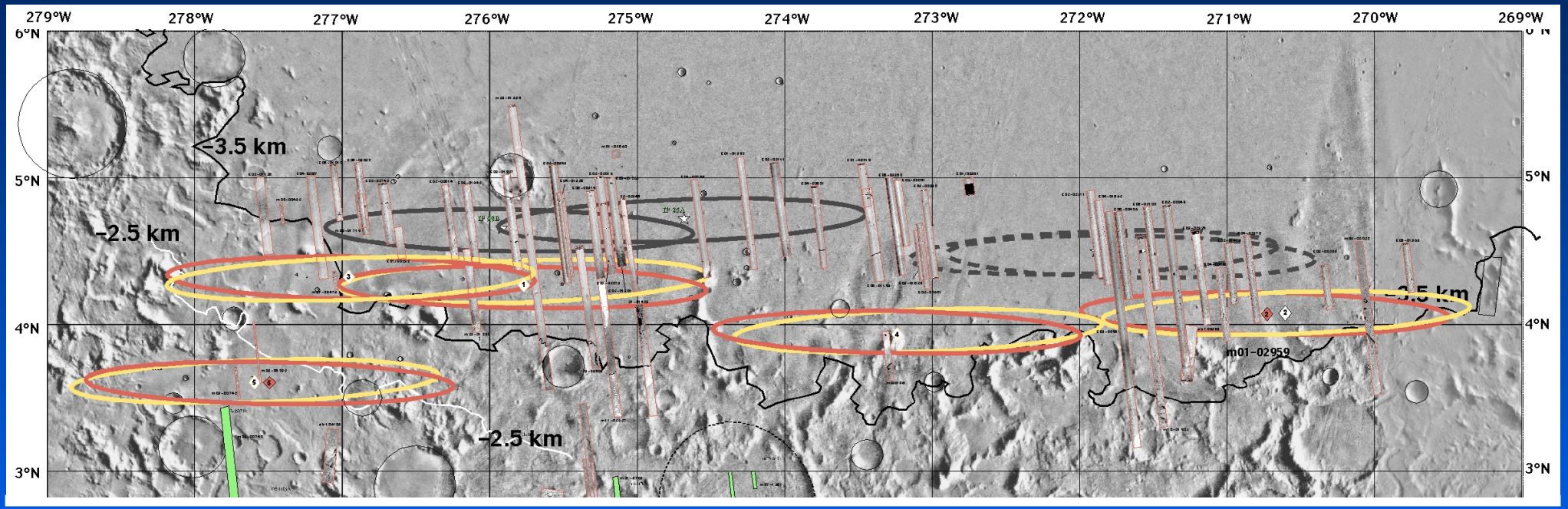
• *rocky sites with weathered crusty surface*

Mission Science



• *diverse mineralogy including likely water-altered (weathered) materials*

MOC ROTO Images for Isidis



- **zoomable CANVAS™ file with all MOC images of Isidis sites at full resolution [available 350 Mb file]**