Mars Science Laboratory:
Mission Perspective

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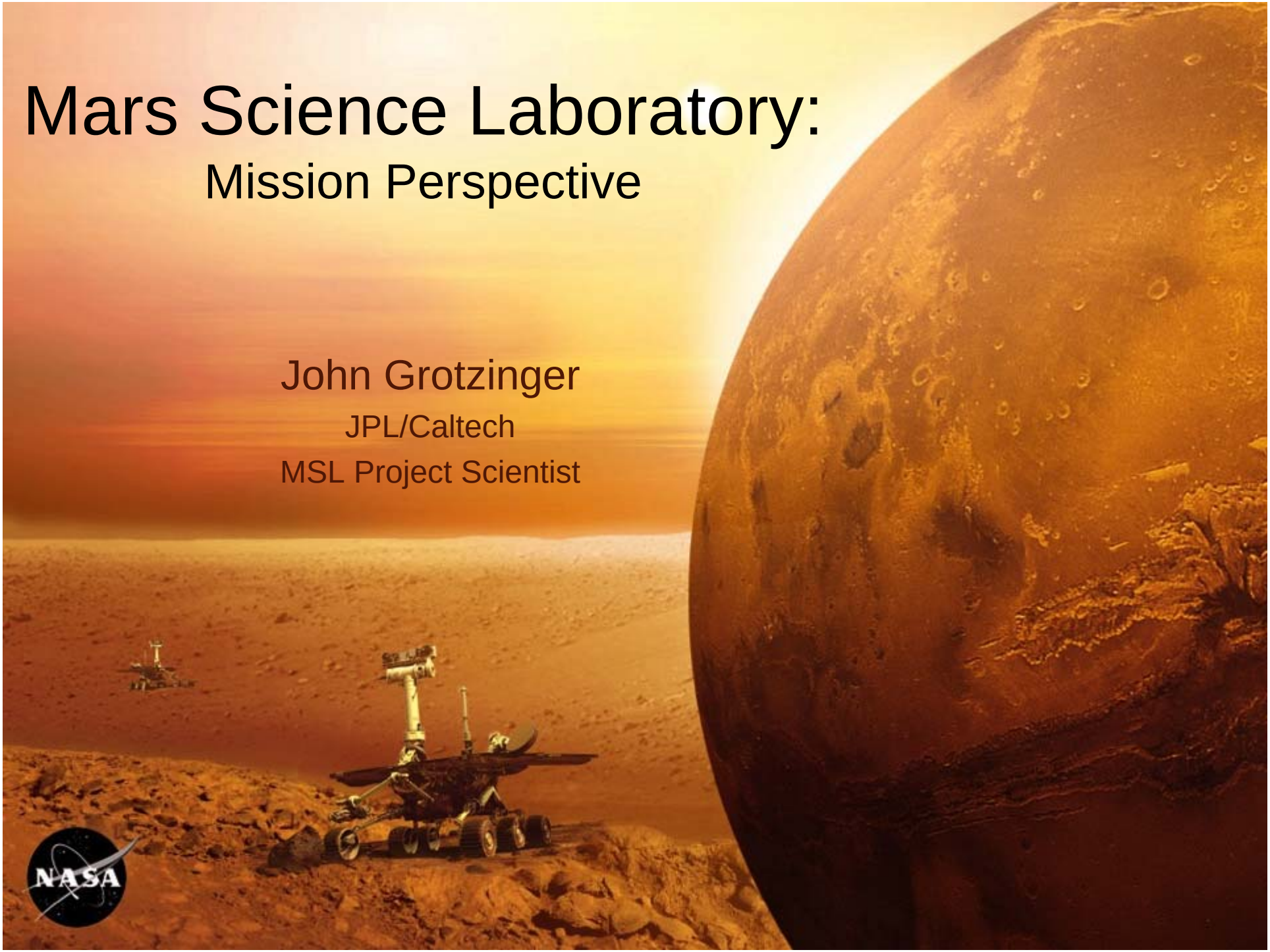


Science Goals

MSL's primary scientific goal is to explore a landing site as a potential habitat for life, and assess its potential for preservation of biosignatures

Objectives include:

- Assessing the biological potential of the site by investigating organic compounds, other relevant elements, and biomarkers
- Characterizing geology and geochemistry, including chemical, mineralogical, and isotopic composition, and geological processes
- Investigating the role of water, atmospheric evolution, and modern weather/climate
- Characterizing the spectrum of surface radiation

Mission and Rover Overview

Mission Overview

CRUISE/APPROACH

- 8-month cruise
- Arrive August 6-20, 2012

LAUNCH

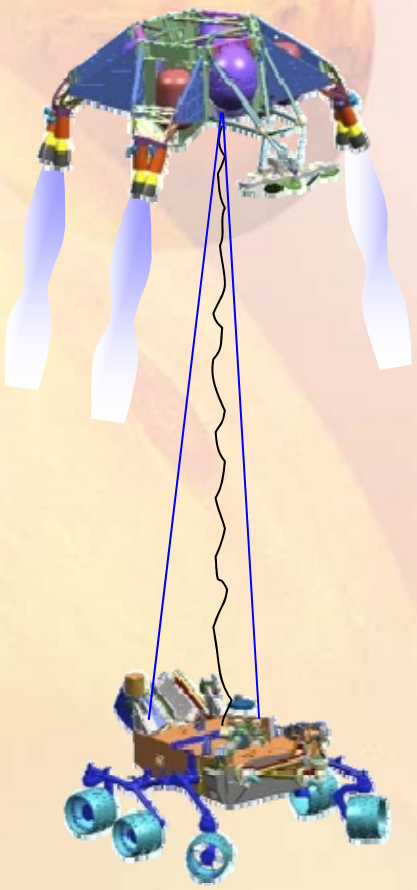
- Nov-Dec ’11
- Atlas V (541)

ENTRY, DESCENT, LANDING

- Guided entry and powered “sky crane” descent
- 20×25-km landing ellipse
- Access to landing sites ±30° latitude, <0 km elevation
- 900-kg rover

SURFACE MISSION

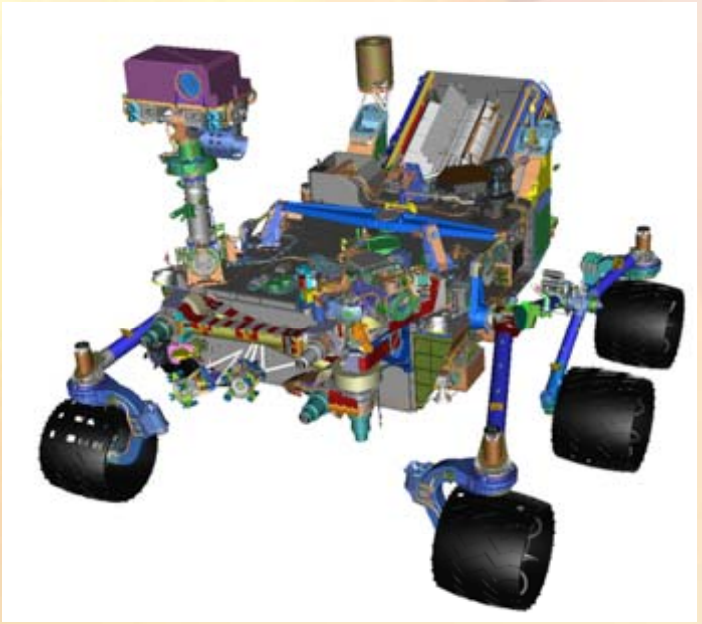
- Prime mission is one Mars year (687 days)
- Latitude-independent and long-lived power source
- Ability to drive out of landing ellipse
- 84 kg of science payload
- Direct (uplink) and relayed (downlink) communication
- Fast CPU and large data storage



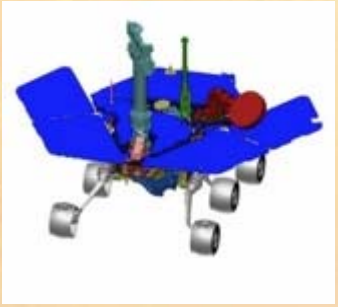
Rover Heritage

Size Comparison

MARS SCIENCE LABORATORY (MSL)



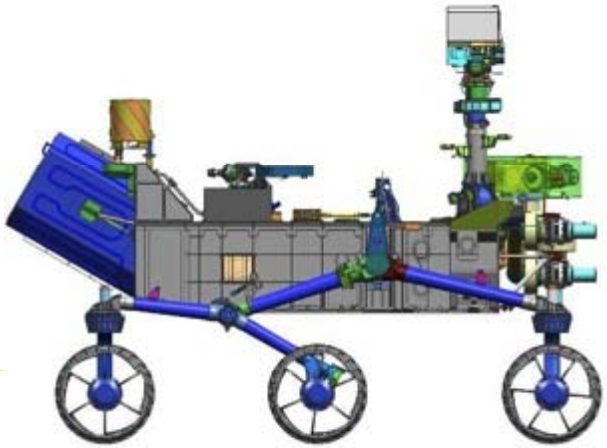
MARS EXPLORATION ROVER (MER)



MARS PATH FINDER (MPF)

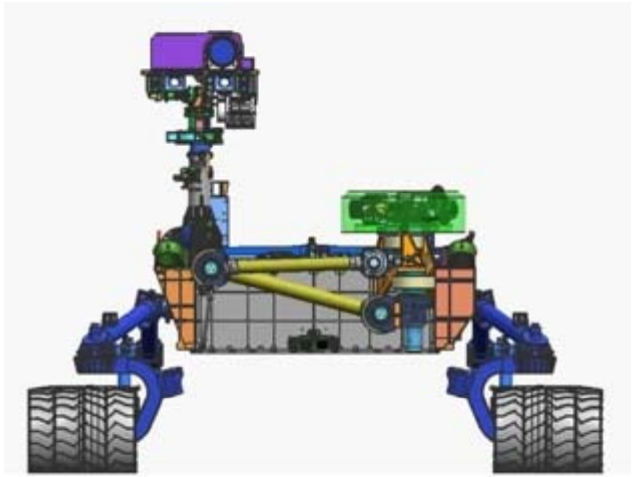
Rover Mass		
10.6 kg	174.0 kg	975.0 kg

MSL Size – Terrestrial Analog



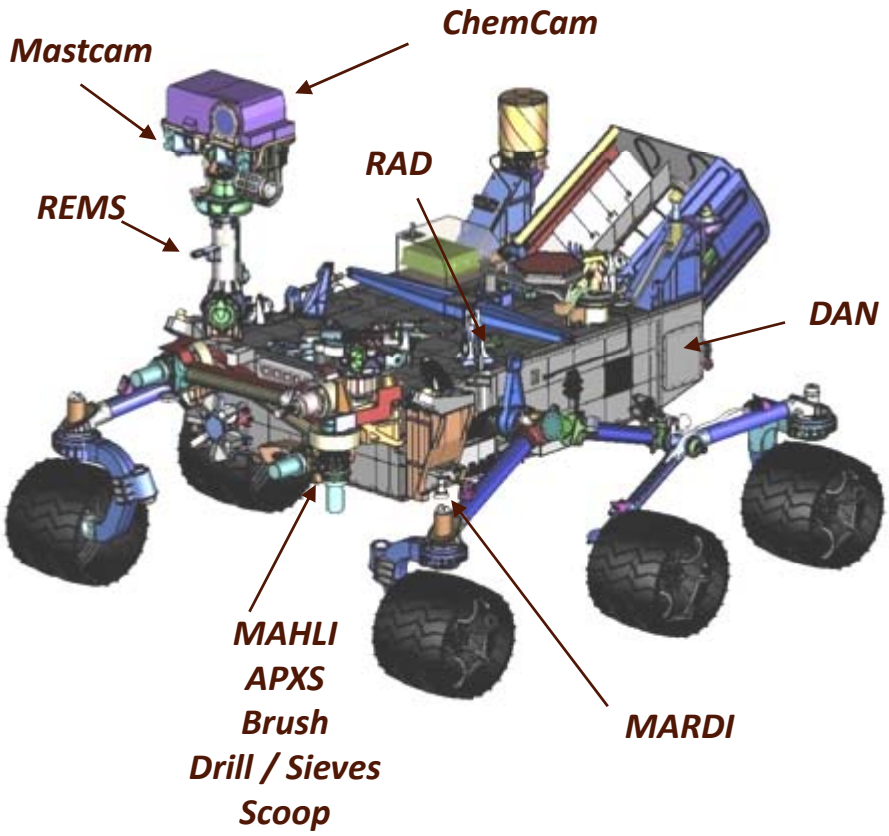
JPL 2009 MSL Rover

2005 MINI Cooper S



Aeroshell "Fit Check"

MSL Science Payload



Rover Width:	**2.8 m**
Height of Deck:	**1.1 m**
Ground Clearance:	**0.66 m**
Height of Mast:	**2.2 m**

REMOTE SENSING

Mastcam (M. Malin, MSSS) - Color and telephoto imaging, video, atmospheric opacity

ChemCam (R. Wiens, LANL/CNES) – Chemical composition; remote micro-imaging

CONTACT INSTRUMENTS (ARM)

MAHLI (K. Edgett, MSSS) – Hand-lens color imaging

APXS (R. Gellert, U. Guelph, Canada) - Chemical composition

ANALYTICAL LABORATORY (ROVER BODY)

SAM (P. Mahaffy, GSFC/CNES) - Chemical and isotopic composition, including organics

CheMin (D. Blake, ARC) - Mineralogy

ENVIRONMENTAL CHARACTERIZATION

MARDI (M. Malin, MSSS) - Descent imaging

REMS (J. Gómez-Elvira, CAB, Spain) - Meteorology / UV

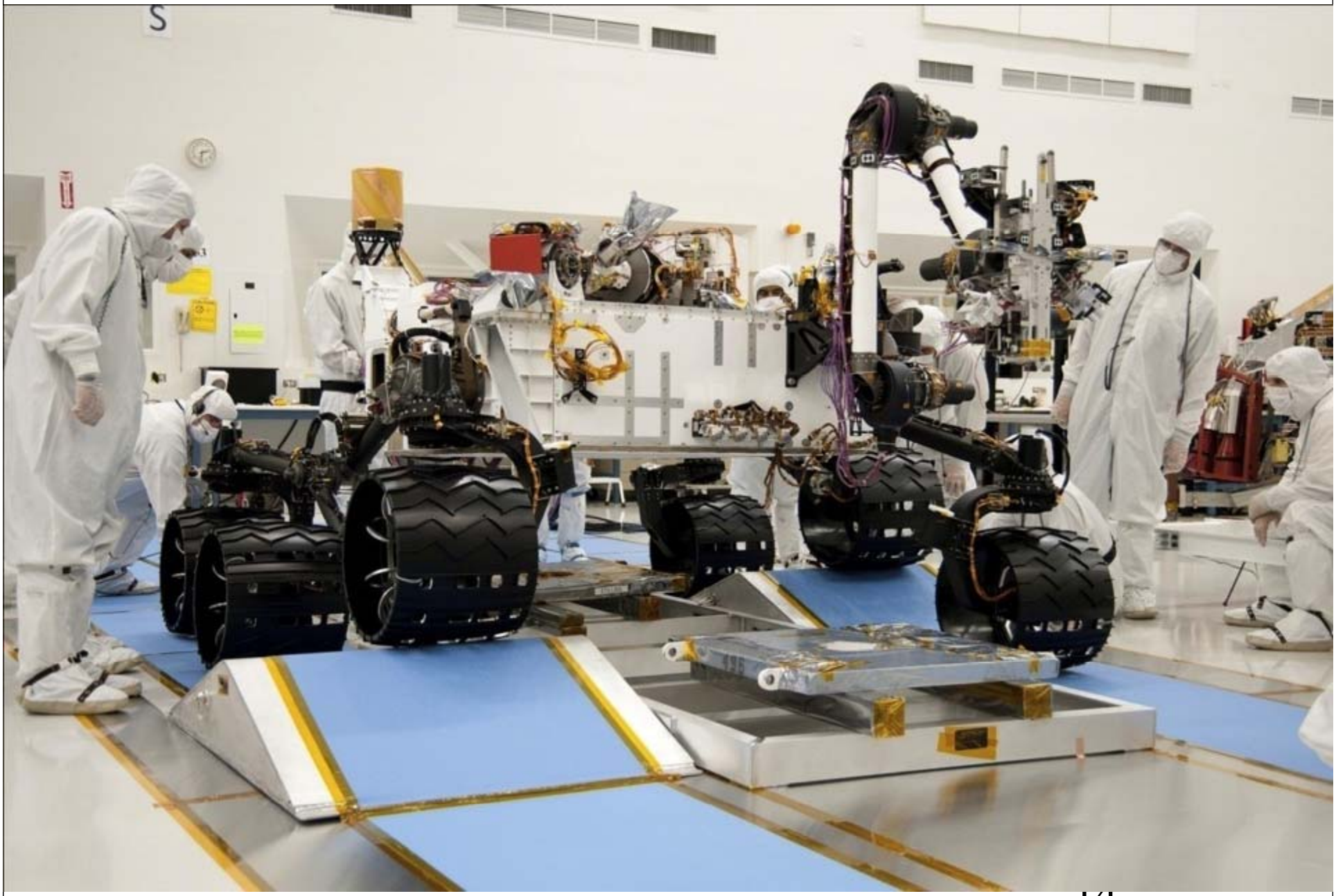
RAD (D. Hassler, SwRI) - High-energy radiation

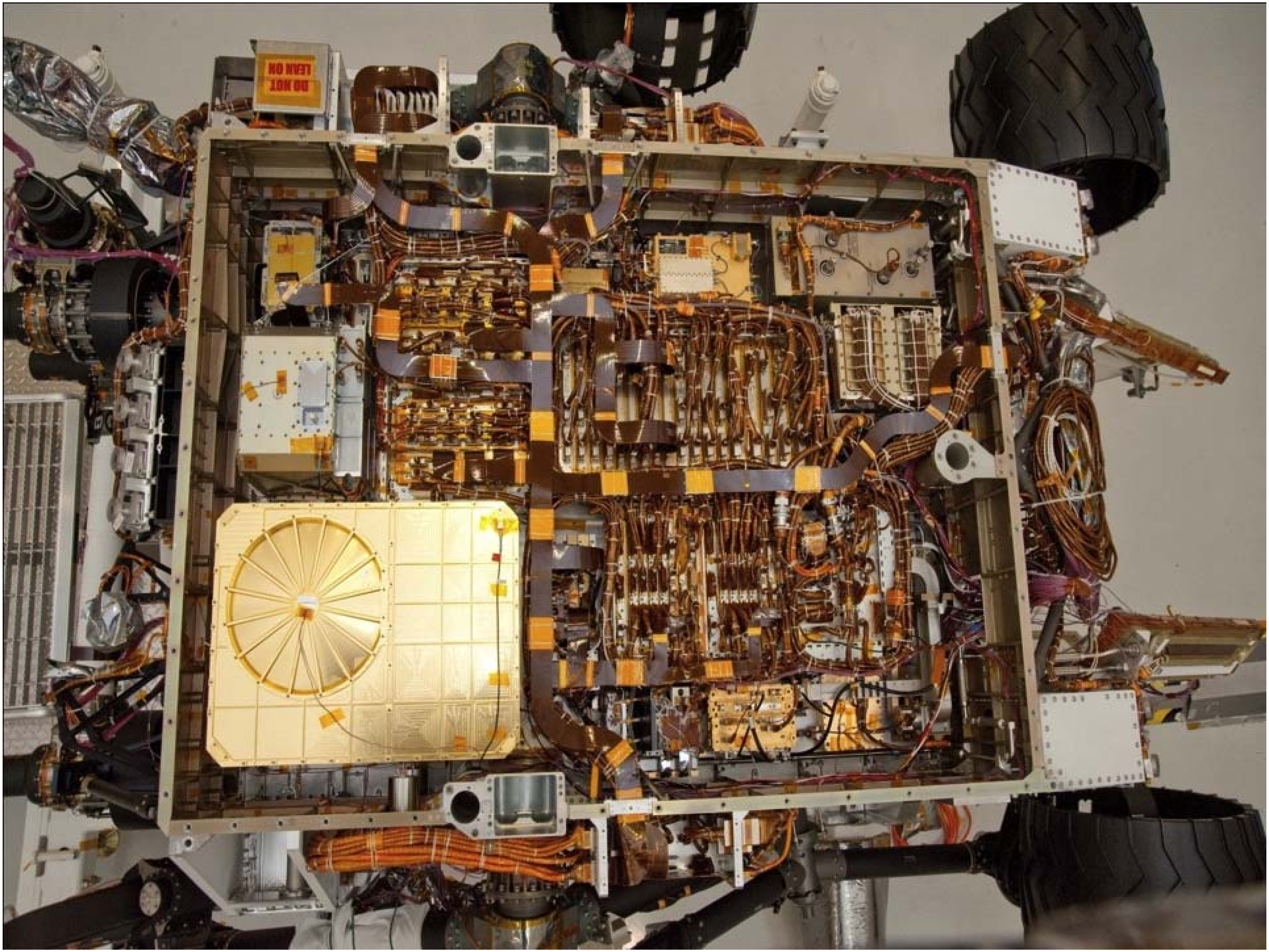
DAN (I. Mitrofanov, IKI, Russia) - Subsurface hydrogen

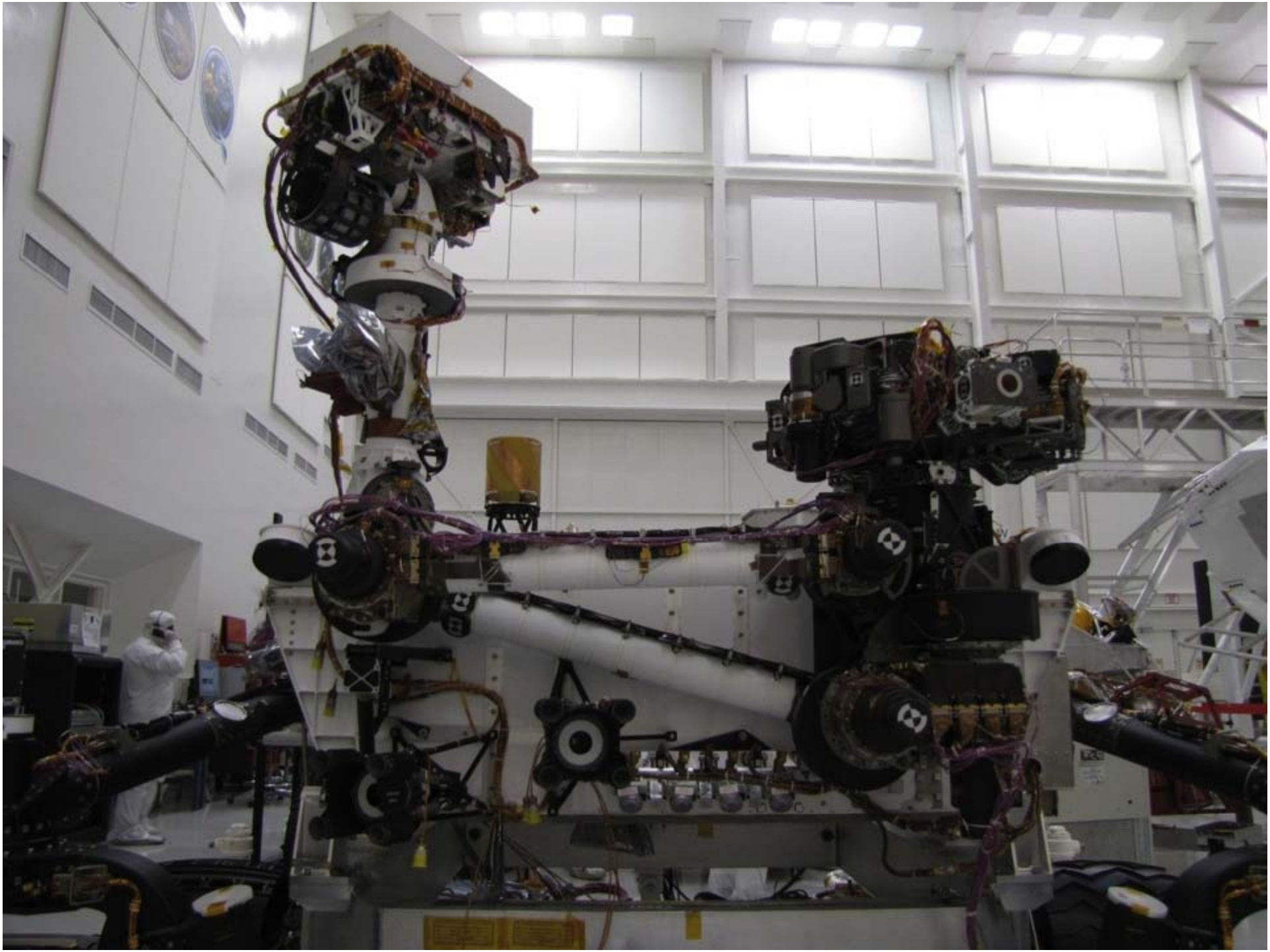
Spacecraft Assembly Facility

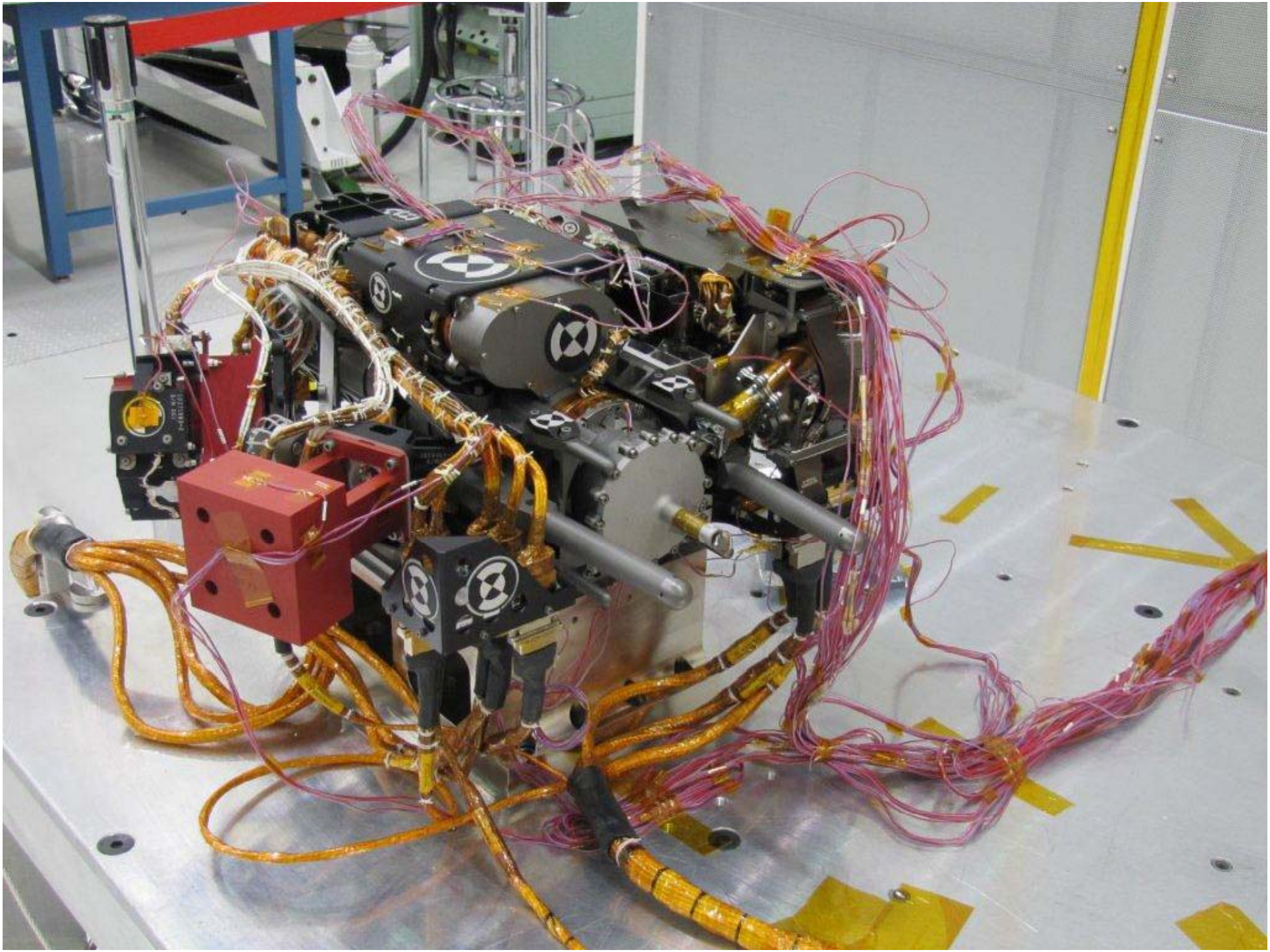

REMOVE
3-3053

FIELD TEST

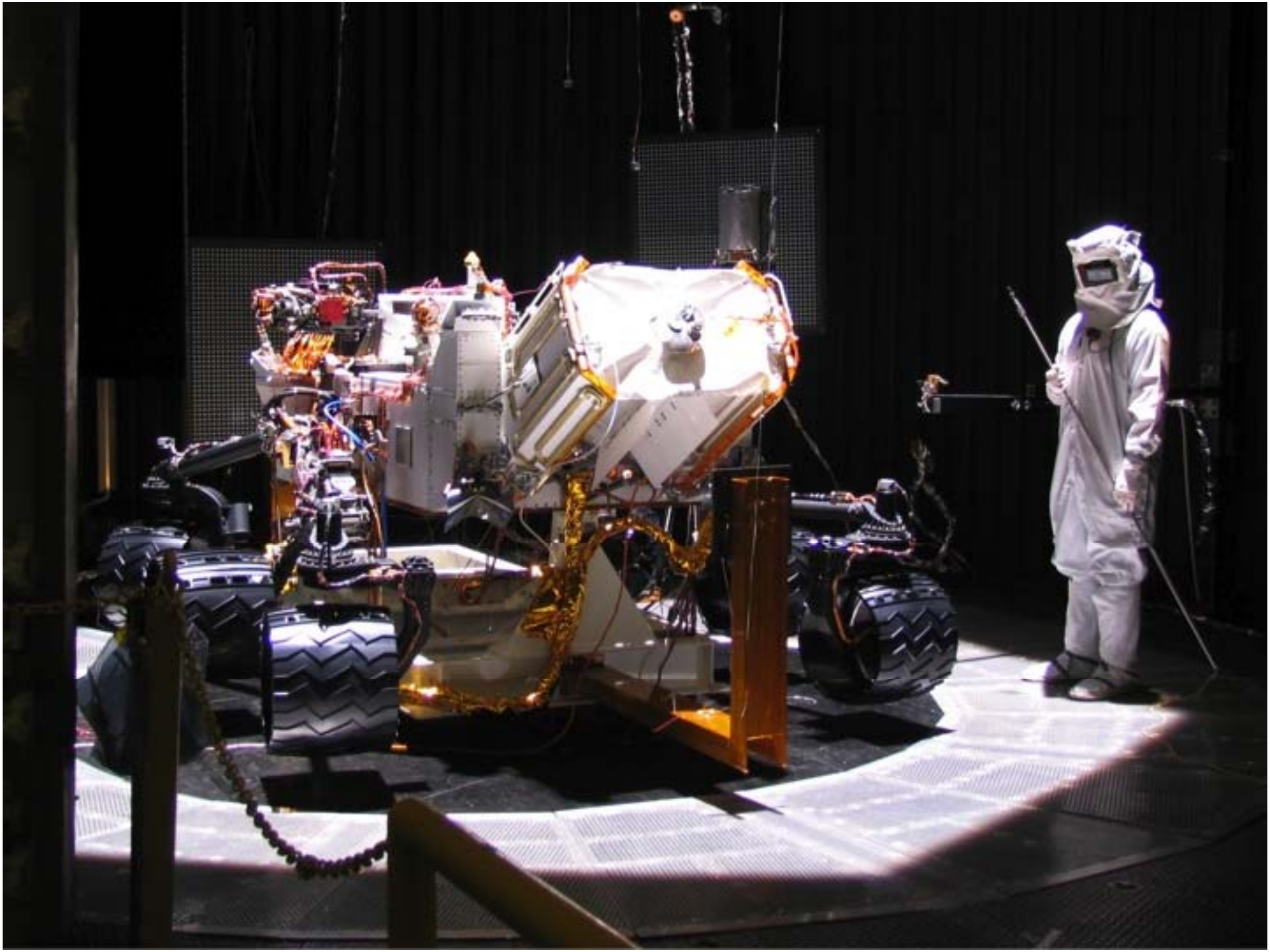



DO NOT
LEAN ON



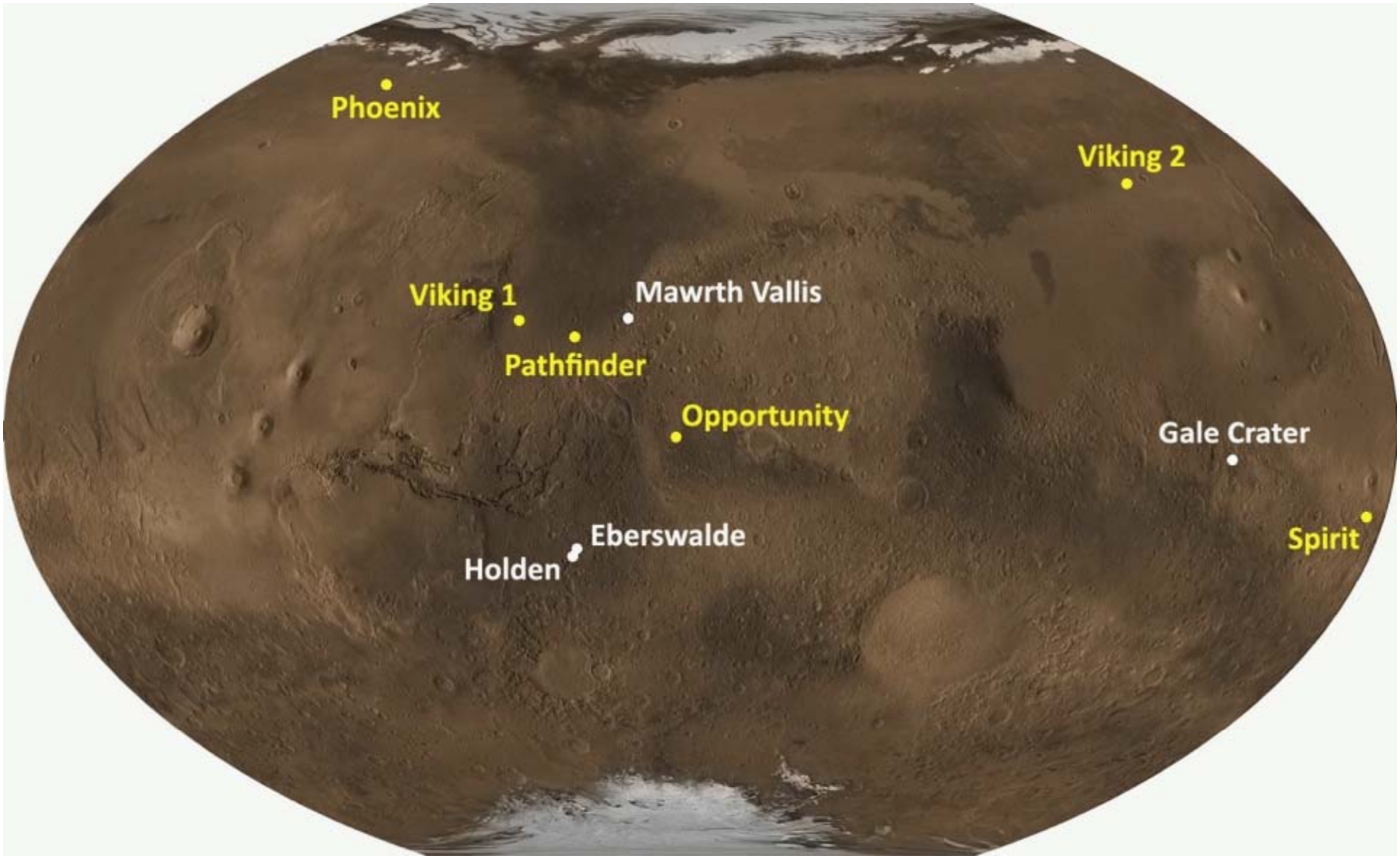


Drill – Kaolinite & Saddleback

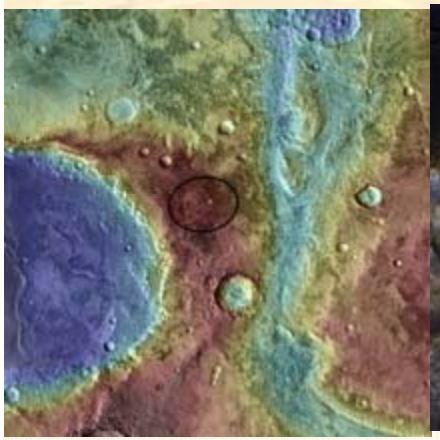


Candidate Landing Sites

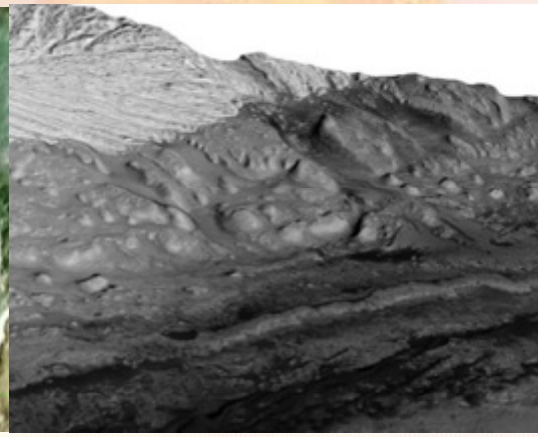
Candidate Landing Sites



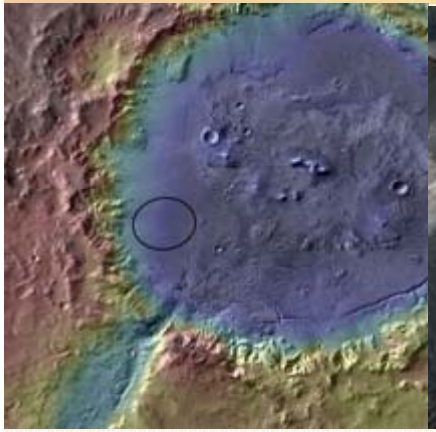
Potential MSL Field Sites




Mawrth Vallis: The oldest stratigraphic record on Mars?

Gale Crater The thickest stratigraphic section on Mars?

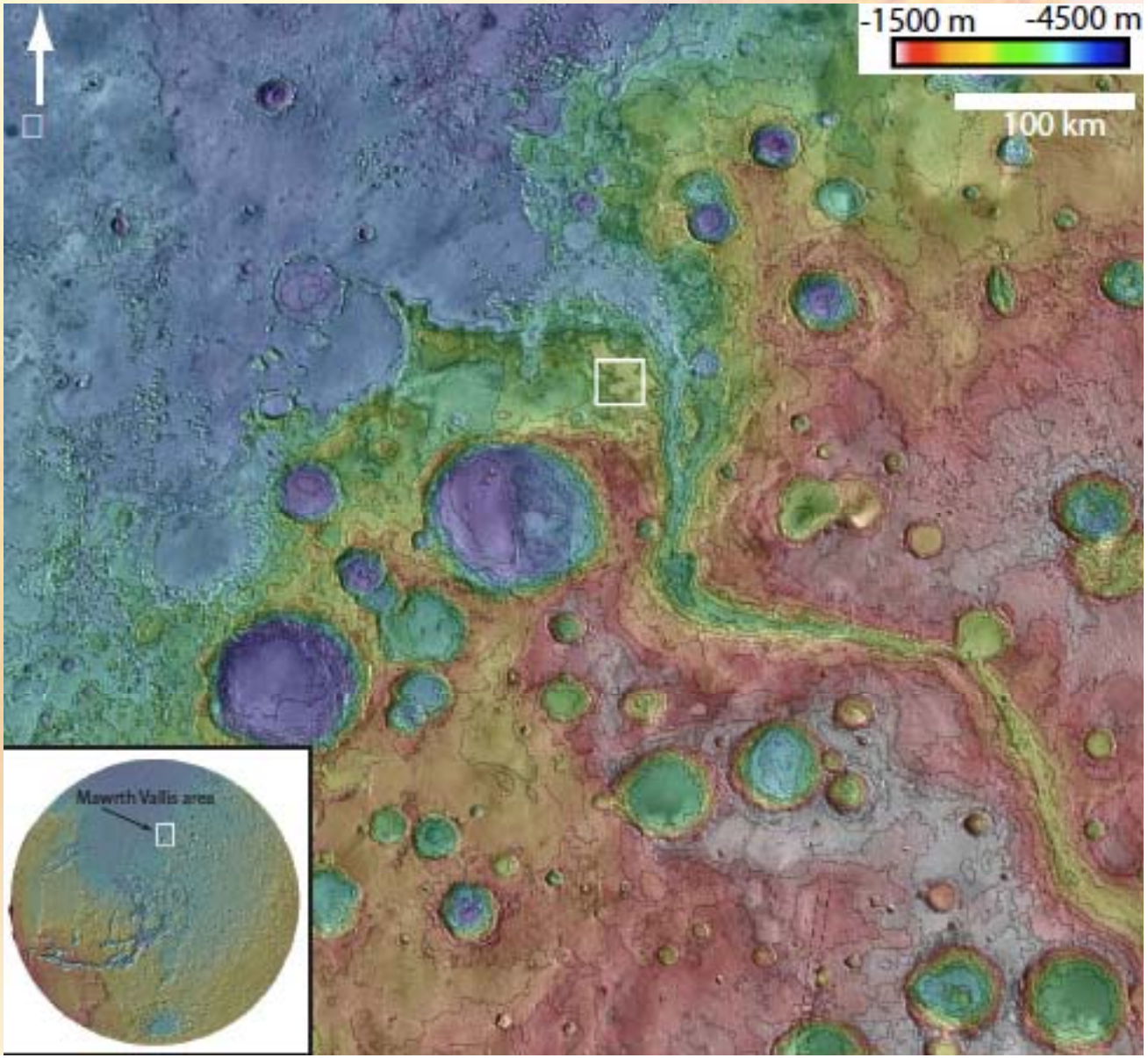


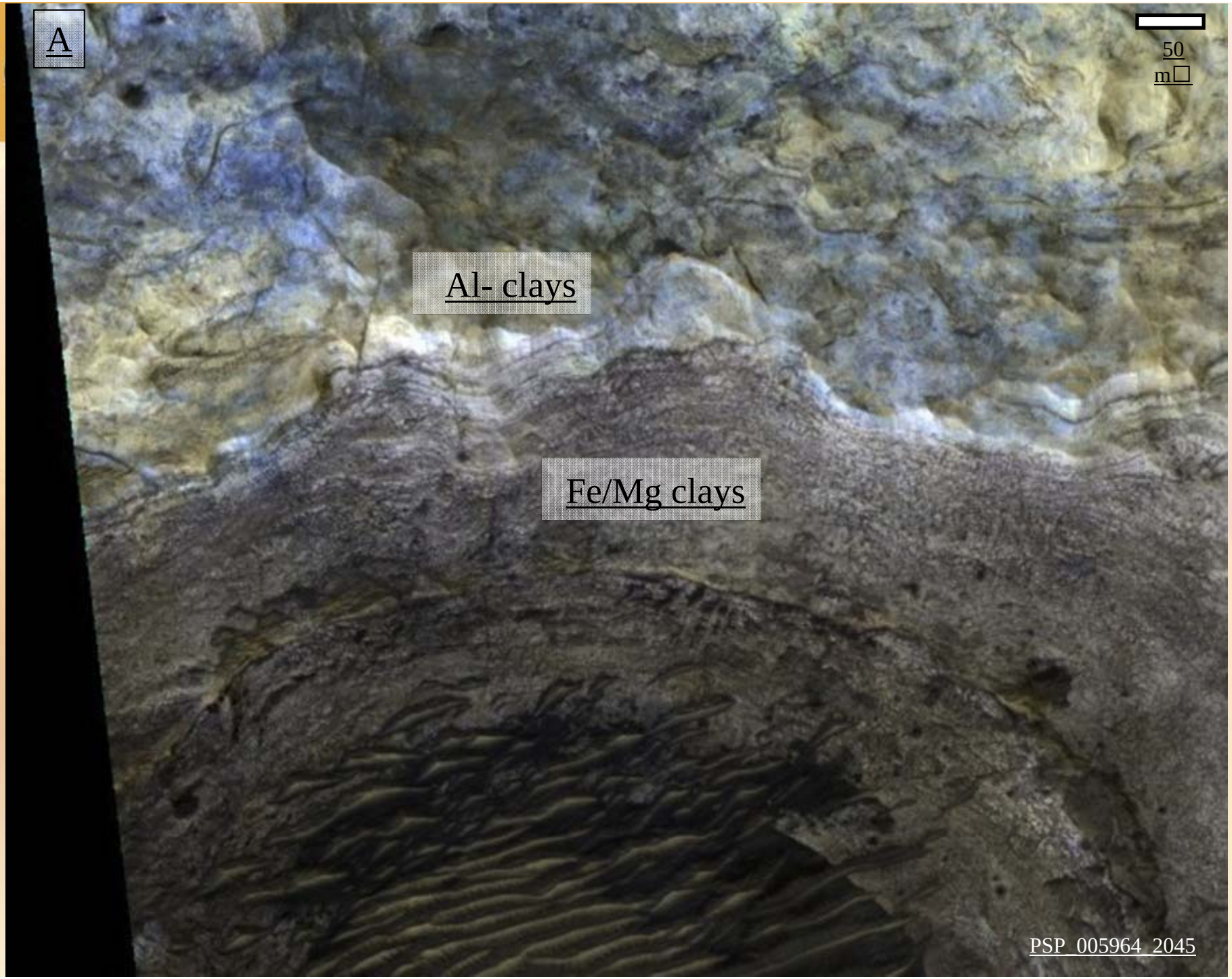

Holden Crater: The most diverse alluvial system on Mars?


Eberswalde Crater: The best delta on Mars?

Mawrth Vallis: Oldest Stratigraphic Section

Ancient Clay-rich Sediments near an Outflow Channel




A
50 m
Al- clays
Fe/Mg clays
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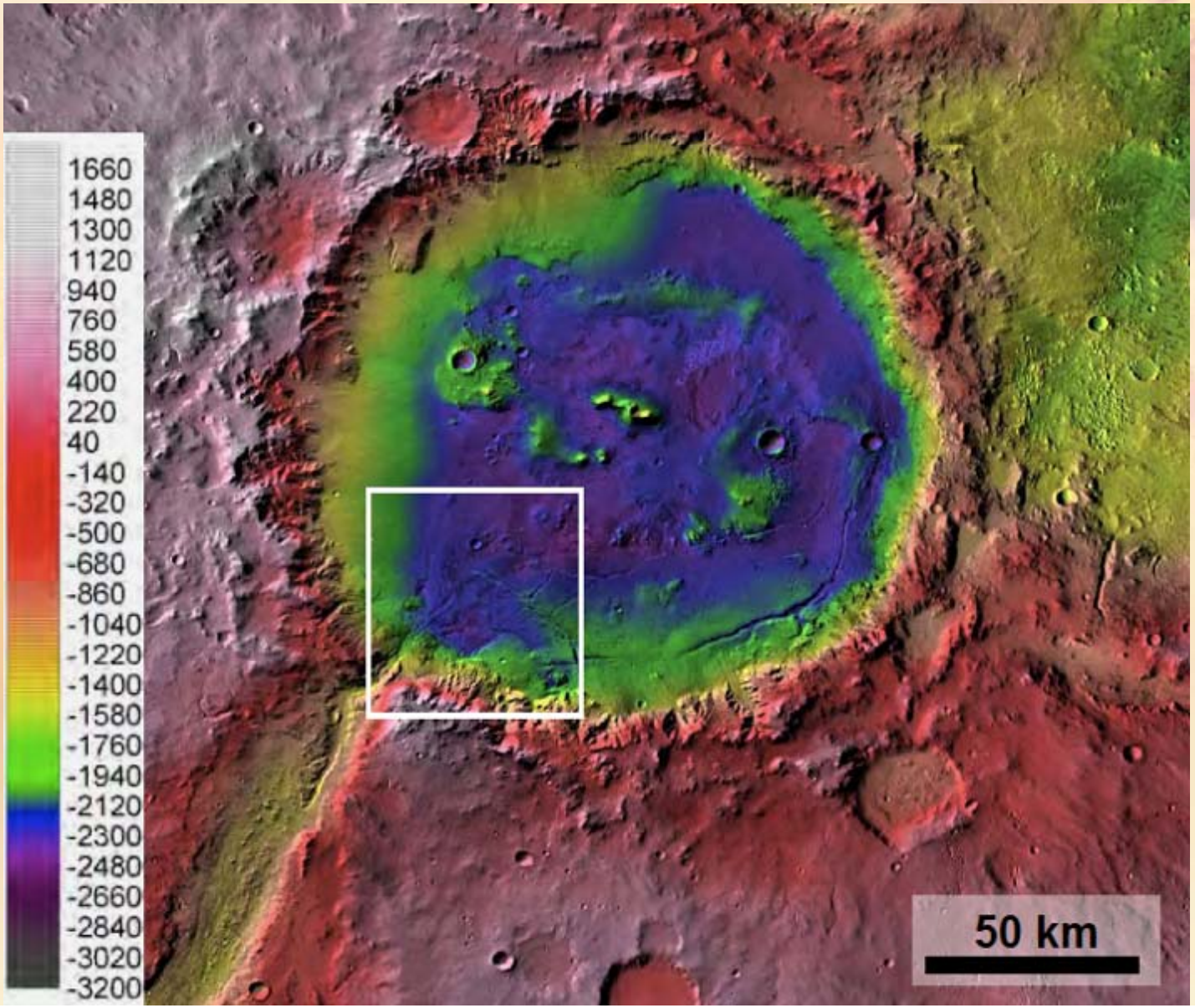
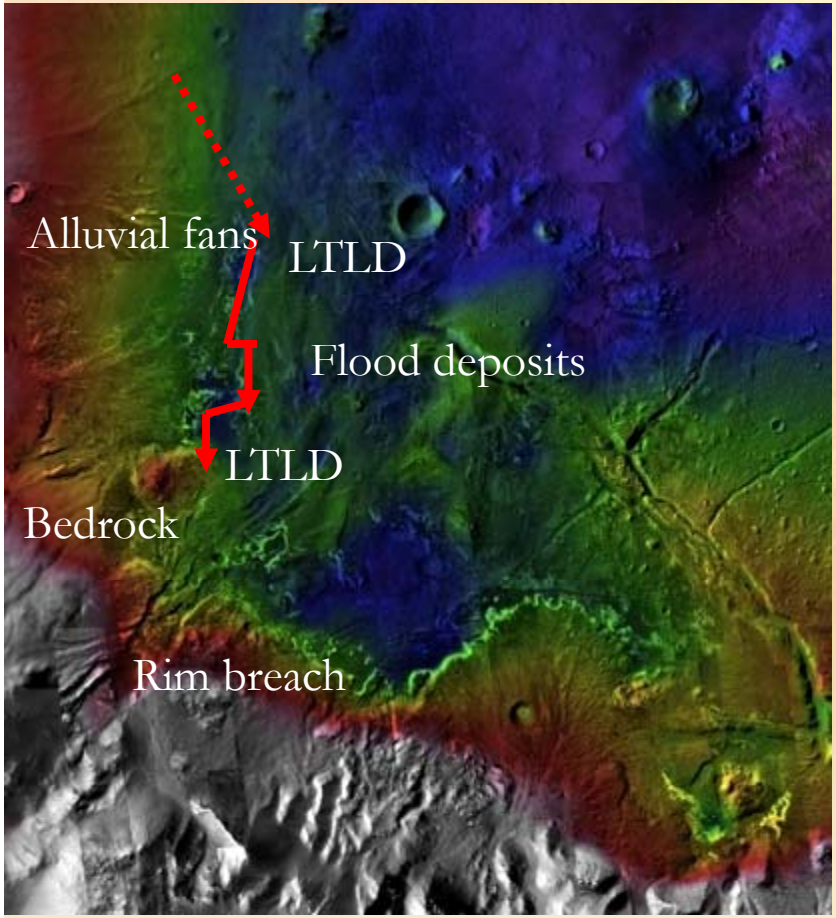
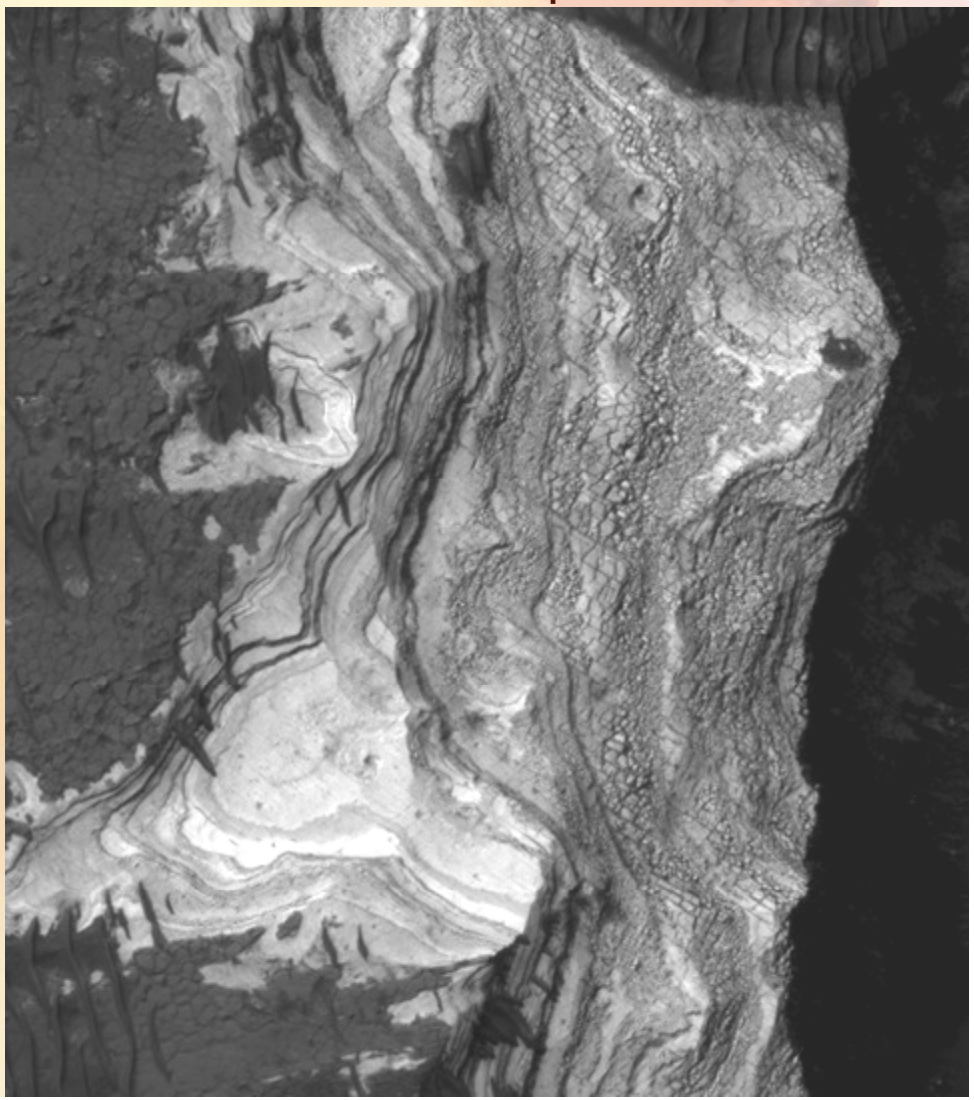
Holden Crater: Lake along Largest River System



Holden Light-toned Layered Deposits

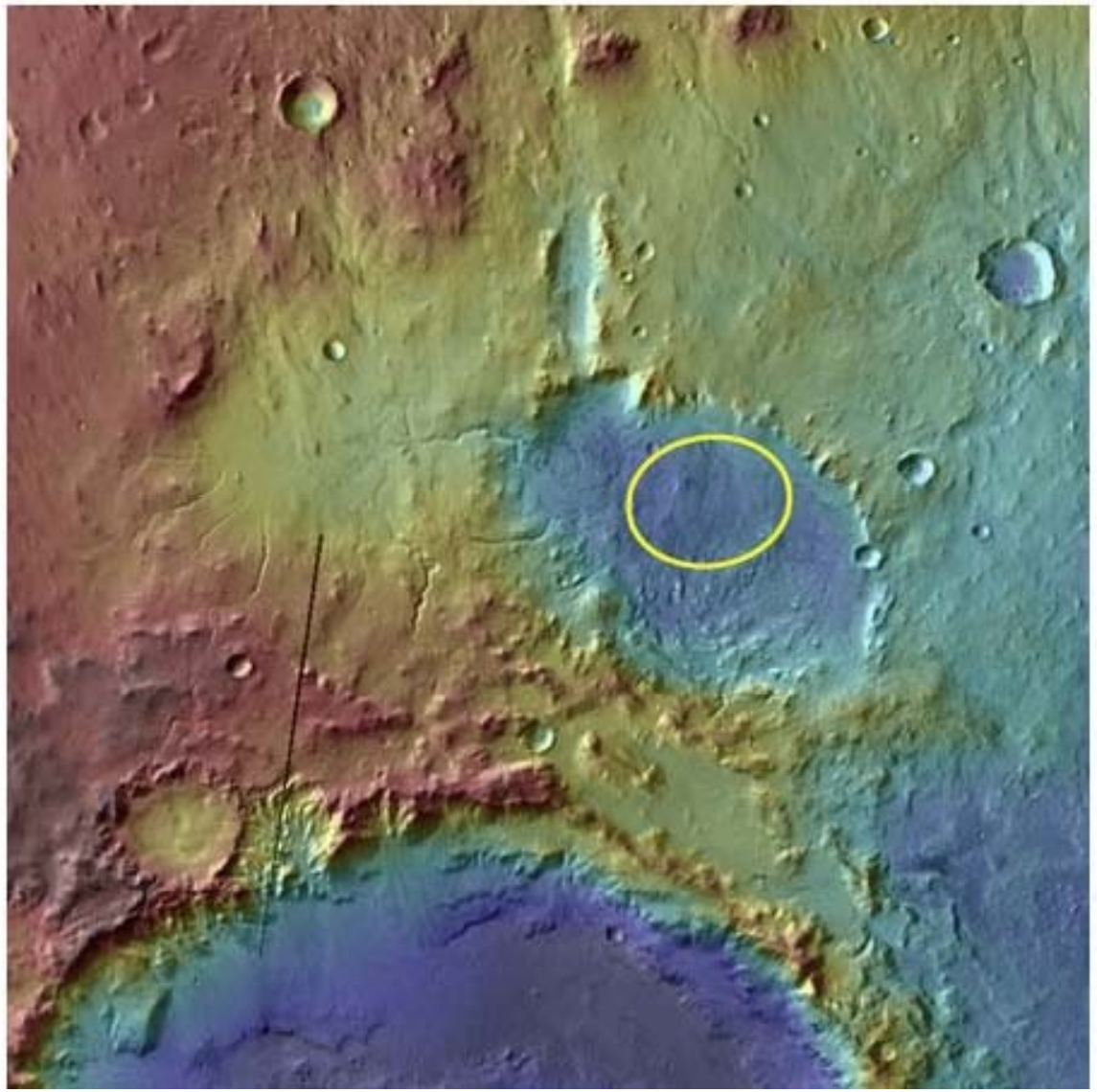
- Offers opportunity to explore 80-m thick section of light-toned layered deposits (phyllosilicate-bearing), paleolake, fan, and flood deposits, and basal materials.

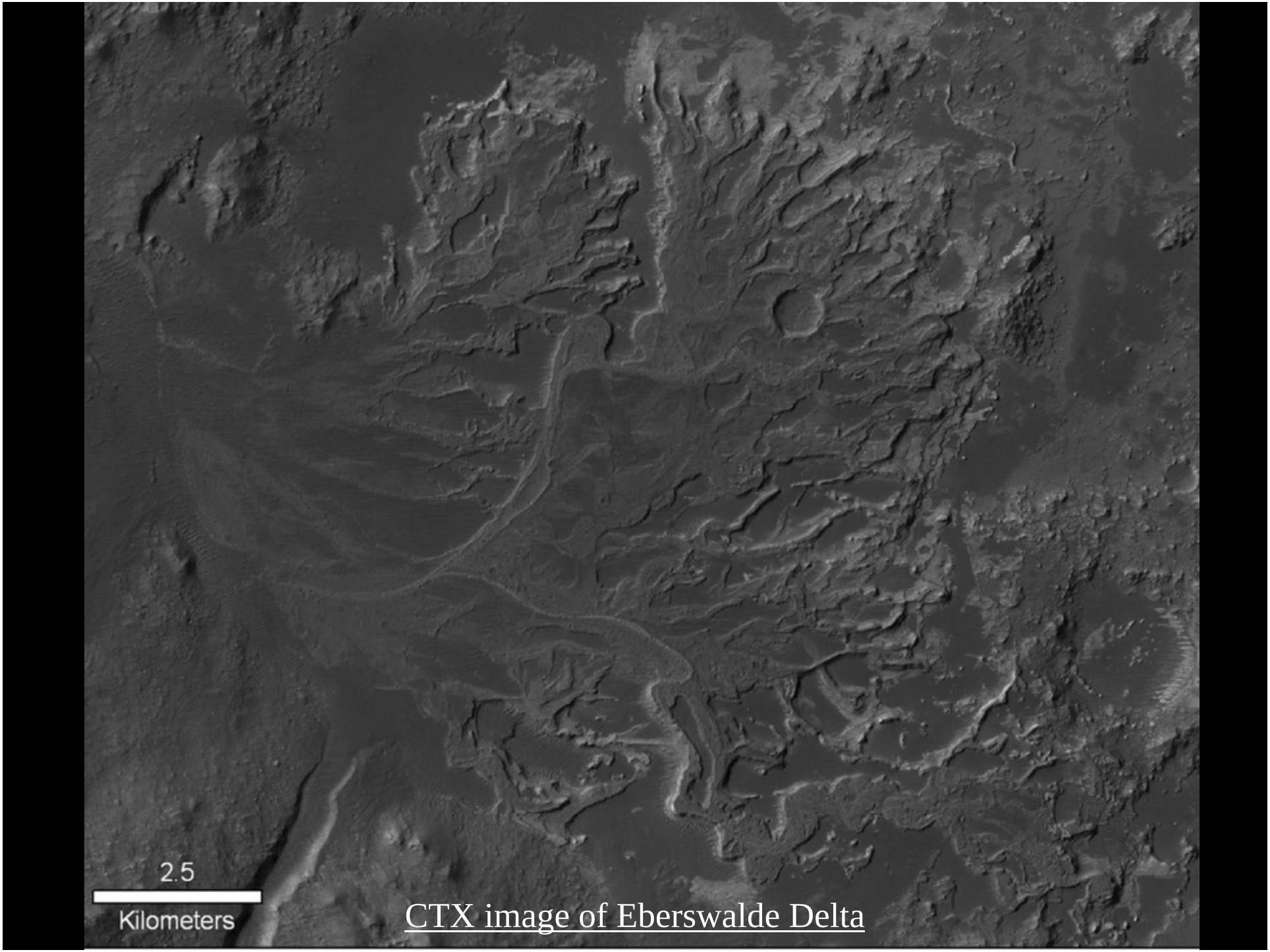




Eberswalde Crater: Best Developed Delta

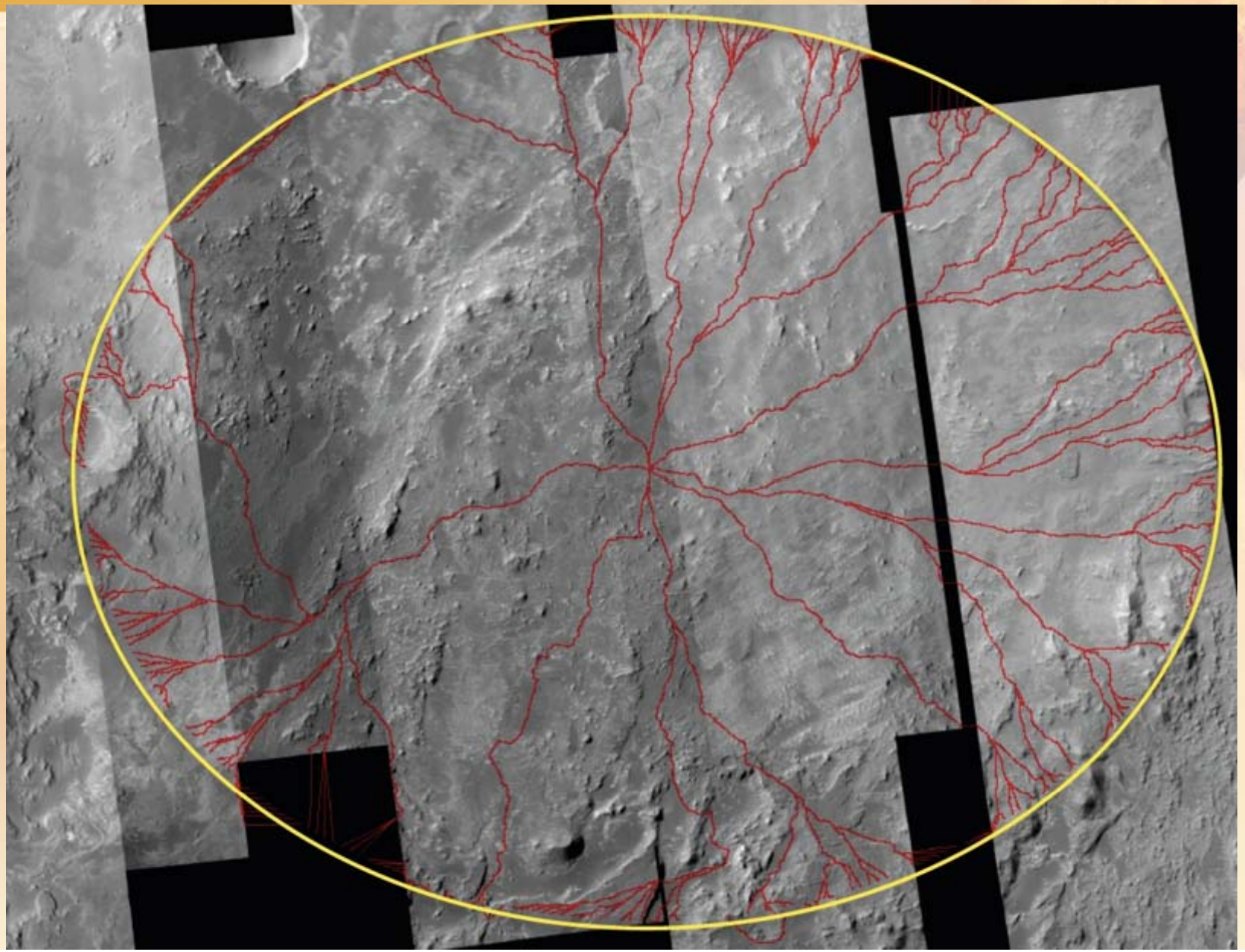
Clay-Bearing Deltaic and Paleolake Deposits within closed basin





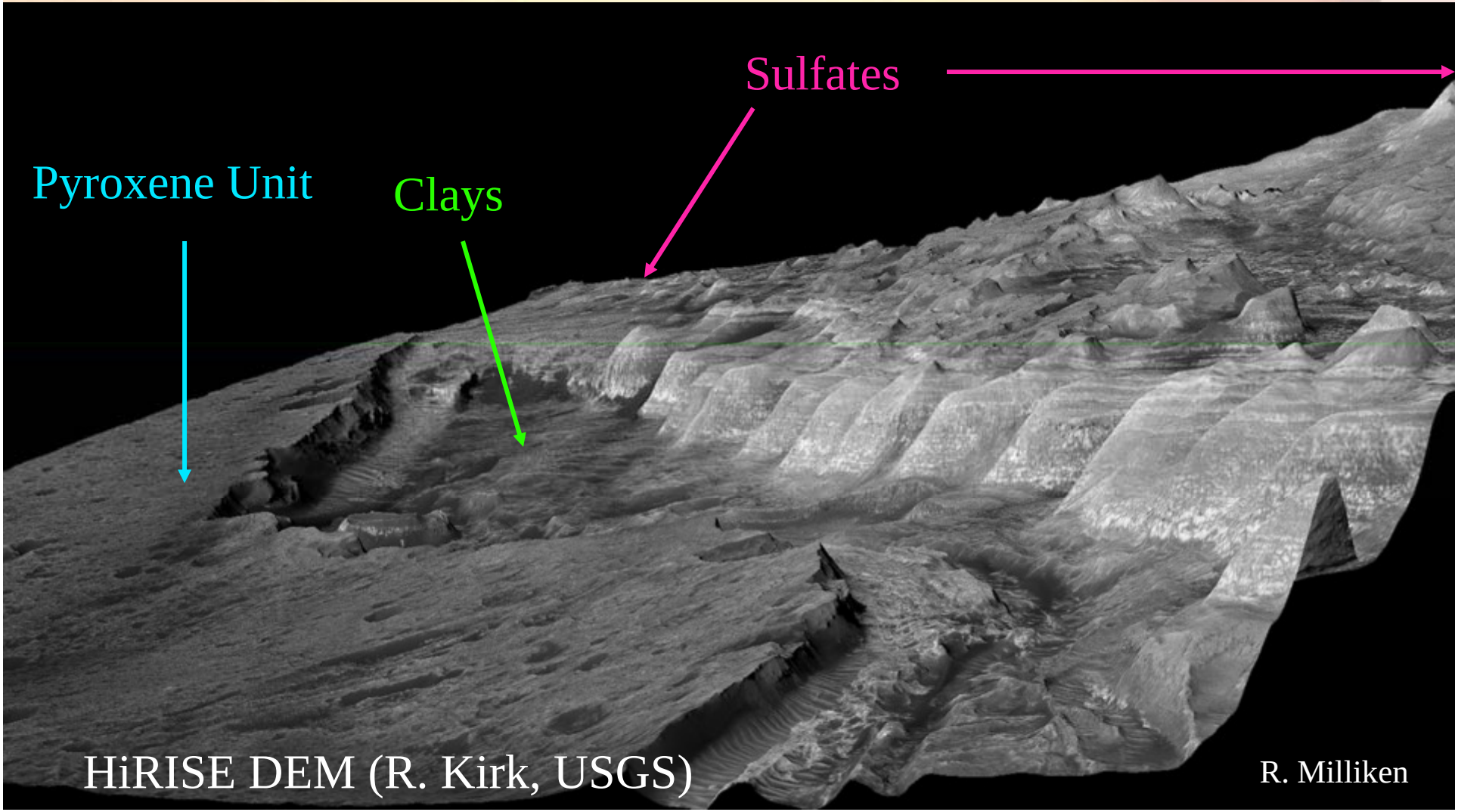
CTX image of Eberswalde Delta

Traversibility Within Landing Site Ellipses



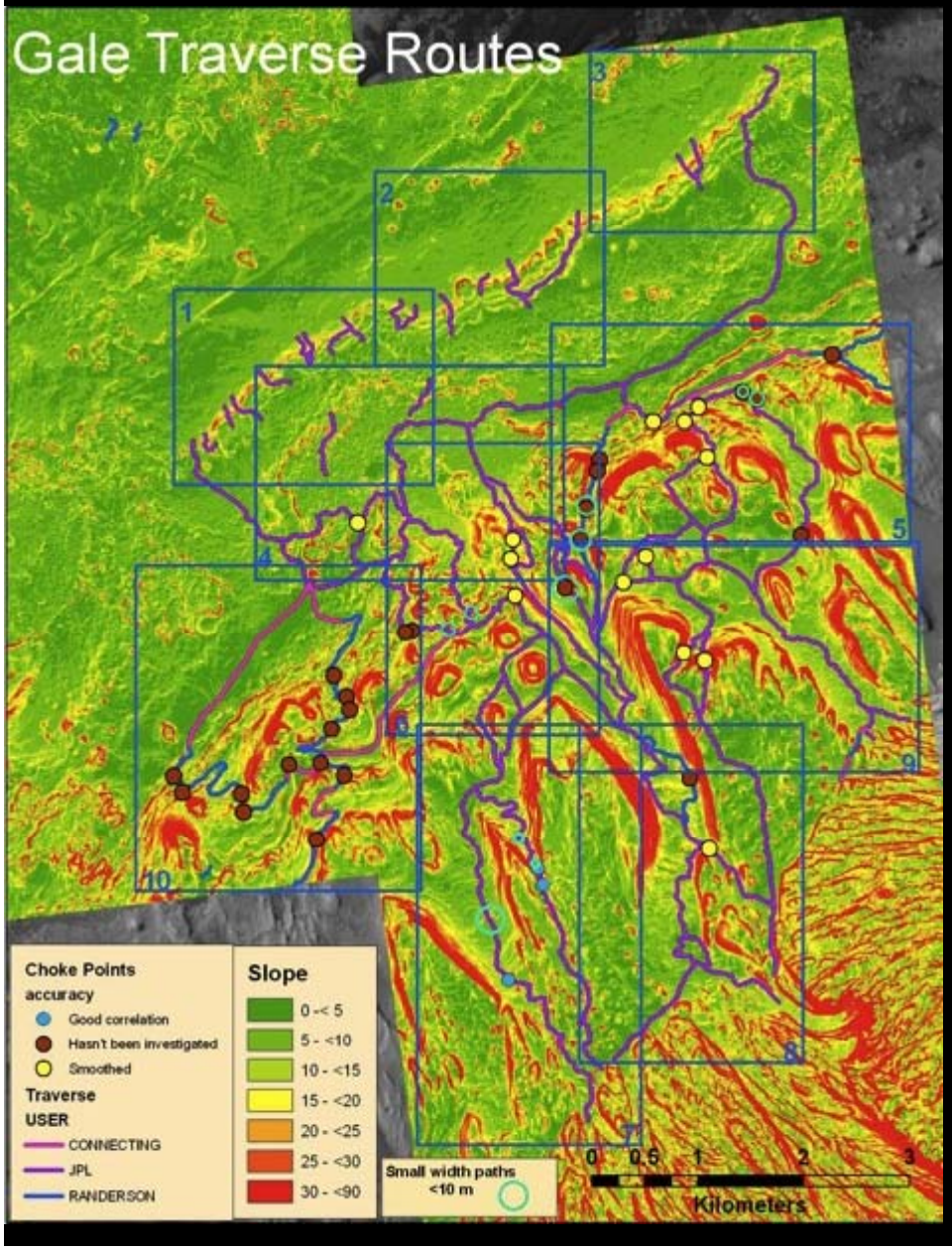
Gale Crater: Thickest Stratigraphic Section

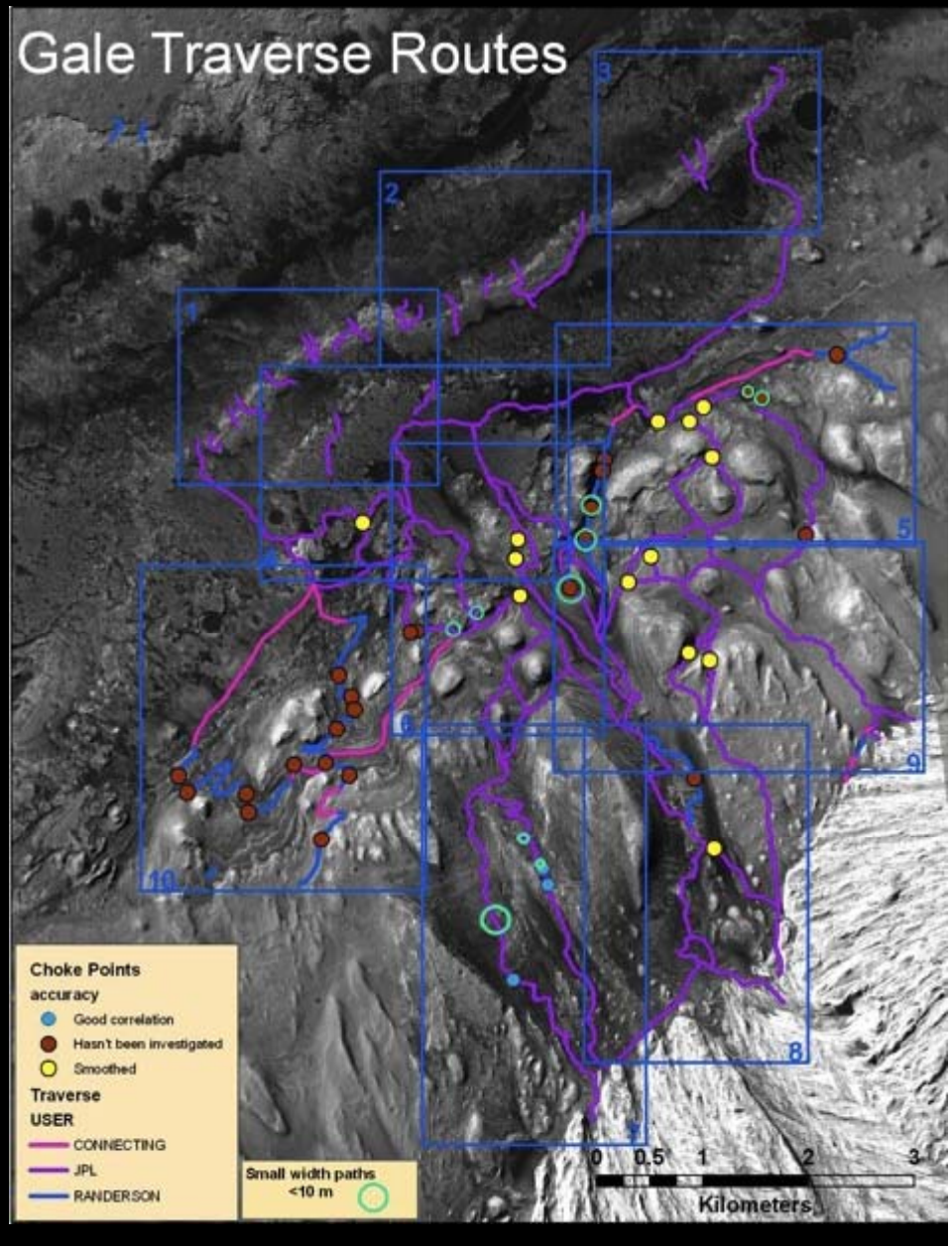
Sulfates Stratigraphically Above Clays?



Simulated view from Curiosity rover in landing ellipse looking toward the field area in Gale; made using MRO CTX stereopair images; no vertical exaggeration. The mound is ~15 km away in this view. Note that one would see Gale's SW wall in the distant background if this were actually taken by the MSL Mastcams on Mars.

Results of Gale Summit Team





Rover Mobility & Navigation Capability

- *MSL's Rover mobility & navigation capability is very similar to MER and is very much a combination of the Rover on Mars (mechanisms, sensors, SW) as well as the ground tools and operators.*
- *The Rover HW is fully integrated and met expected performance requirements. Curiosity has kinematics, ground pressure, speed & torque/weight ratio very similar to MER and is using same IMU and engineering camera design.*
- *Implementation of Rover mobility & navigation SW and ground tools is well underway with ~6 months of development to go. Full scale testing/training program is starting this summer and is planned to continue until landing in August 2012.*
- *The MSL Project (Science and Engineering) is currently developing processes to evaluate and potentially develop additional on-board SW and ground tools beyond planned MER-like capability to increase reliability and performance.*