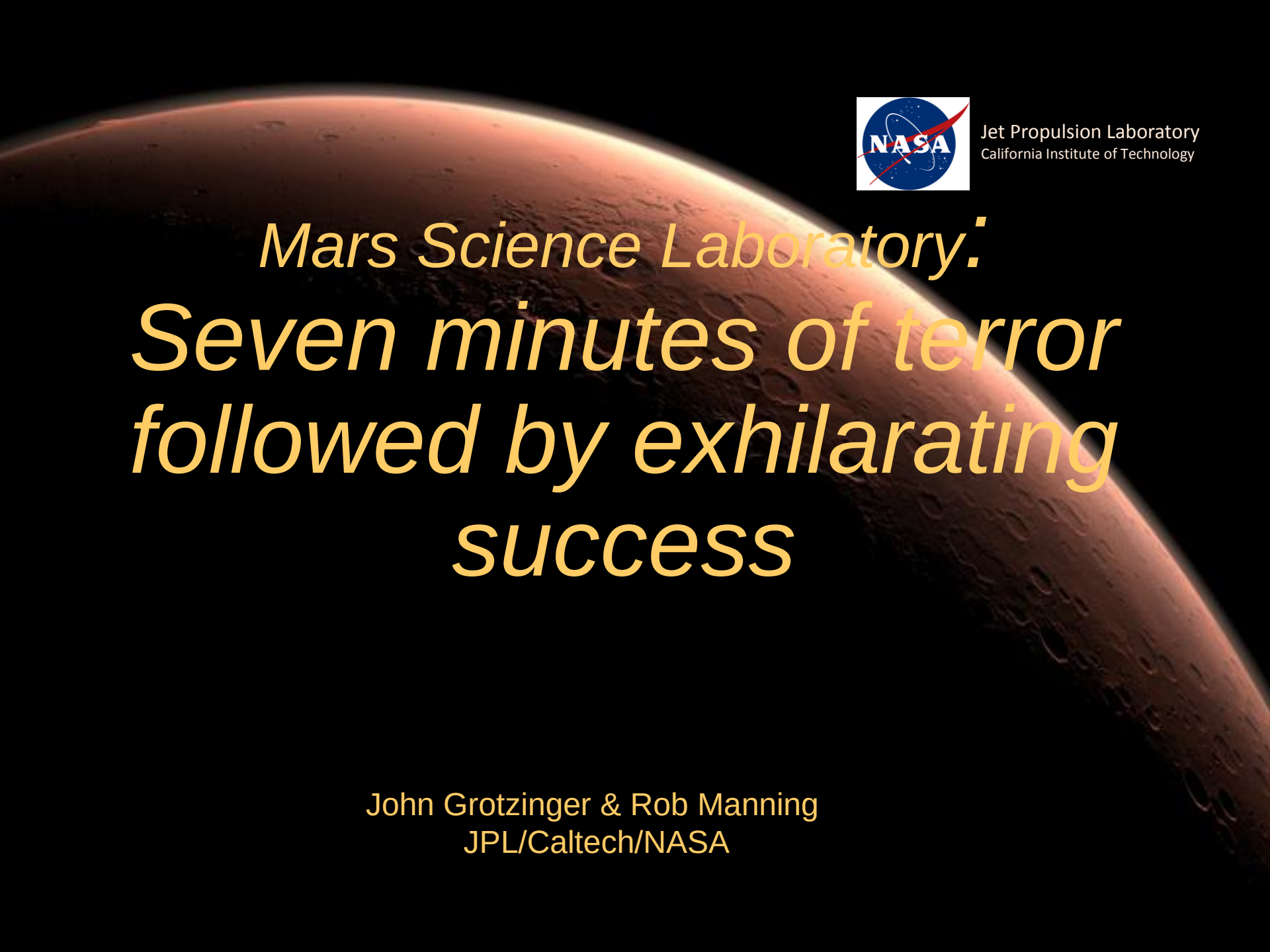


Jet Propulsion Laboratory
California Institute of Technology

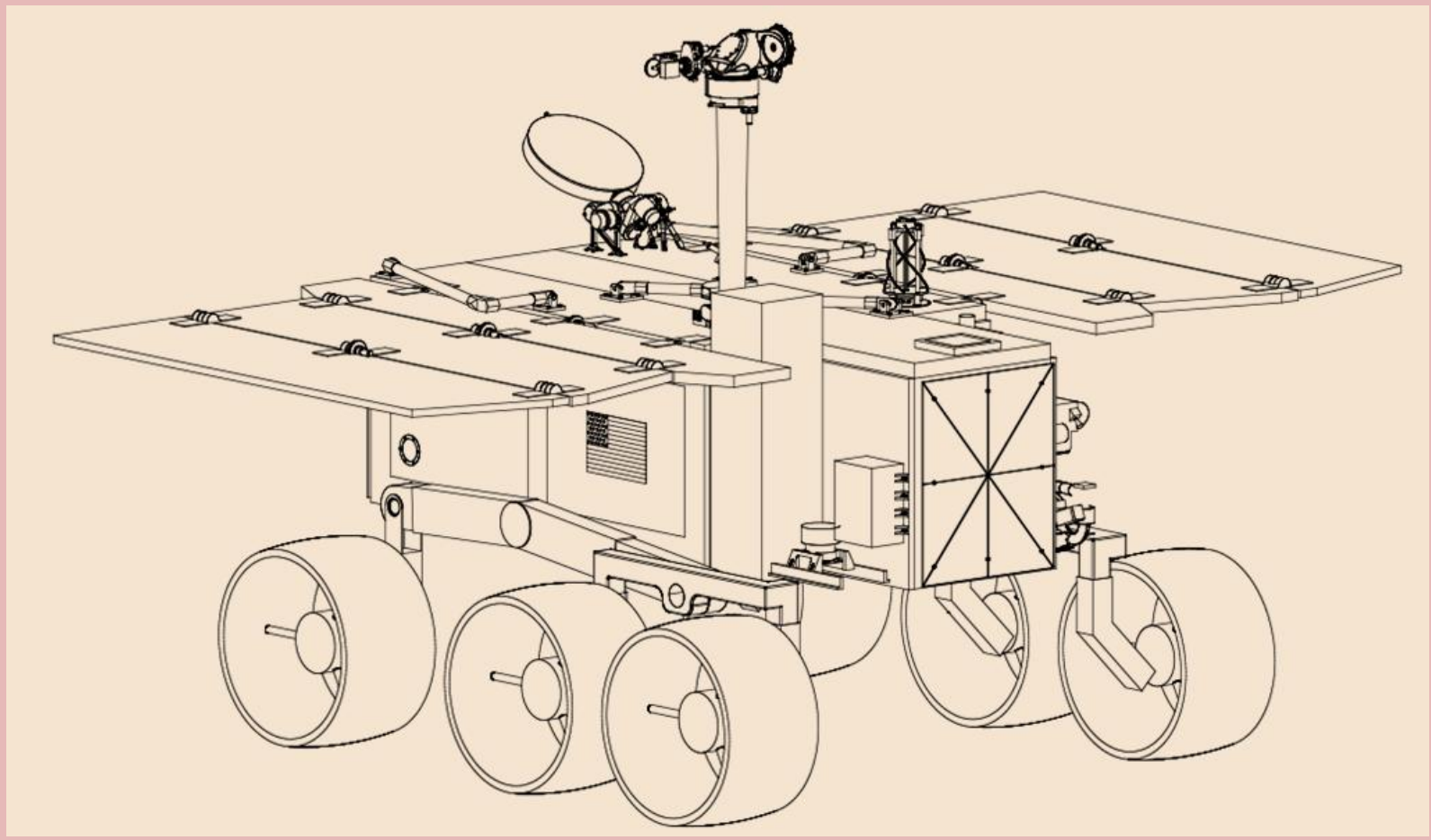
Mars Science Laboratory:
Seven minutes of terror followed by exhilarating success

John Grotzinger & Rob Manning
JPL/Caltech/NASA

“Dare Mighty Things”
Video

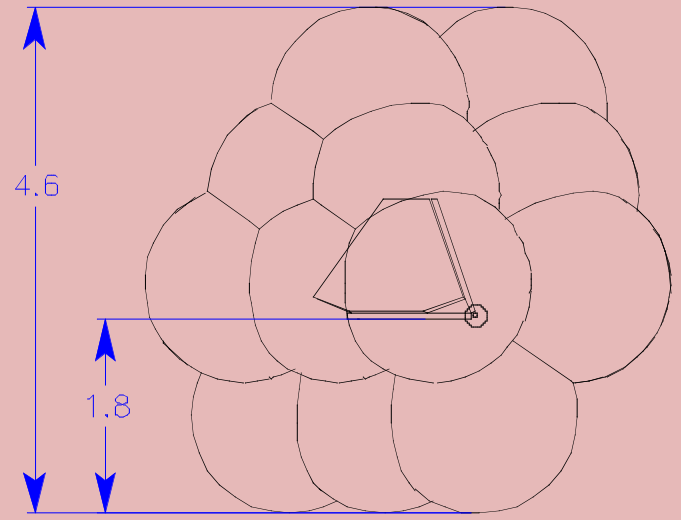
Feb 2000: A vision of a "mega rover"

Something to carry is-situ laboratories or even a sample return rocket

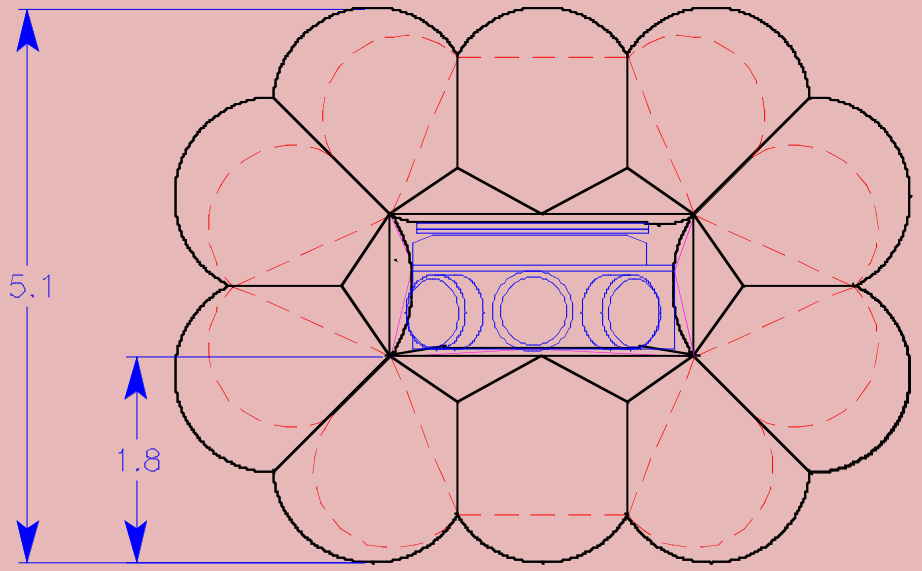


But how do you get it there?

Huge airbags?

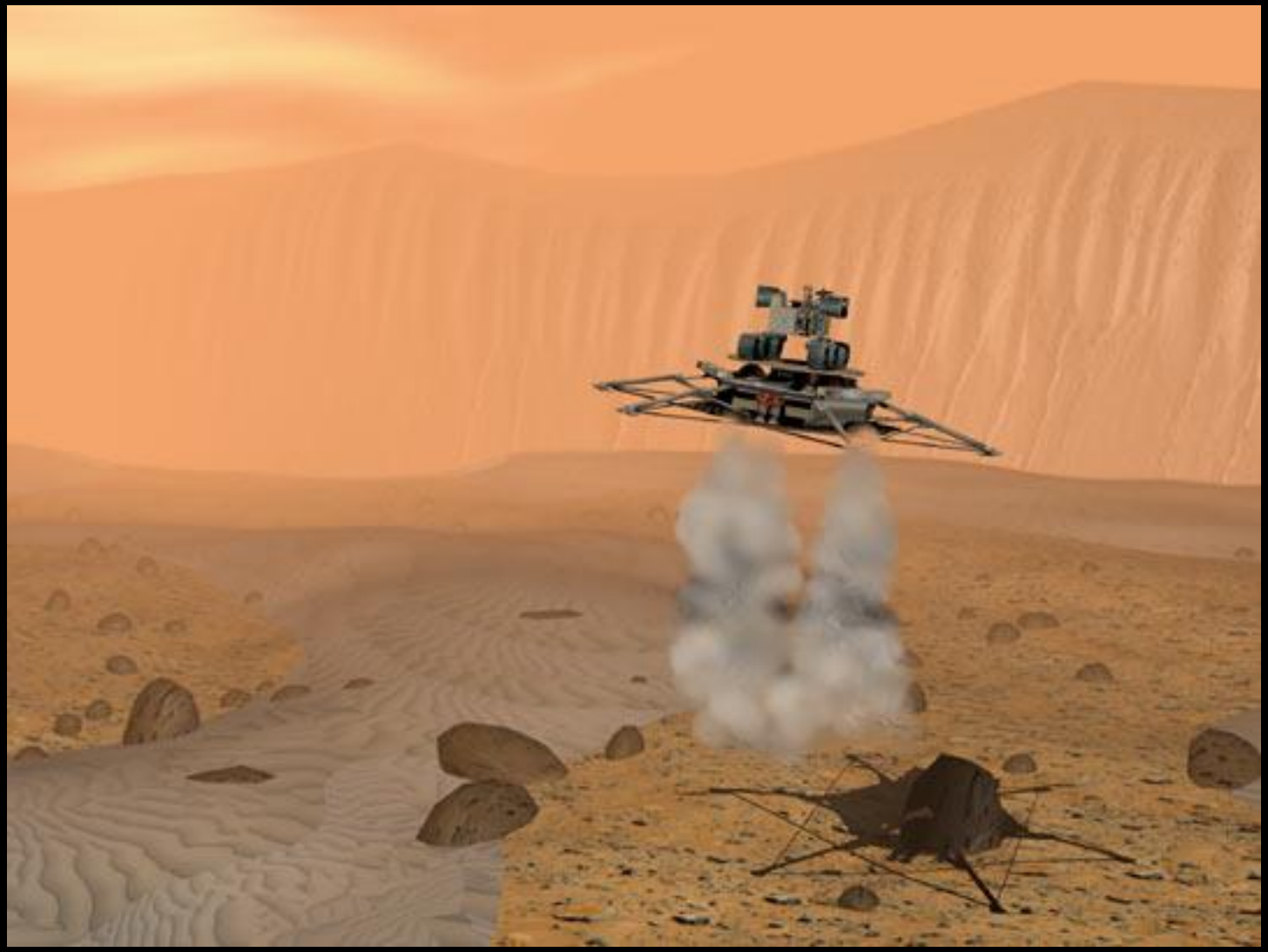


Mars Pathfinder Airbag Configuration

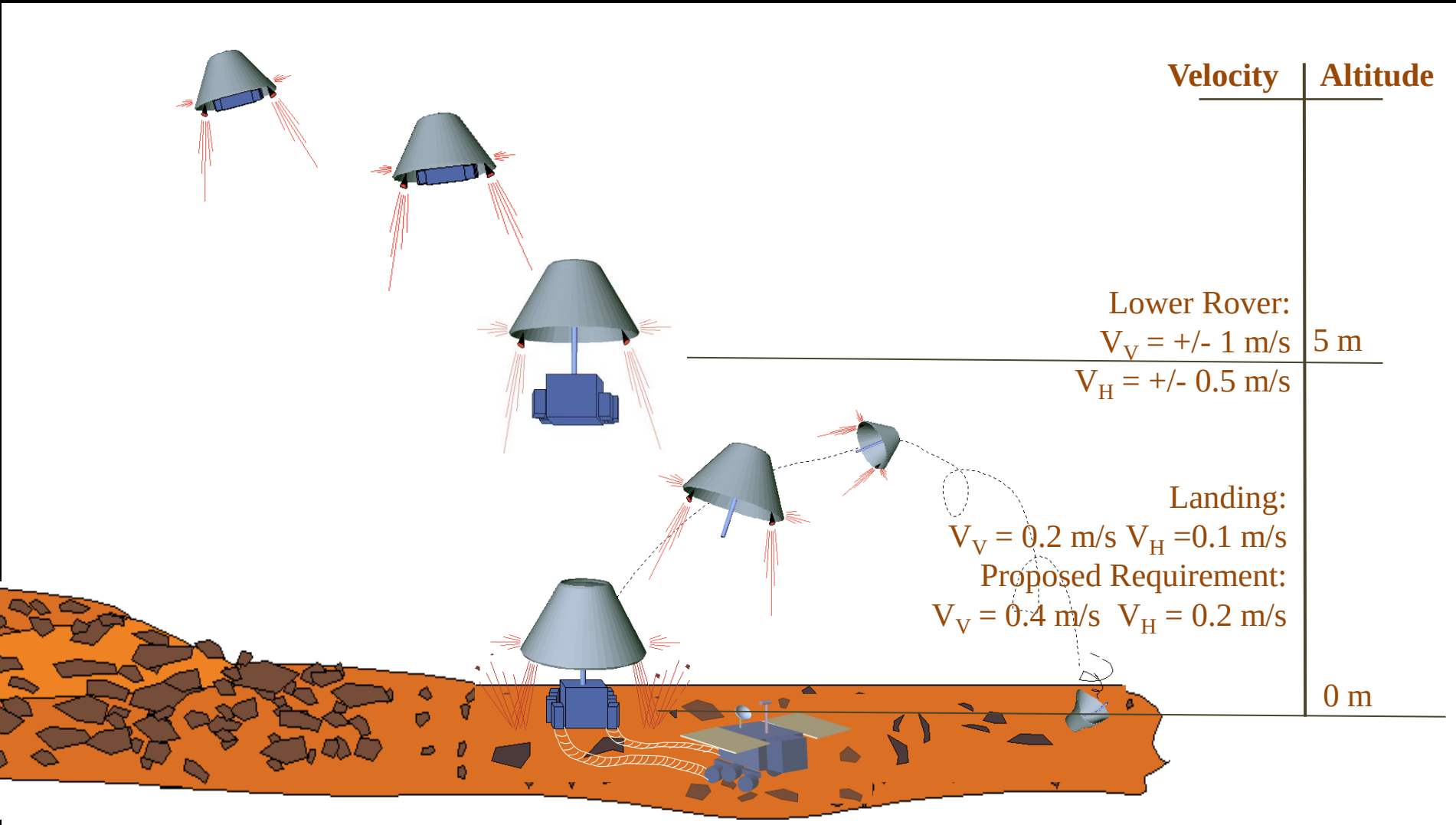


Mega Rover Airbag Configuration

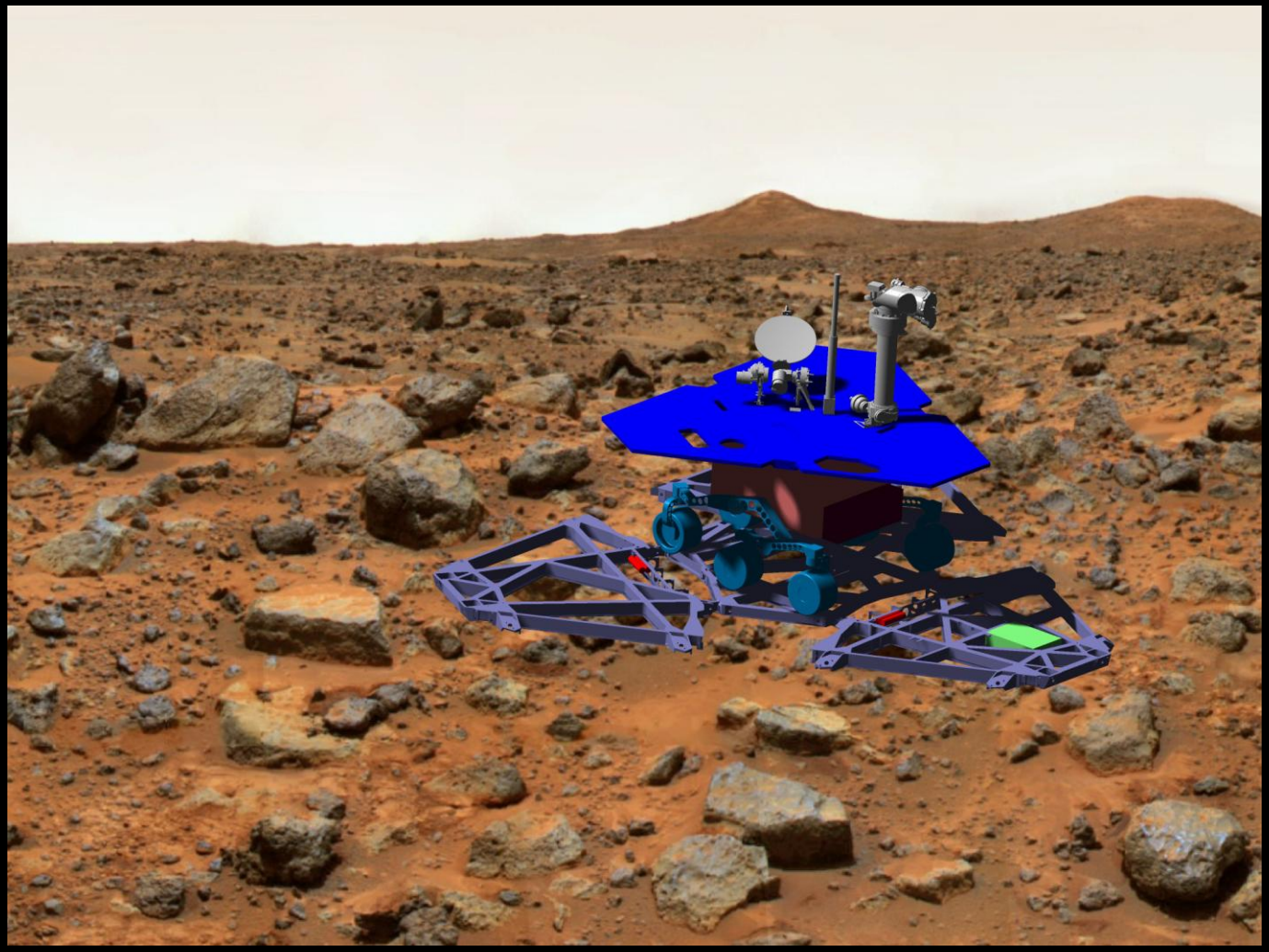
On a Pallet?



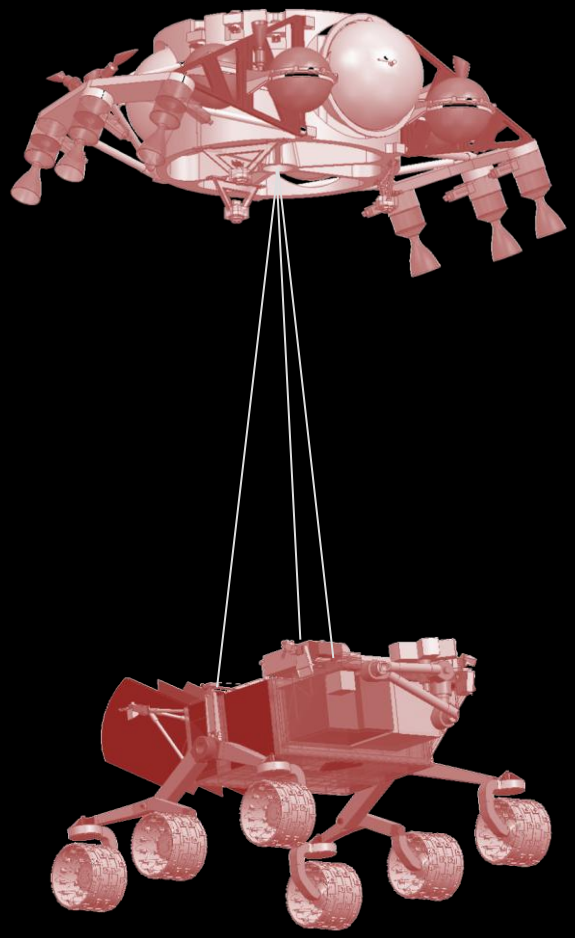
How about if we land it via a rope a la Pathfinder?
(No … too complex .. Idea discarded).



April 2000: Let's merge the pathfinder landing system with a roving geologist



2003: The Skycrane maneuver is born



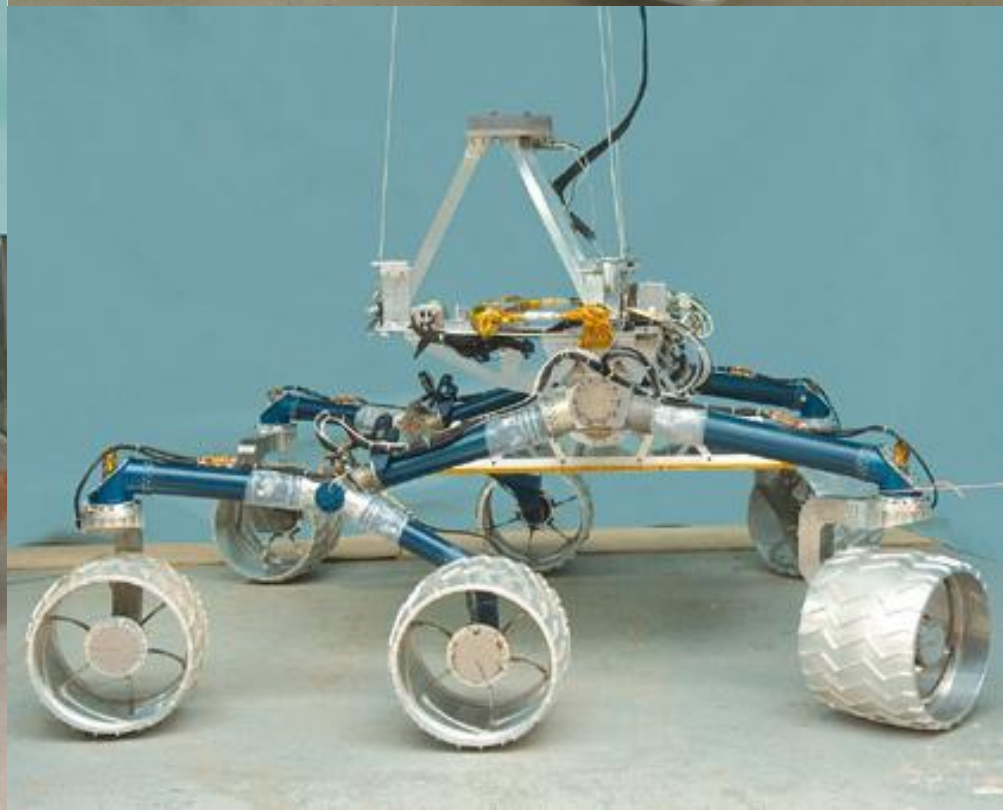
Thousands of problems to solve.

Parachute Inflation
Video #1

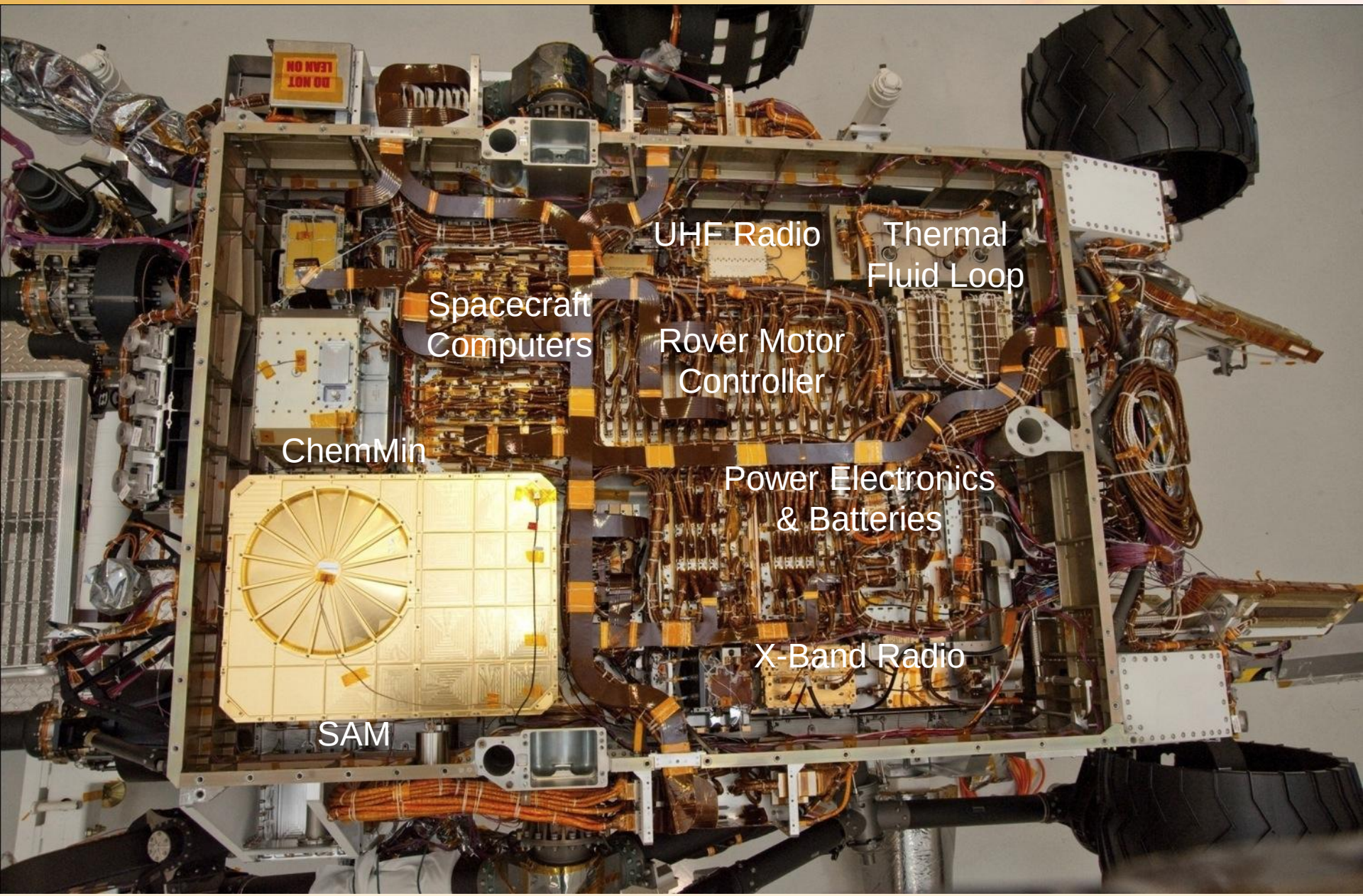
One by one, they were solved.

Parachute Inflation
Video #2

Testing



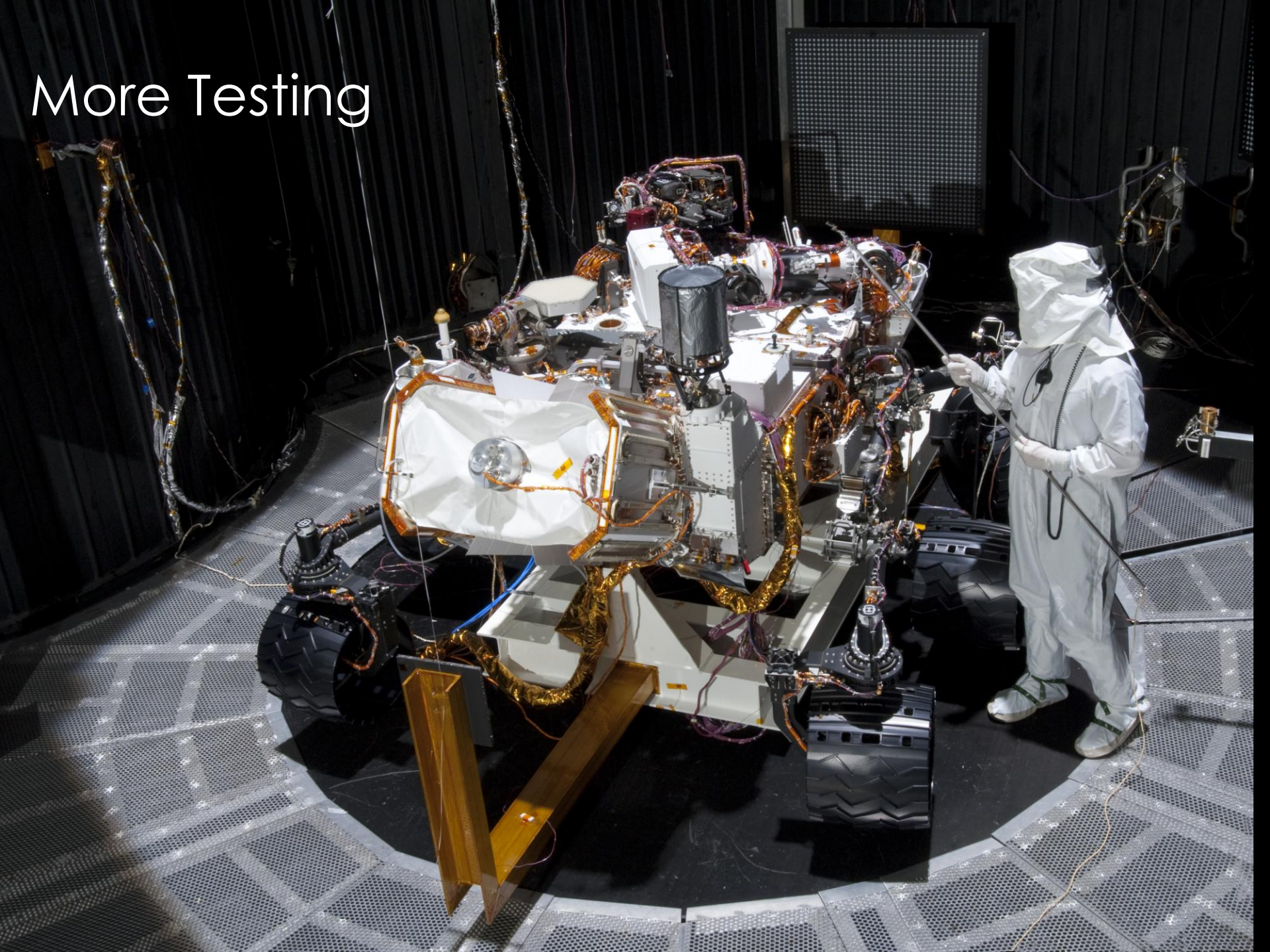
Complexity under the Hood



More testing

More testing …

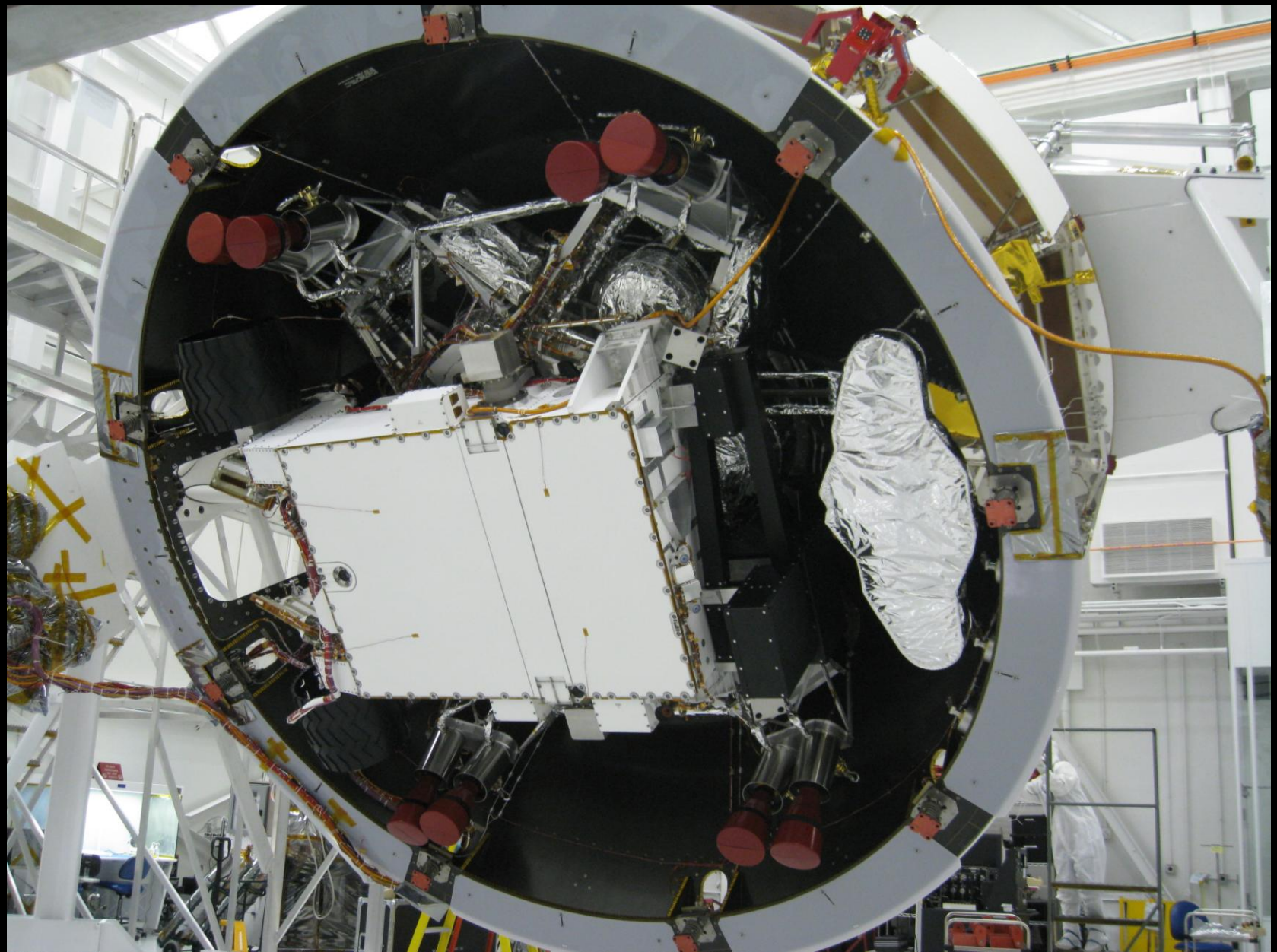
More Testing



2010
Finally, a real Mars Science Lab!

Rover Family Portrait

Rover Packaging



Ready for flight

Ready for the fairing

Encapsulation at KSC

ATLAS V fairing

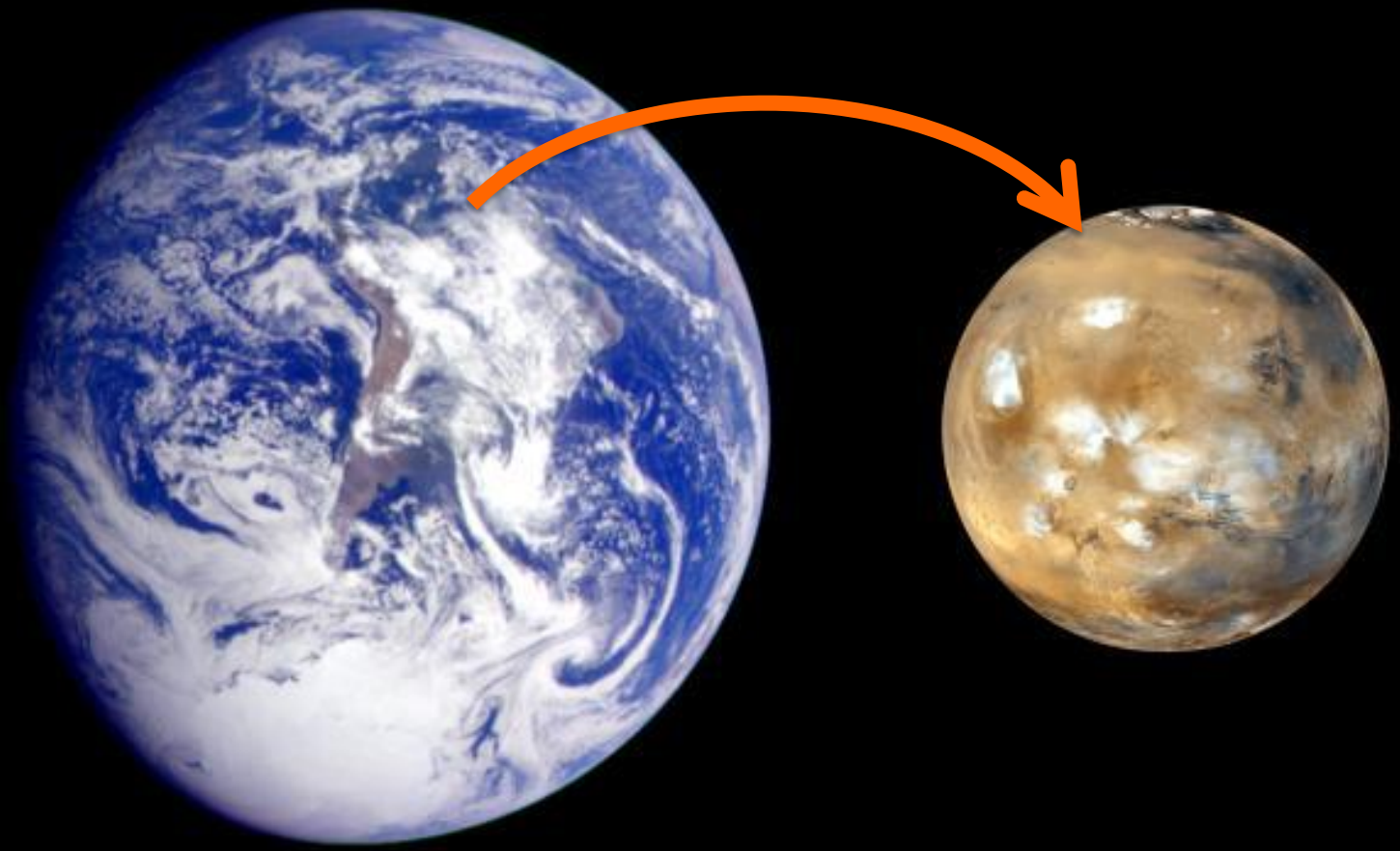
Launch Complex 41
NASA/KSC

Atlas V

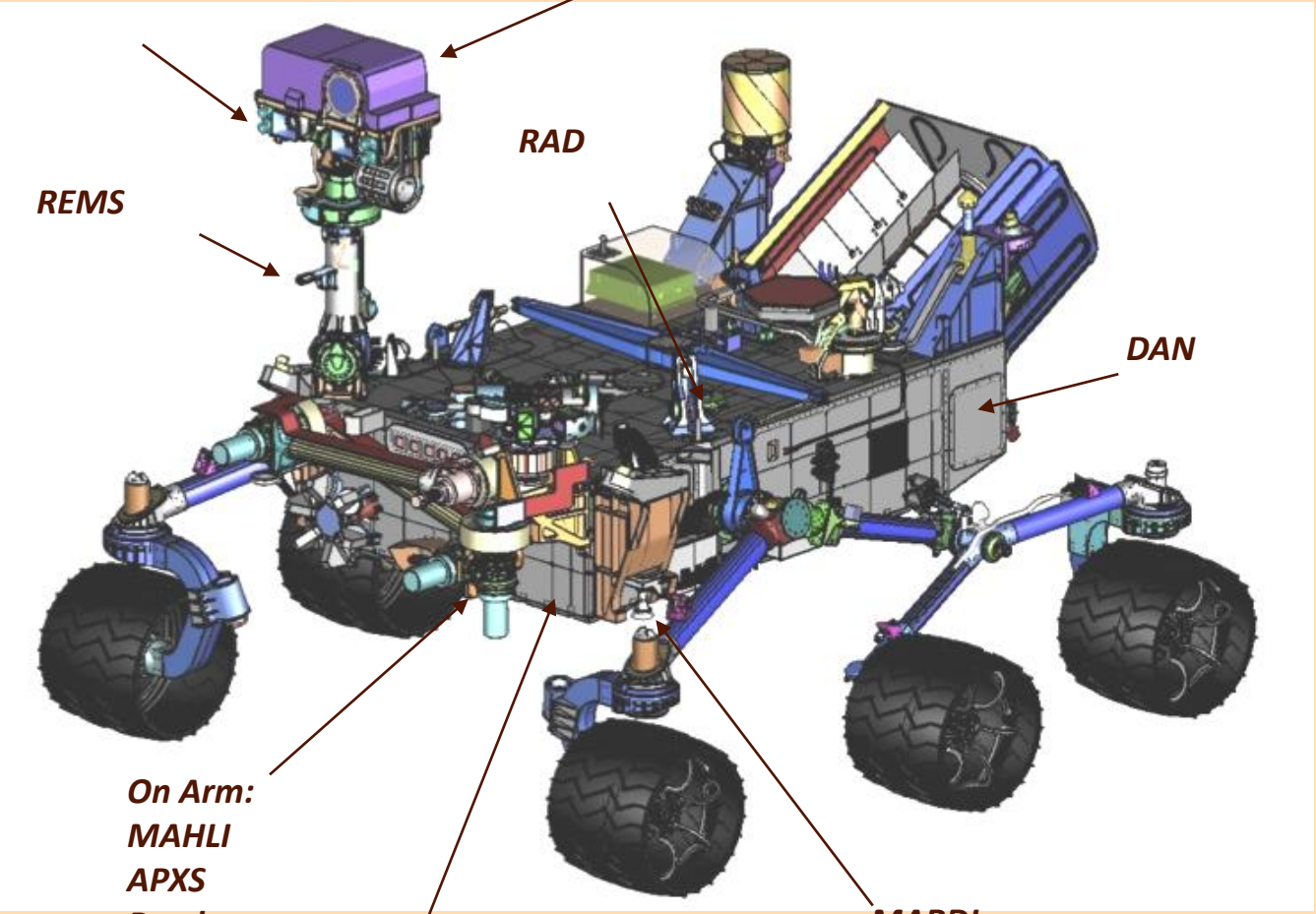

NASA

MSL Launch: Nov 26, 2011

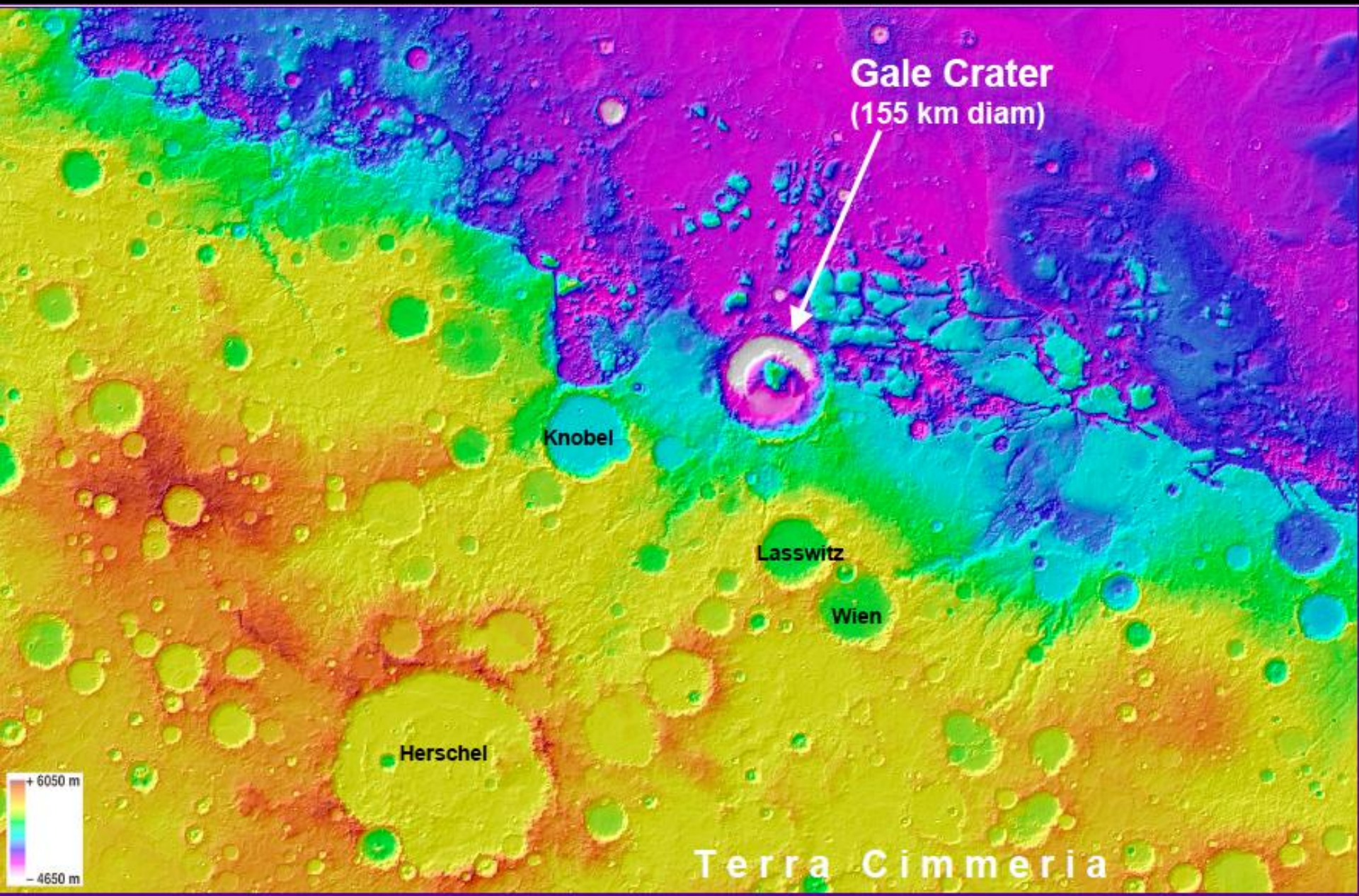
The mission ....



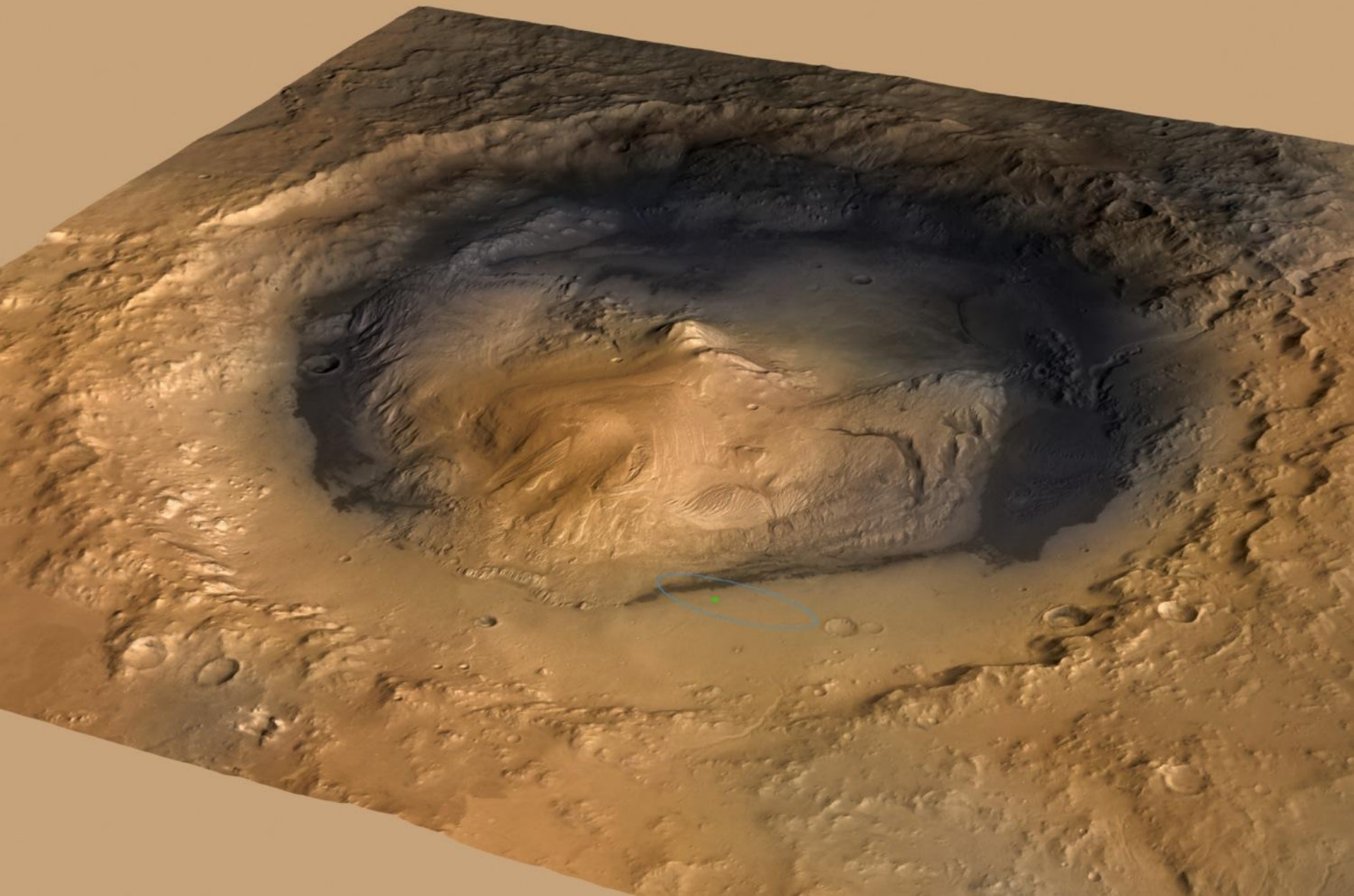
MSL Science

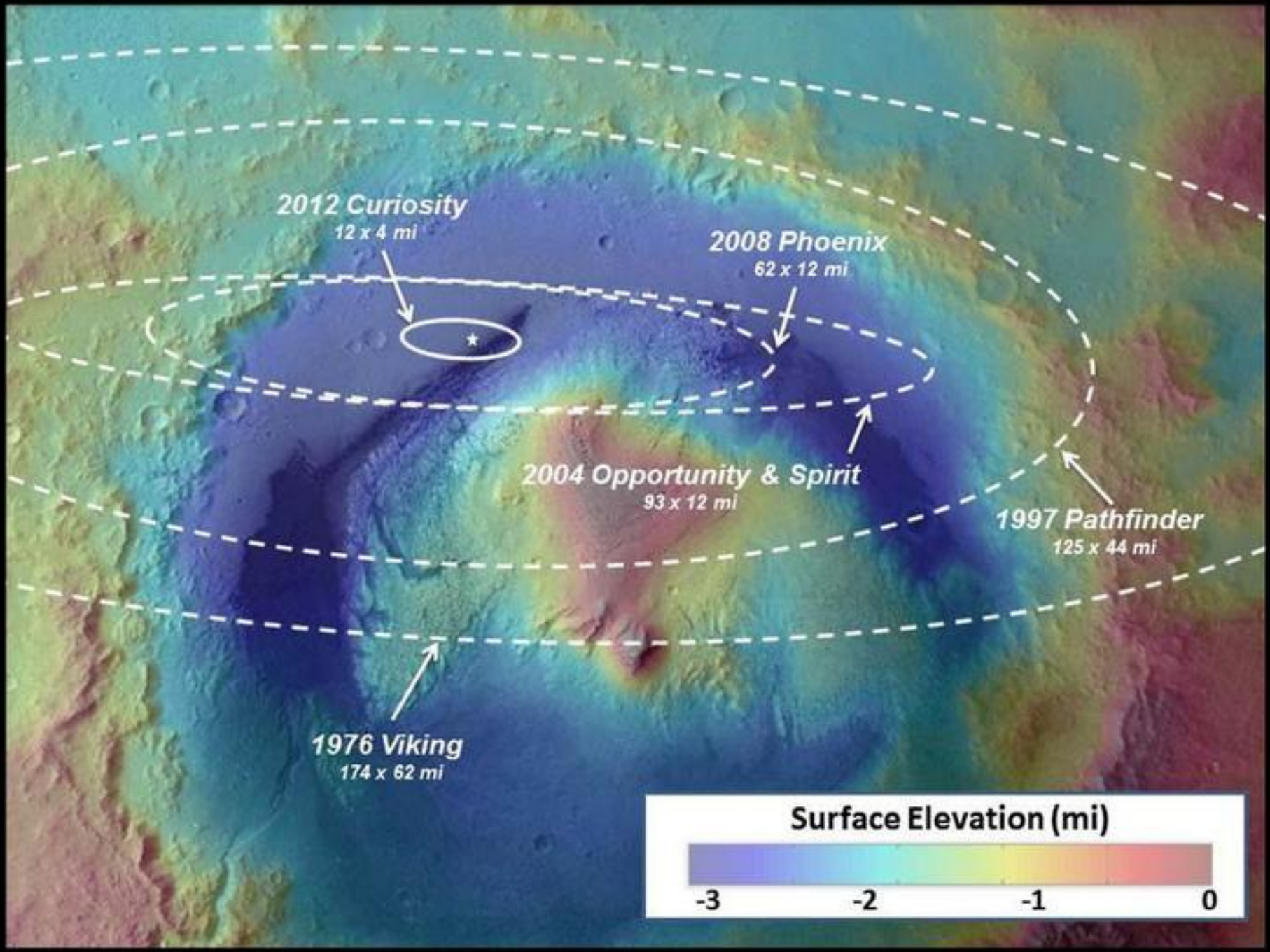

ChemCam
Mastcam
RAD
REMS
DAN
On Arm:
MAHLI
APXS
Brush
Drill / Sieves
Scoop
SAM &
ChemMin(inside
rover)
MARDI

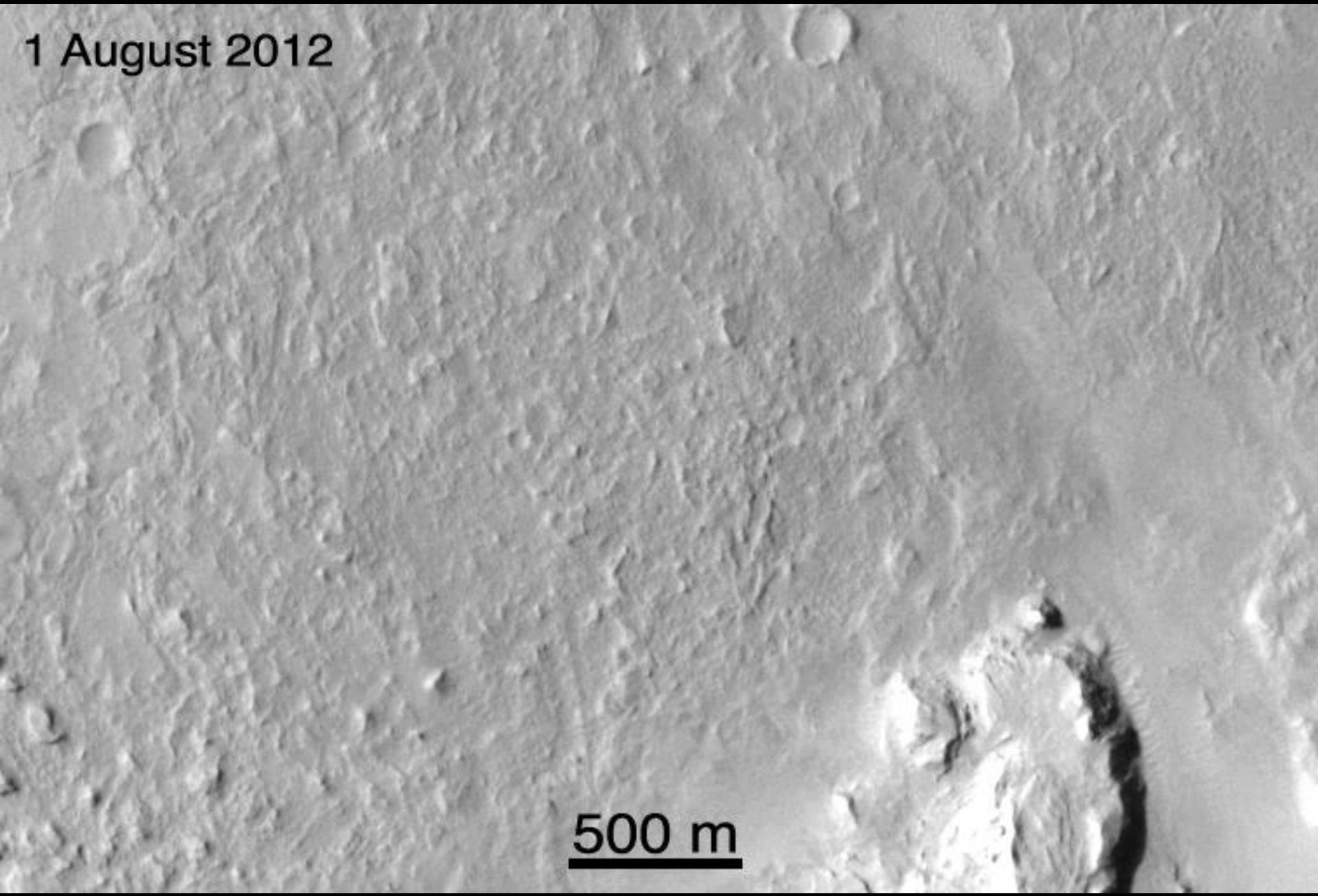
Gale is on the Dichotomy Boundary

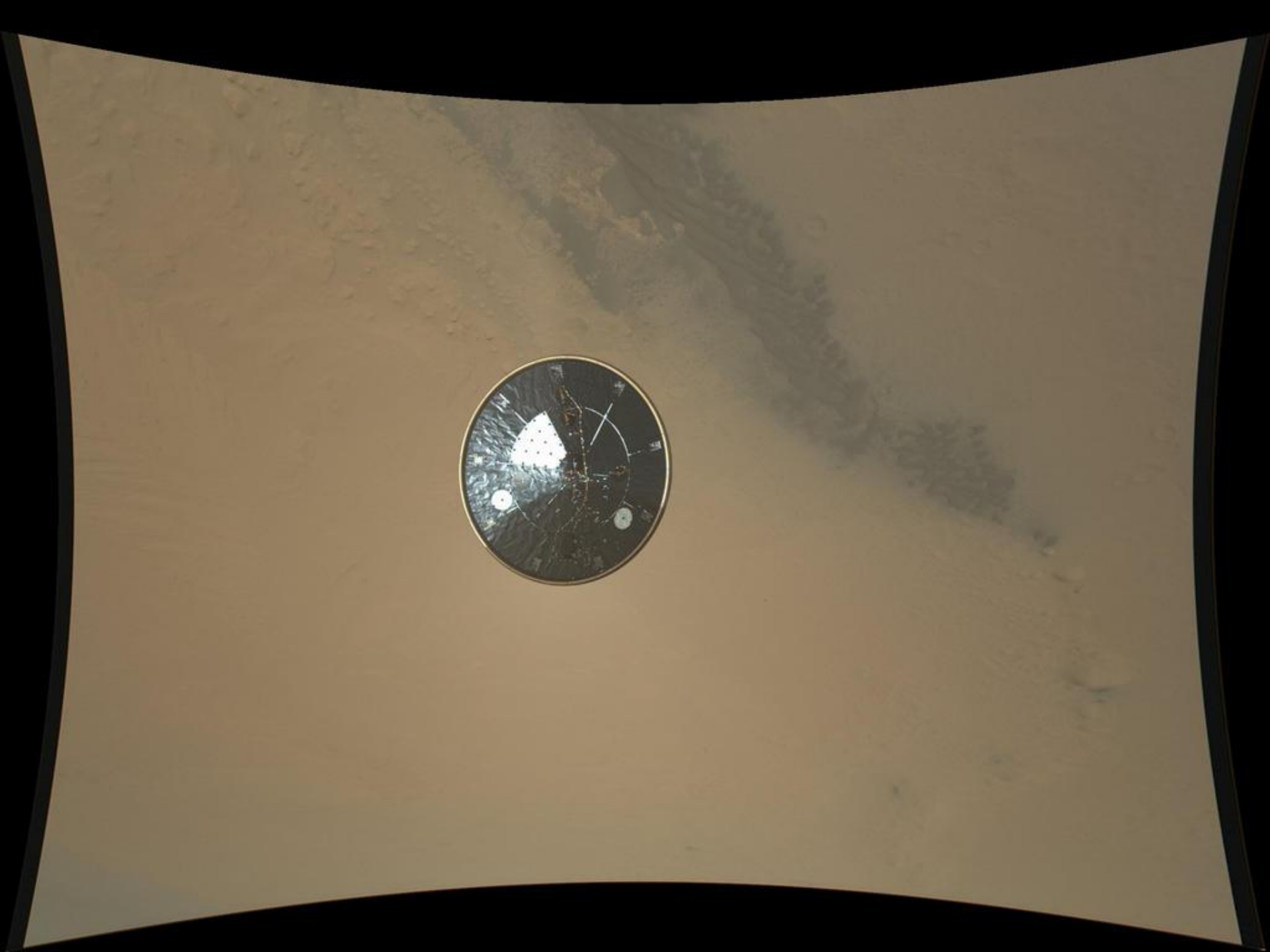


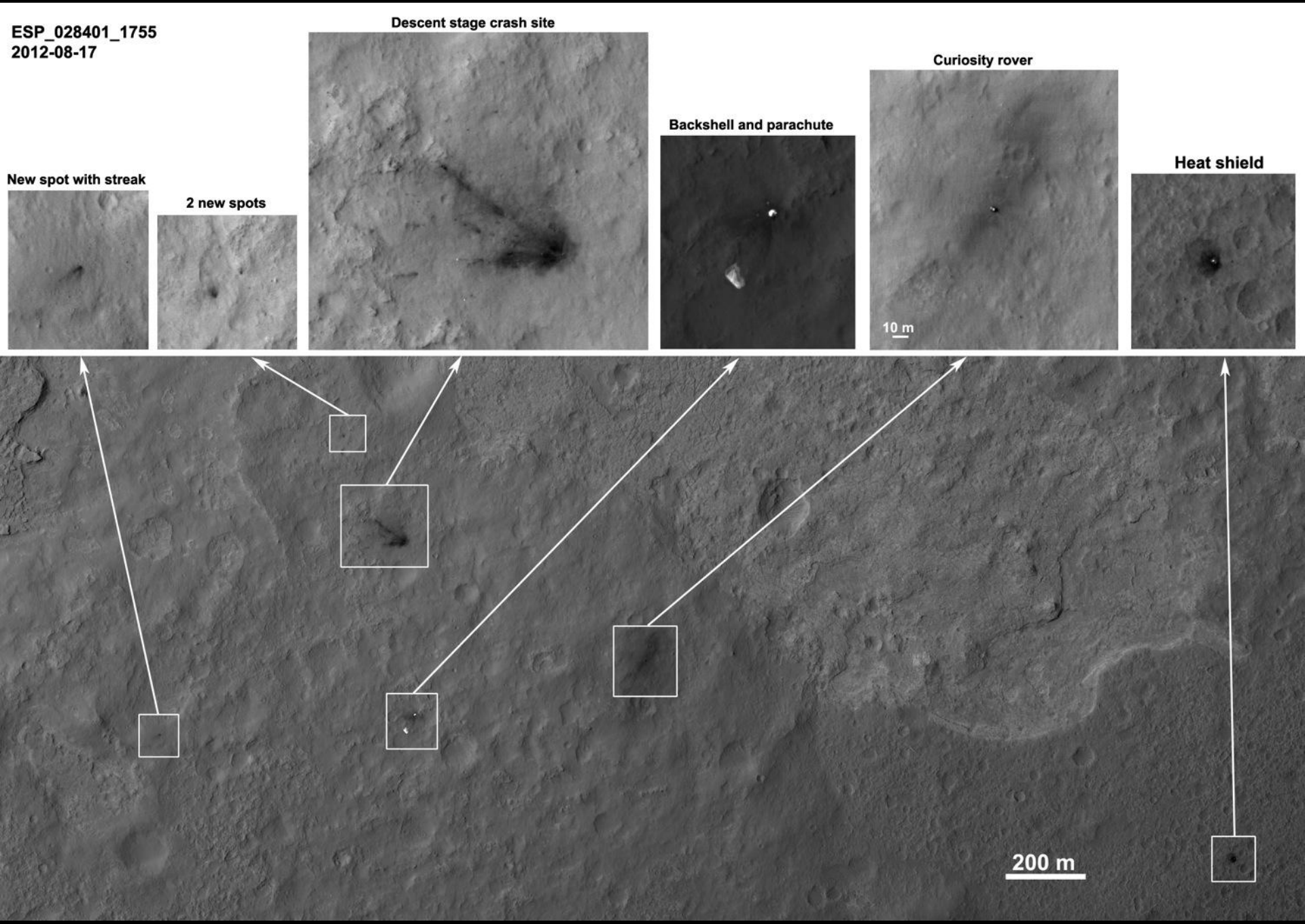
Gale Crater and Mount Sharp




2012 Curiosity
12 x 4 mi
2008 Phoenix
62 x 12 mi
2004 Opportunity & Spirit
93 x 12 mi
1997 Pathfinder
125 x 44 mi
1976 Viking
174 x 62 mi
Surface Elevation (mi)
-3
-2
-1
0

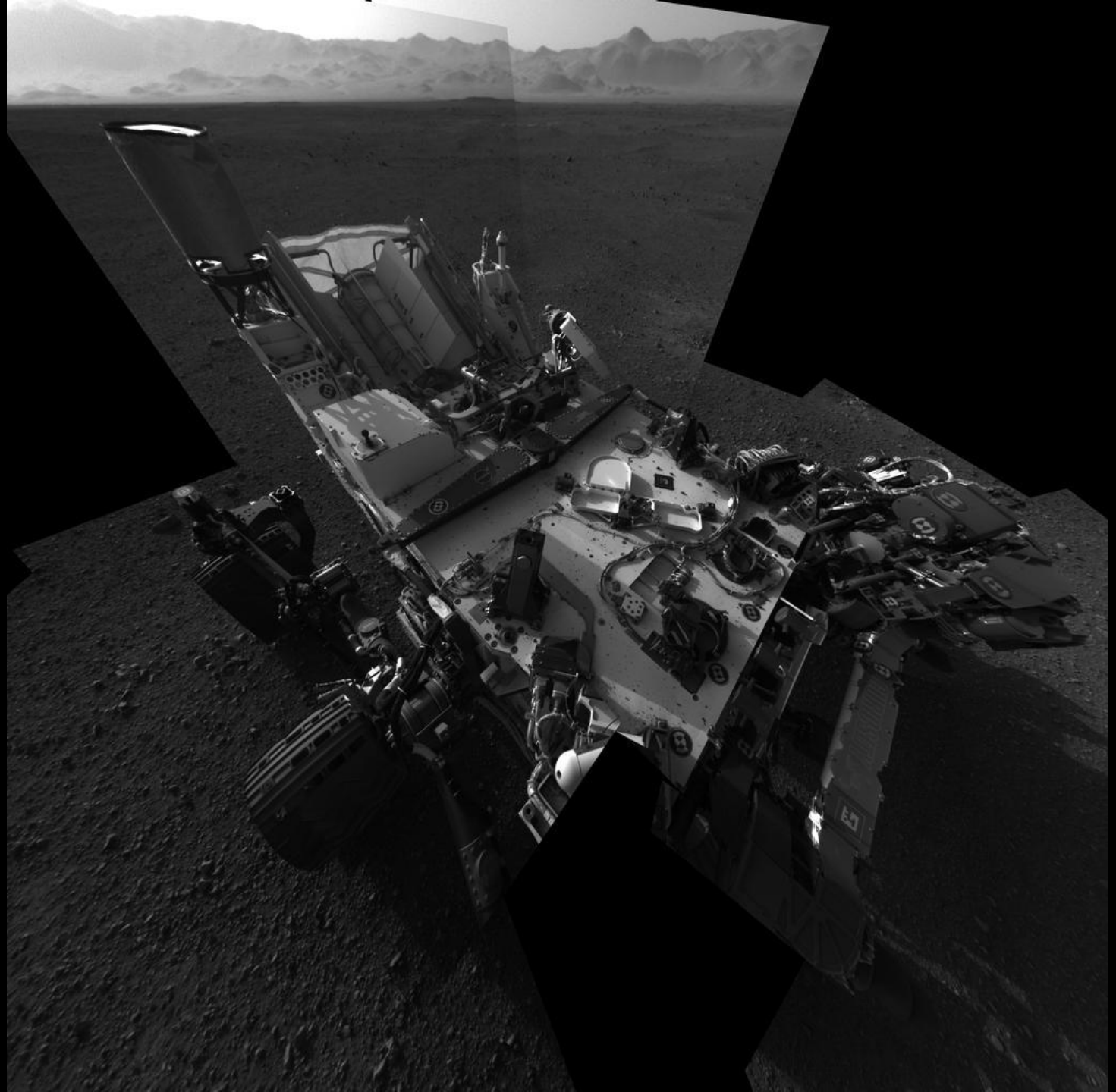

1 August 2012
500 m

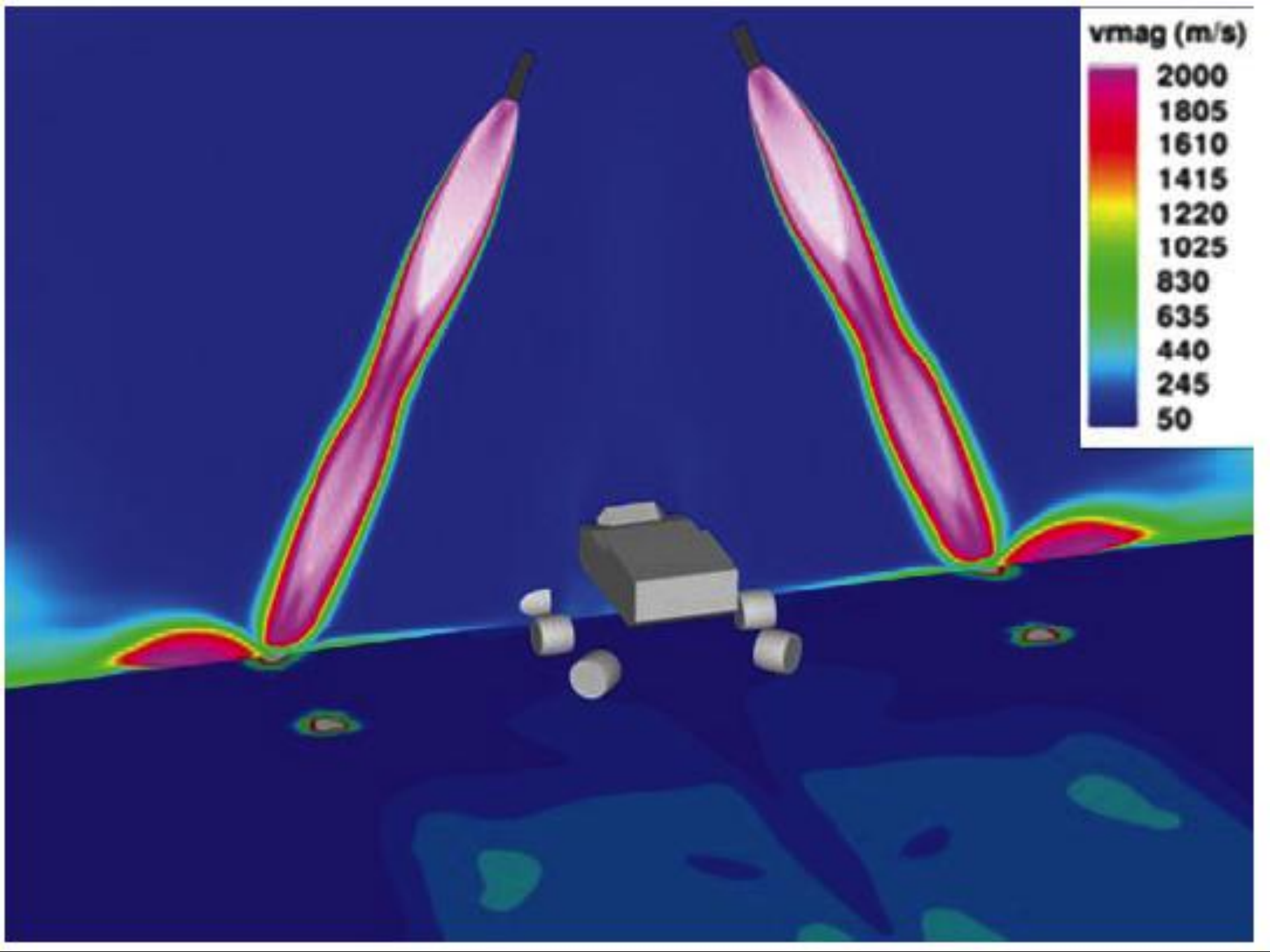



ESP_028401_1755
2012-08-17
Descent stage crash site
Curiosity rover
Backshell and parachute
Heat shield
New spot with streak
2 new spots
10 m
200 m

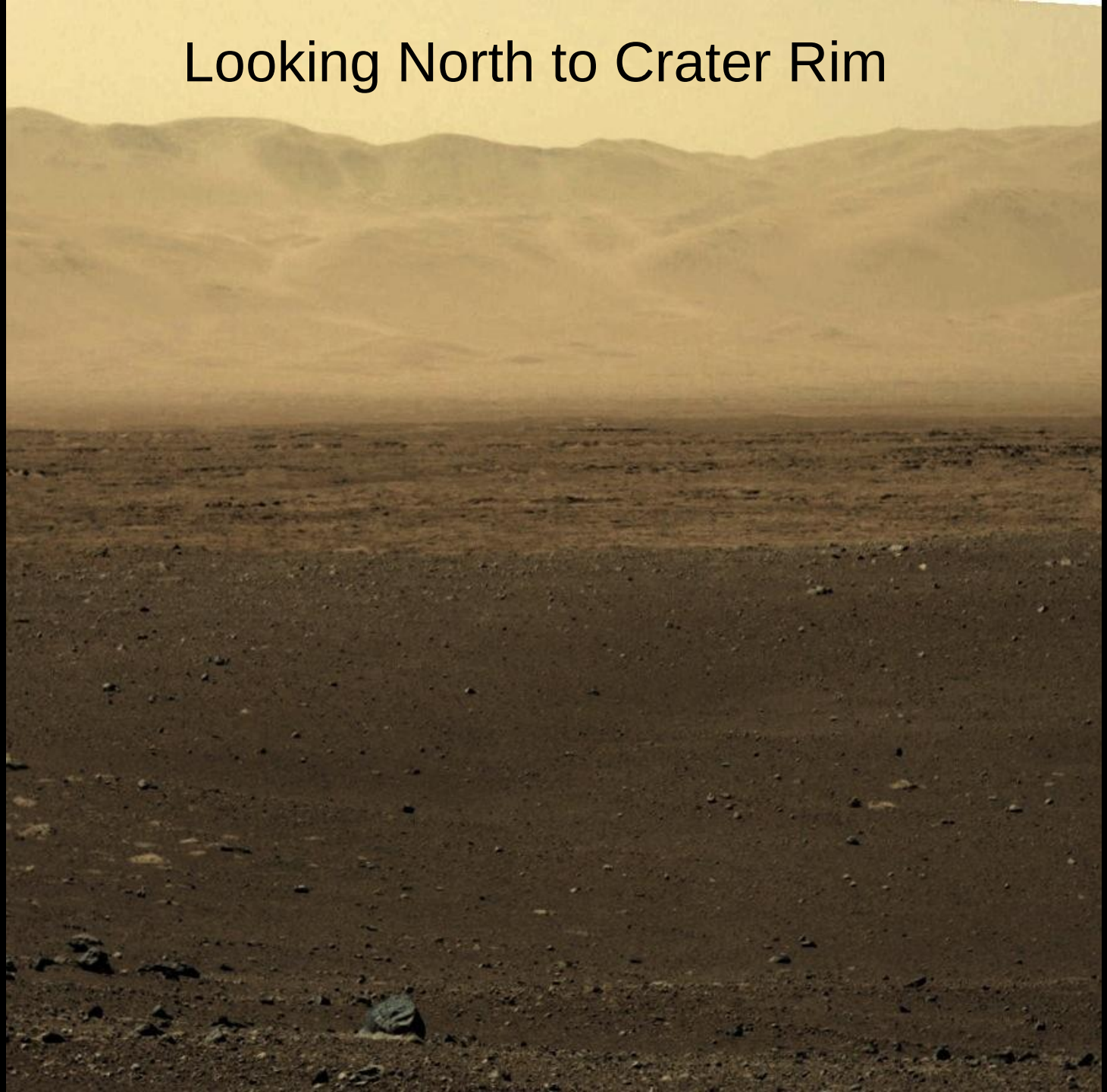
Left Rear Hazcam 05:18:38 UTC

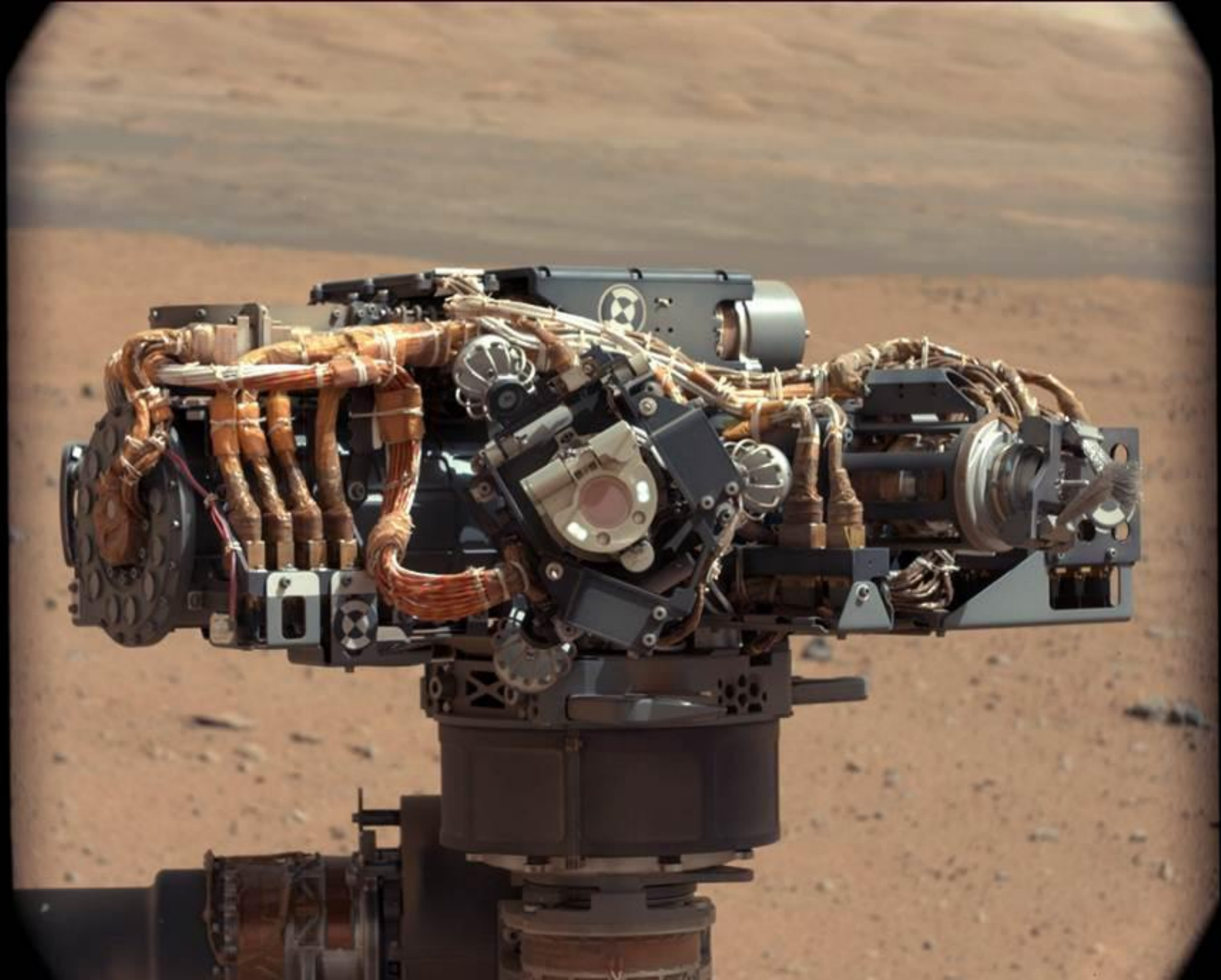
Left Rear Hazcam 06:03:27 UTC



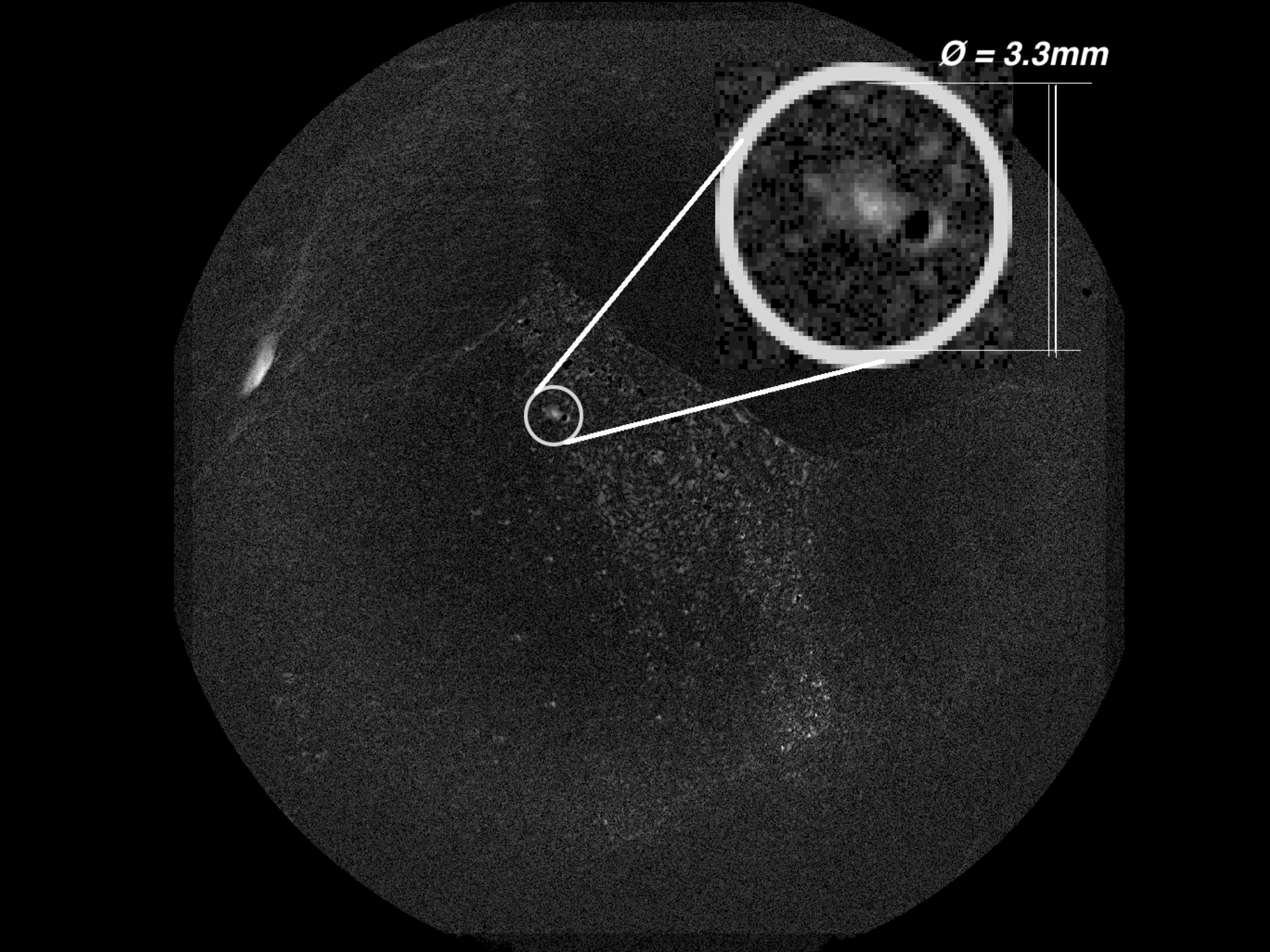

vmag (m/s)
2000
1805
1610
1415
1220
1025
830
635
440
245
50

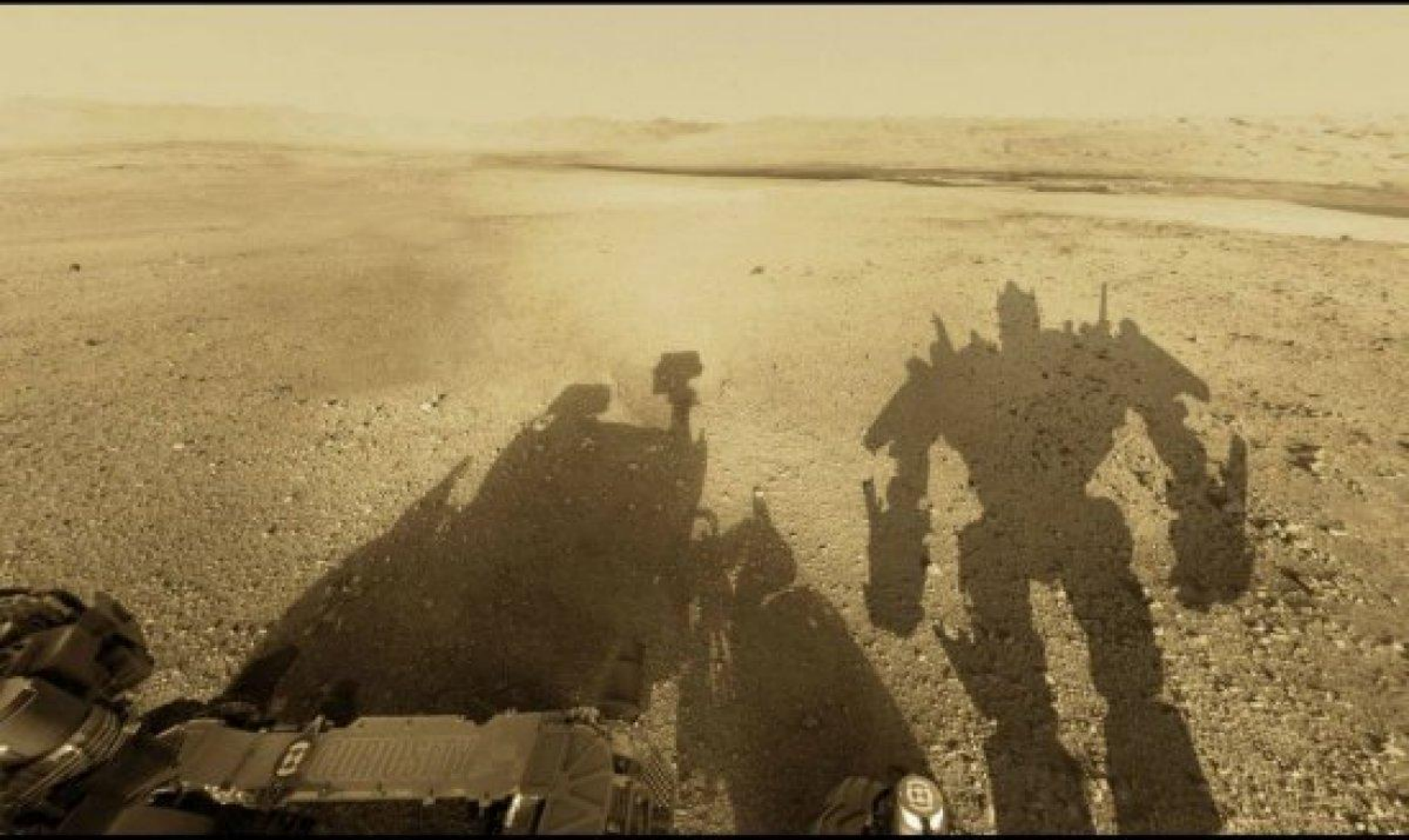
Looking North to Crater Rim



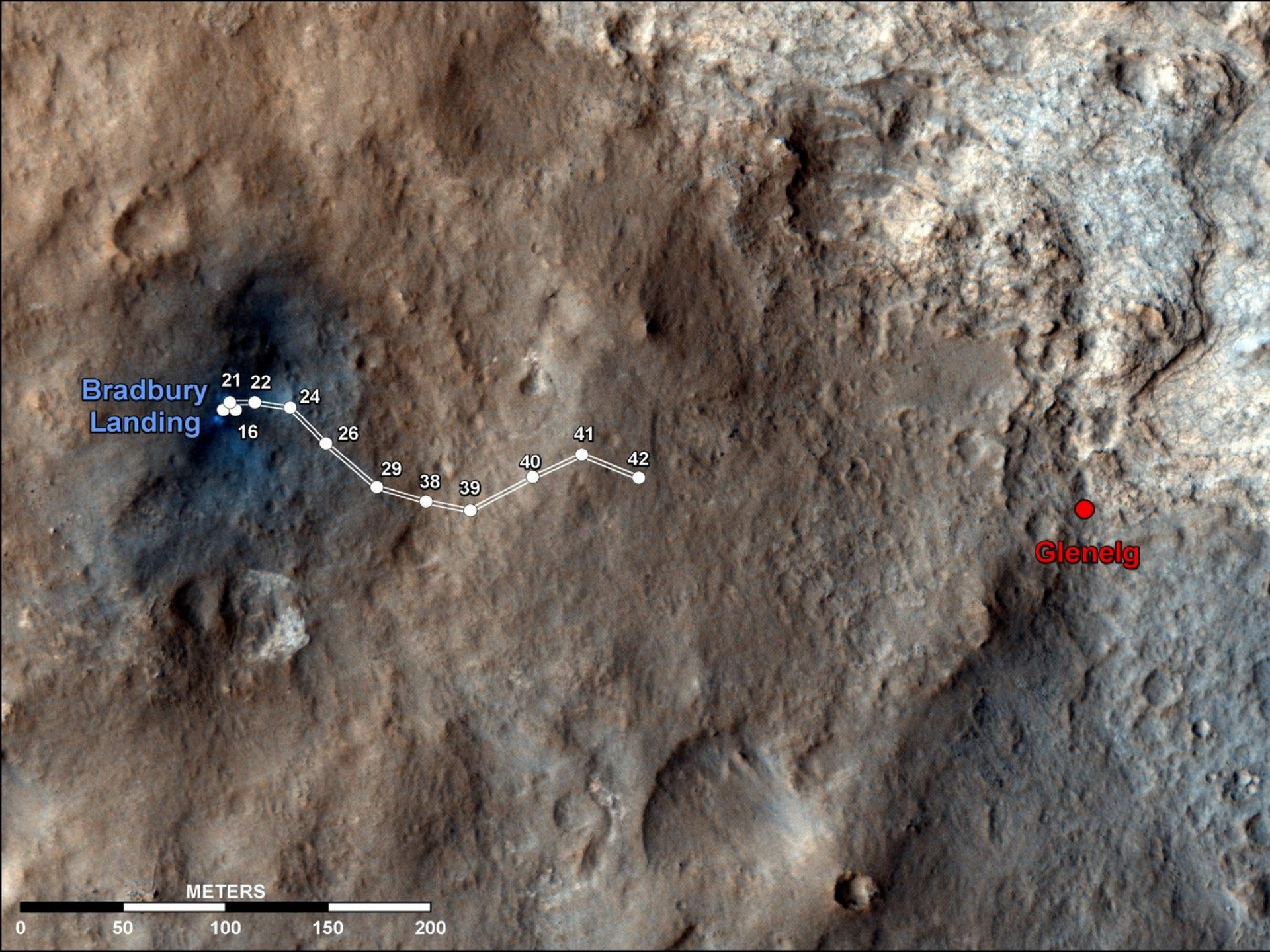


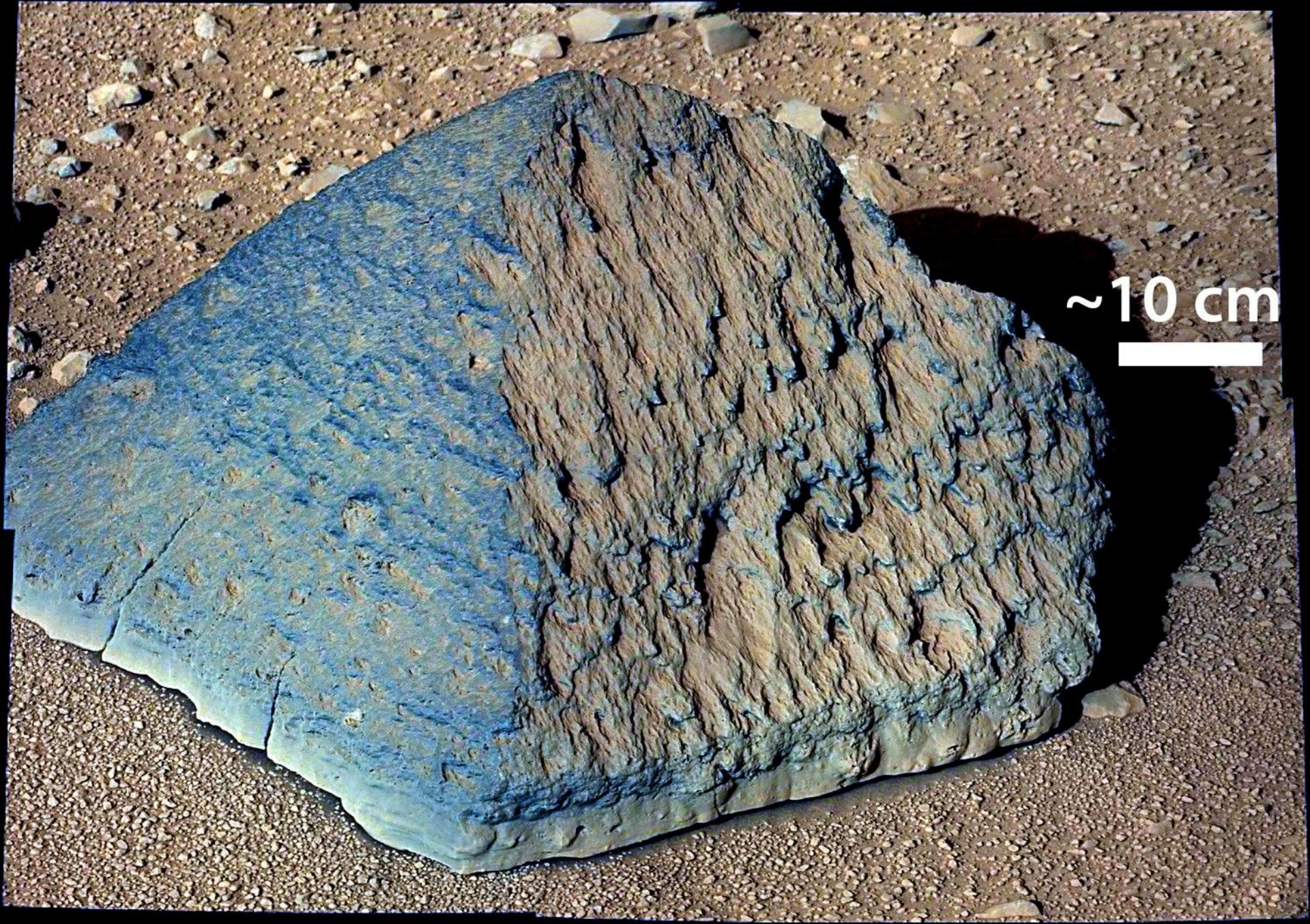
“Coronation” ChemCam Target

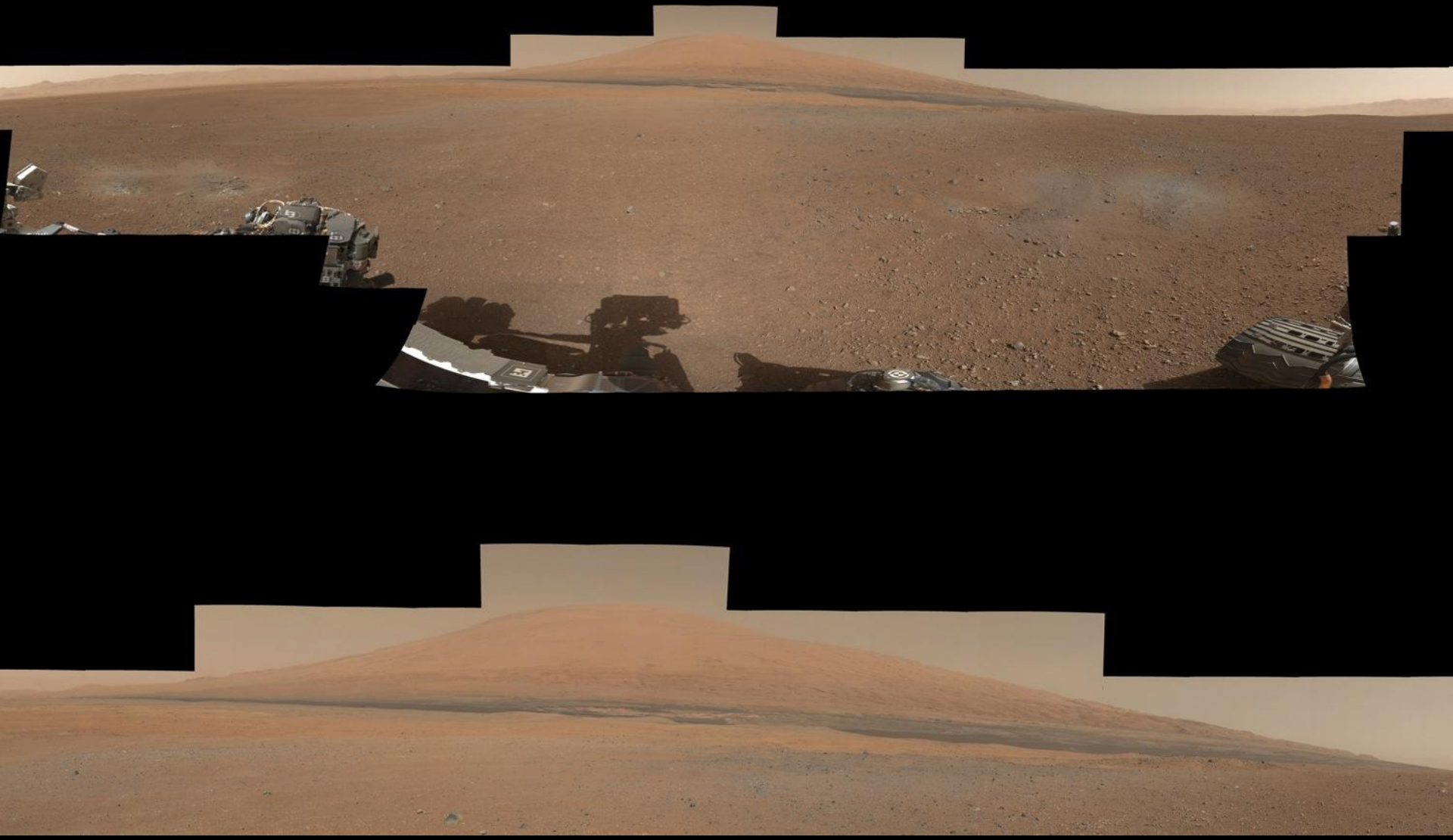

Ø = 3.3mm



User: wrighteous5280


Bradbury Landing
16
21
22
24
26
29
38
39
40
41
42
Glenelg
METERS
0
50
100
150
200


~10 cm



Foothills of Mt. Sharp

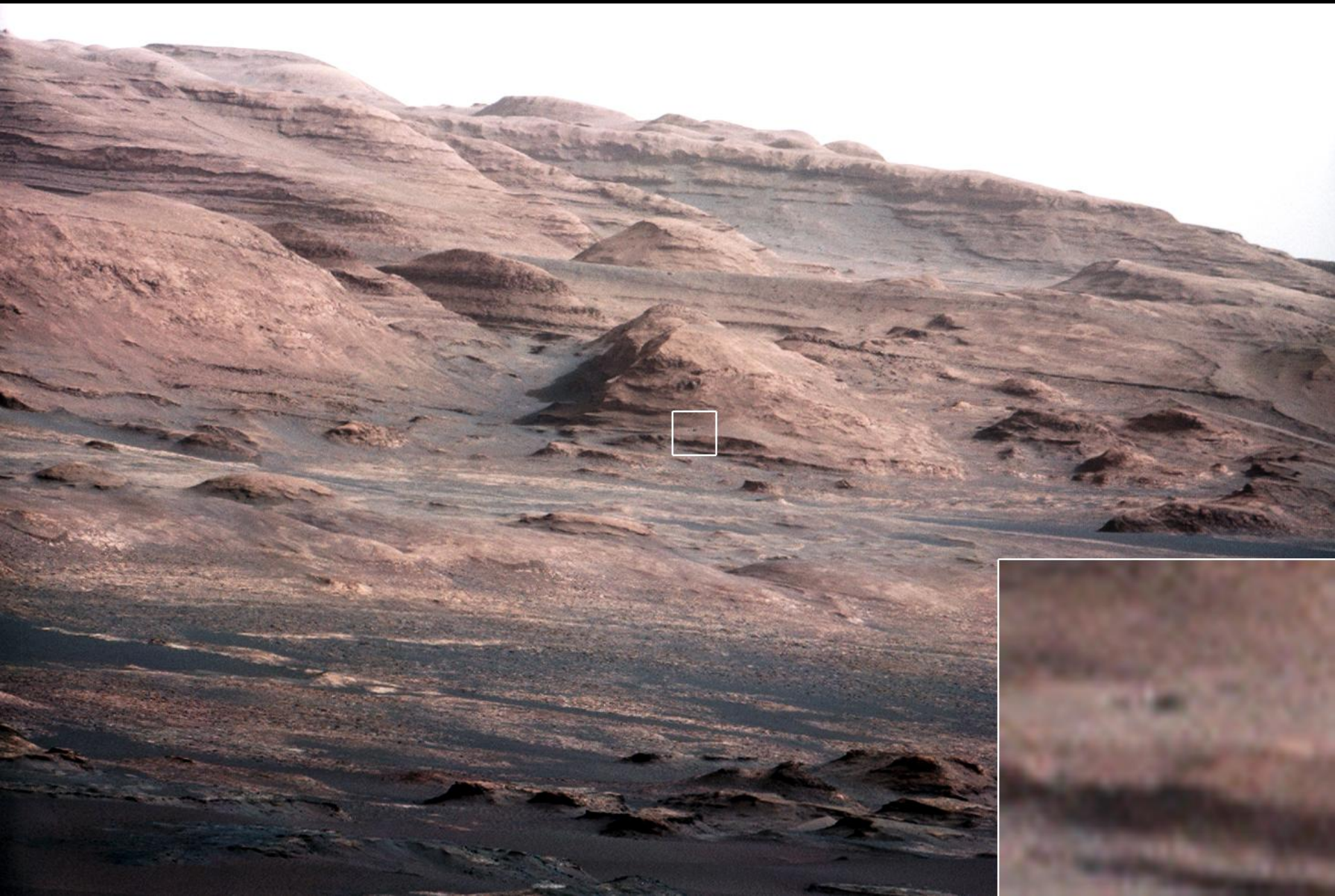



image: Bernhard Braun 2011
raw data: NASA/JPL/University of Arizona/Malin Space Science Systems