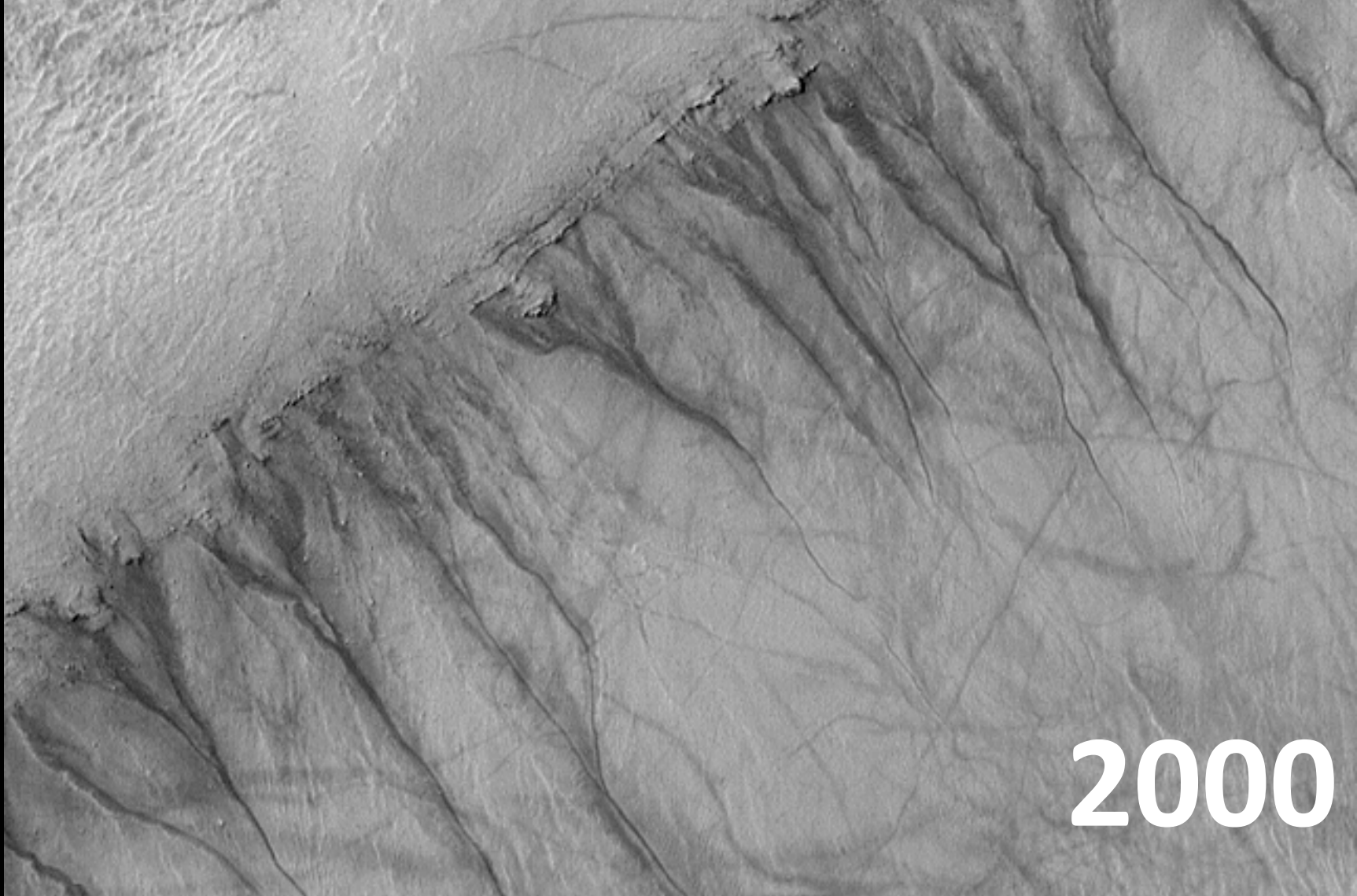
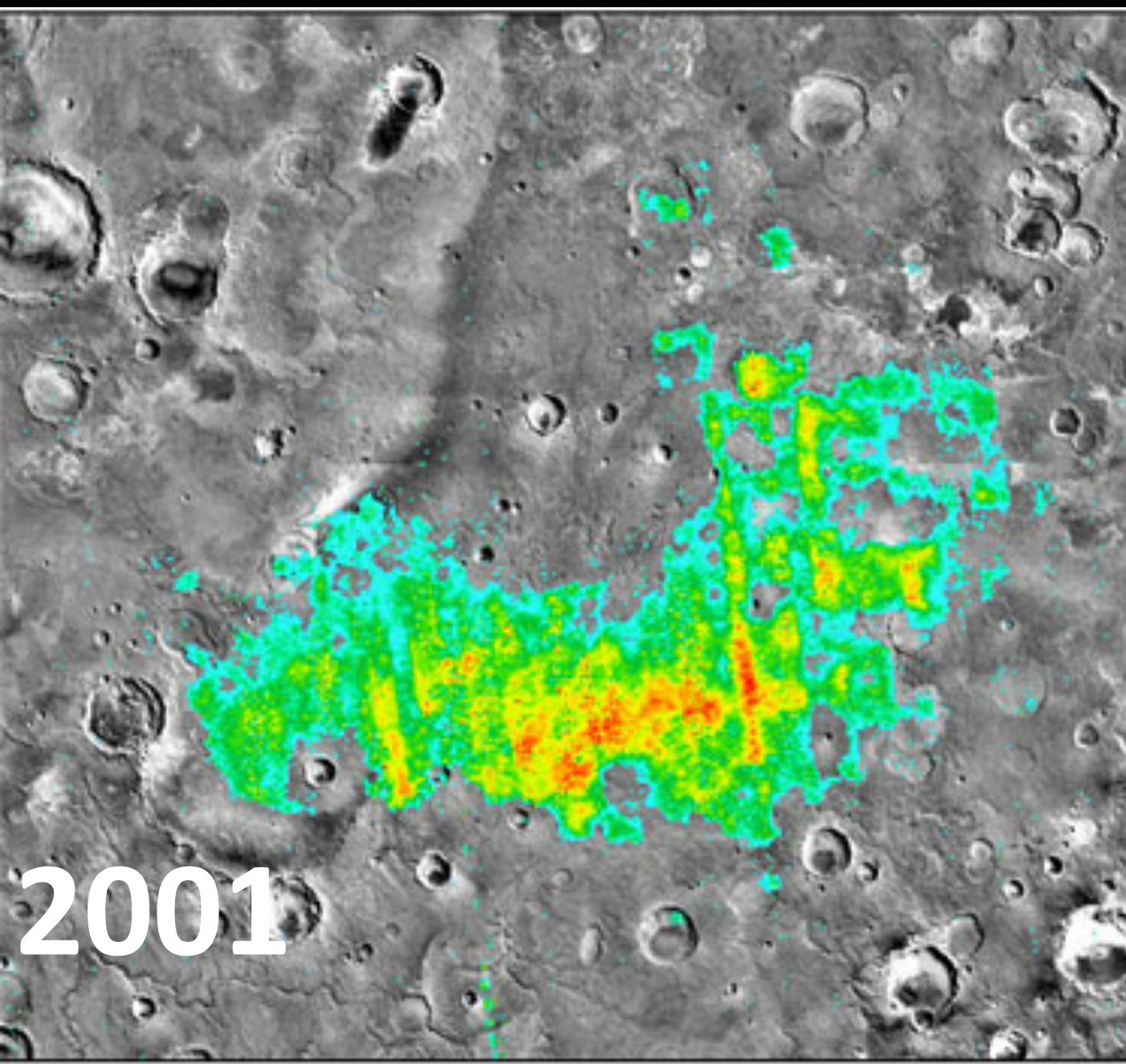


1978



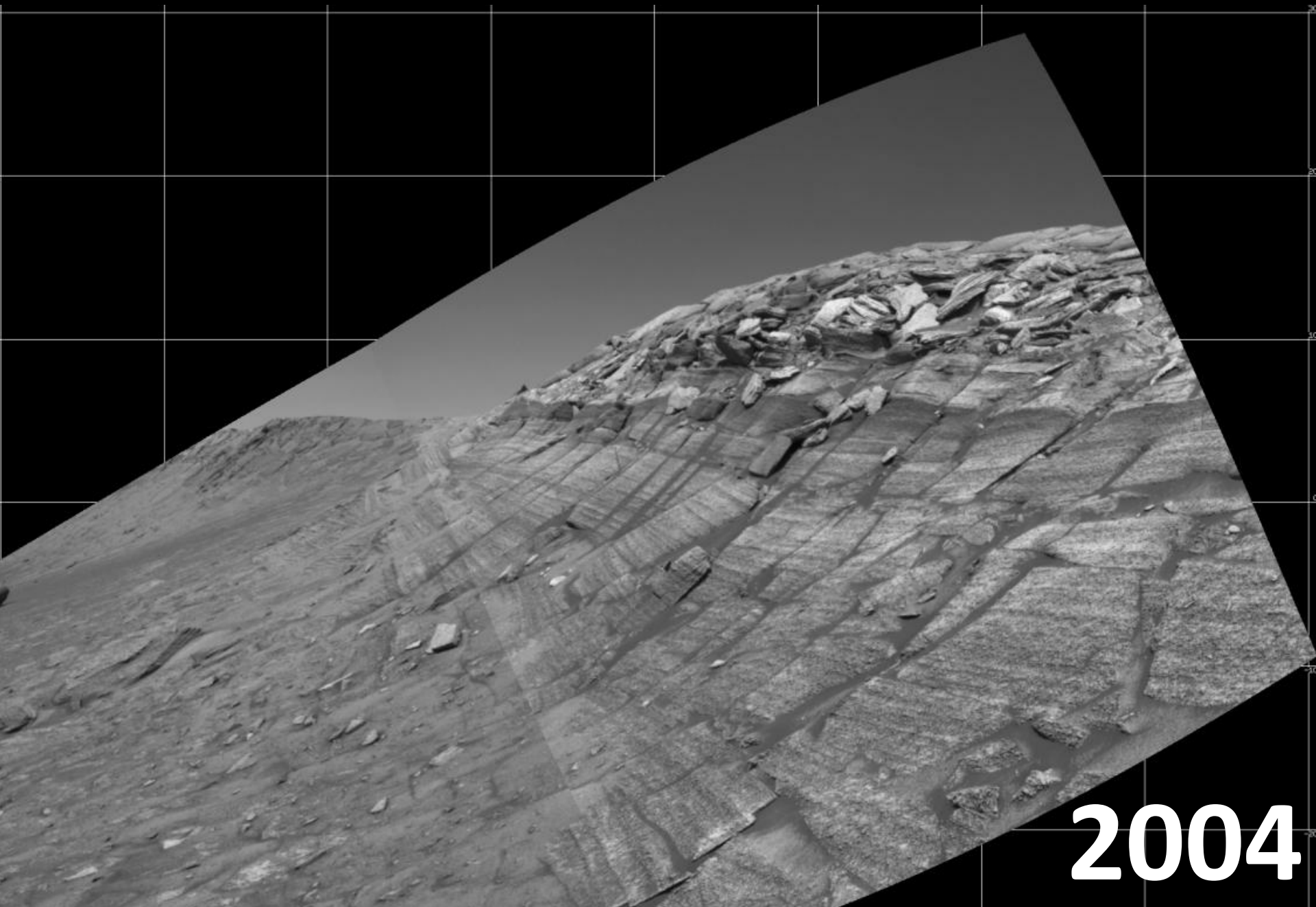
2000

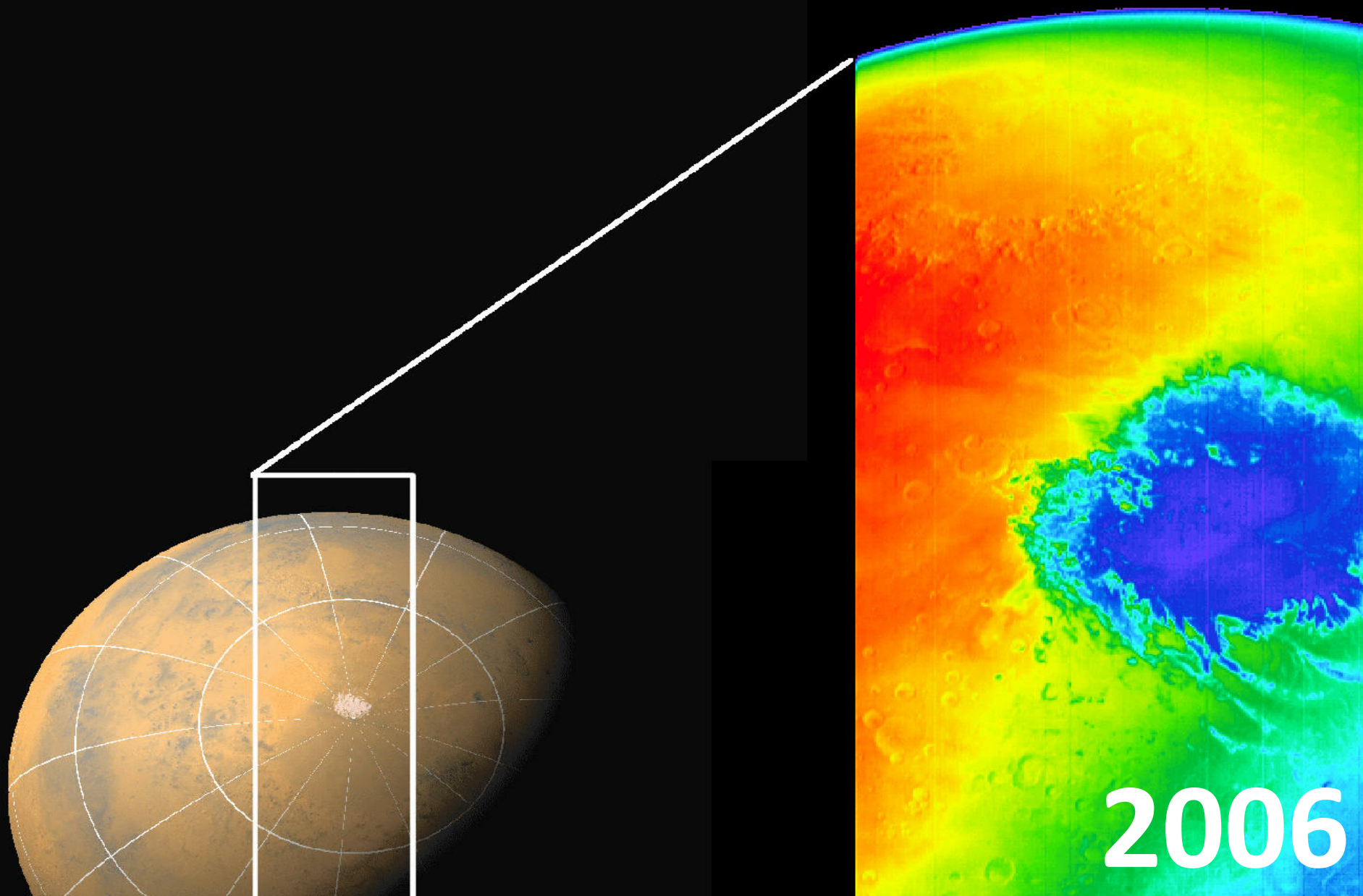


2001



2004





SOL 20



SOL 24



2008



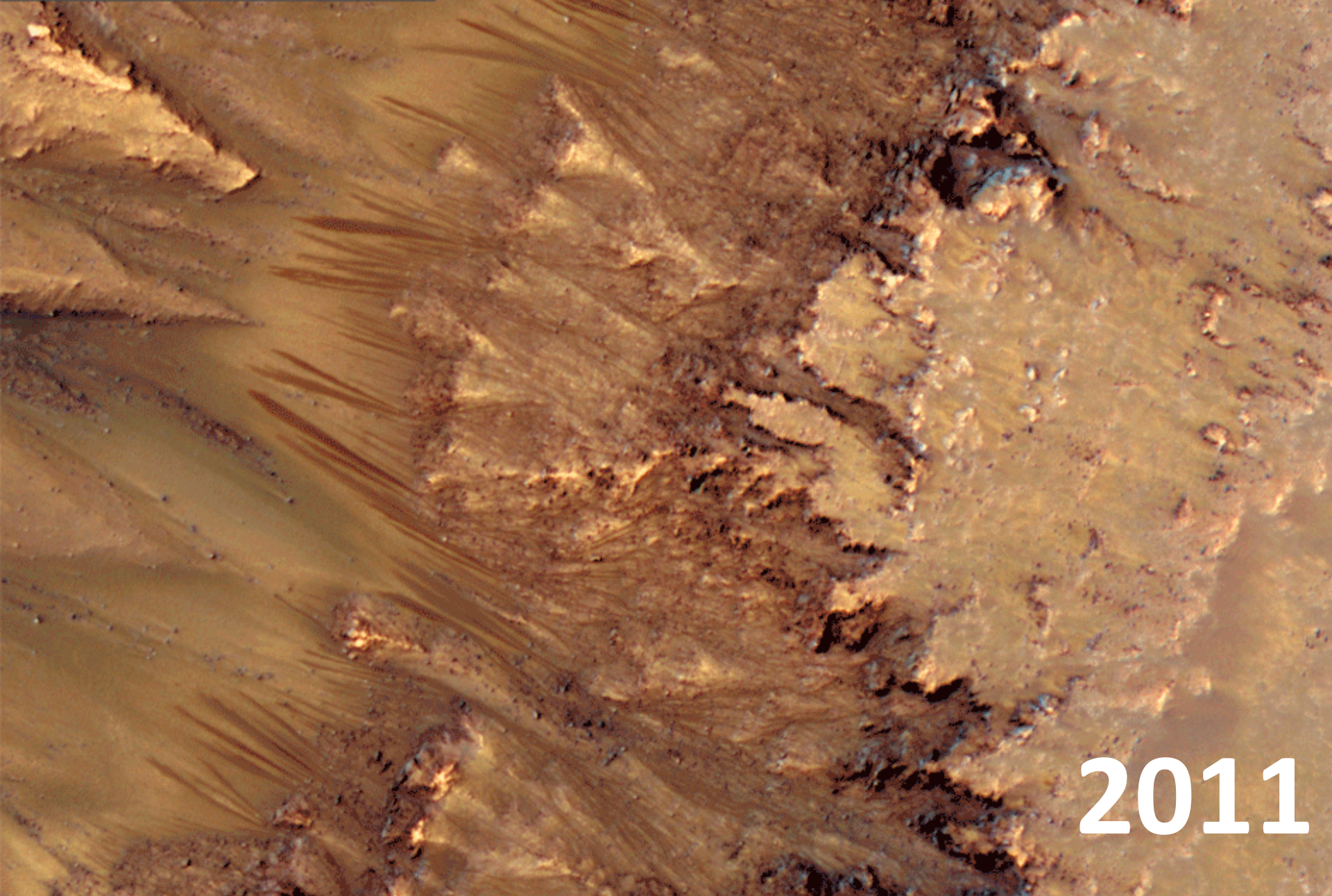
2011



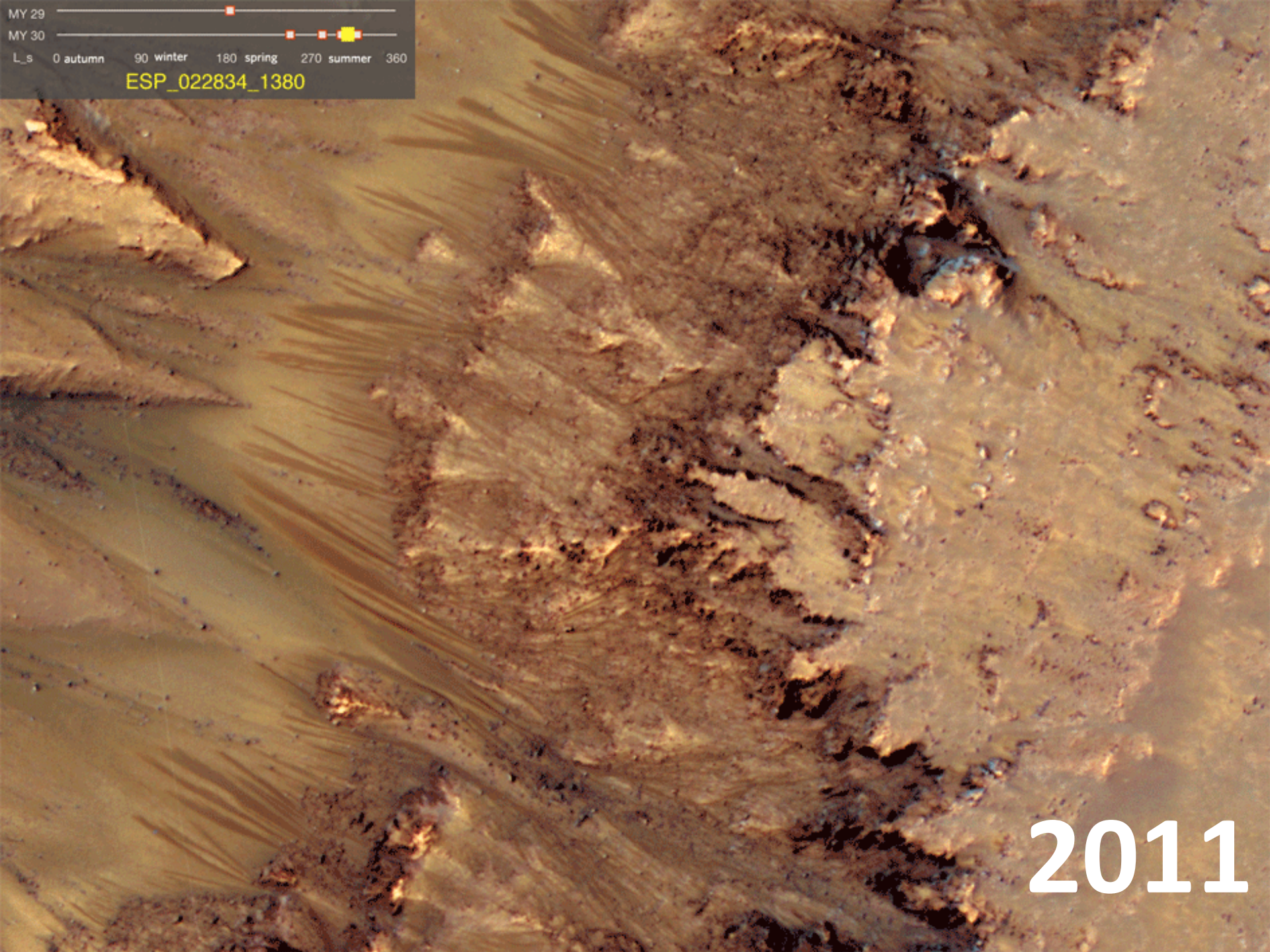
2011



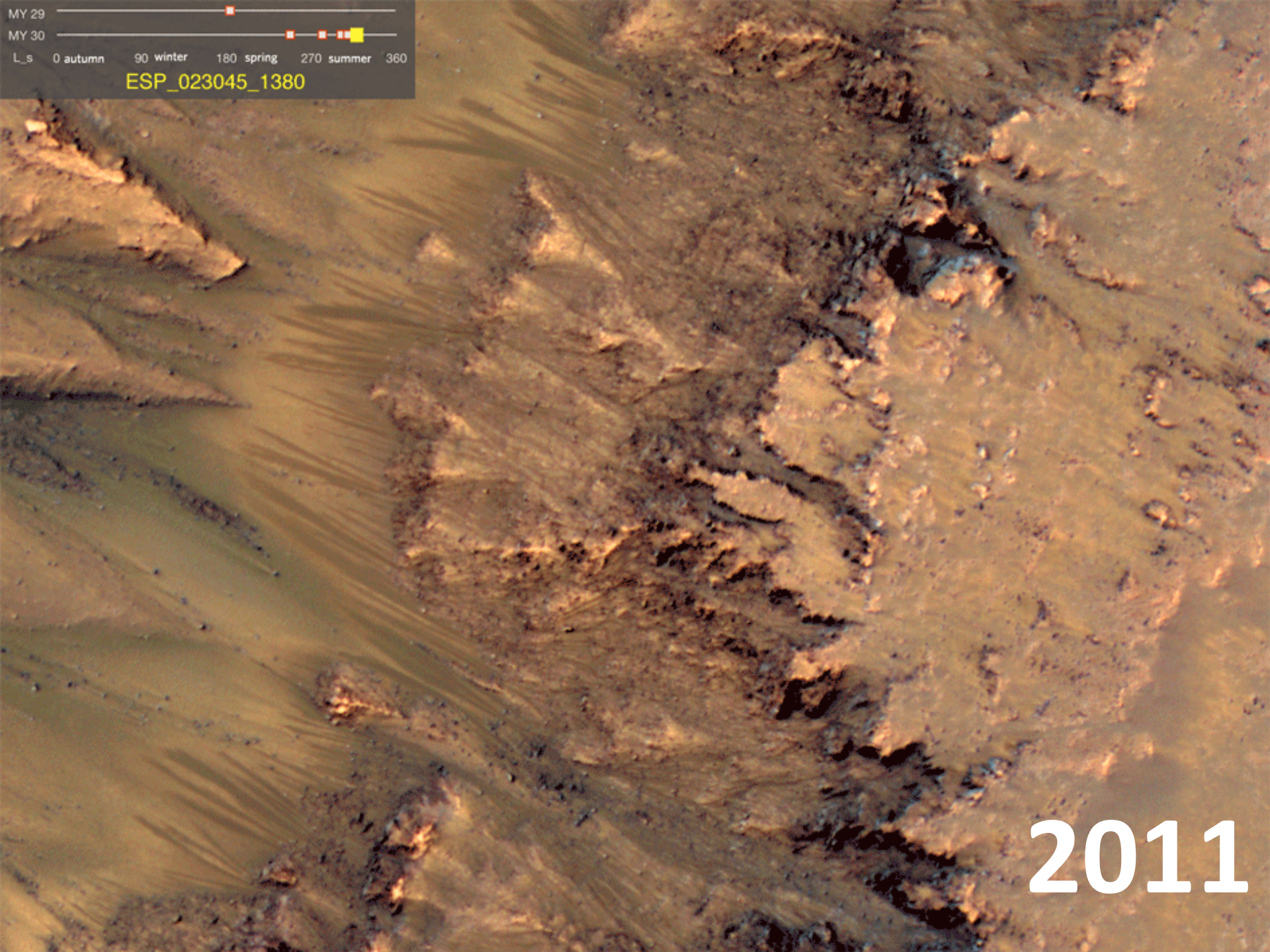
2011



2011



2011



2011

What have we learned by "following the water?"

- There has been a history of water at the surface... or at least **very** close to the surface of Mars.
- Evidence for ancient water at/near the surface:
 - Ancient gullies and networks of "streams" (water flow)
 - Ancient mineral deposits (standing water)
- Evidence for modern water and/or ice at/near the surface:
 - Recent valley outflows, with seasonal upwelling
 - The presence of H atoms (think H₂O) near the surface
 - Ice we have dug up and watched as it

What do we want to learn after "following the water?"

- What about the **transition** between the "**wet times**" and the "**dry times**?"
 - How/why/when/where did it happen?
 - If there is/was water at and near the surface, what about the **other things life needs**?
 - What is the inventory of **organic materials** at the surface?
 - What chemicals are present for **energy**?
 - What is the **radiation** environment of Mars?
- (Astronauts should also be paying attention...)

MSL/Curiosity Science Goals

1. Determine the **mineralogical composition** of the Martian surface and near-surface geological materials.
2. Attempt to detect **chemical building blocks of life** (biosignatures).
3. **Interpret the processes** that have formed and modified rocks and soils.
4. Assess long-timescale (i.e., 4-billion-year) Martian **atmospheric evolution processes**.
5. Determine present state, distribution, and cycling of **water and carbon dioxide**.
6. Characterize the broad spectrum of **surface radiation**, including galactic radiation, cosmic radiation, solar proton events and secondary neutrons.



Mars Exploration Program

An Integrated, Strategic Program

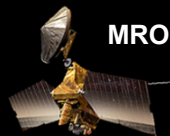
2001



2003



2005



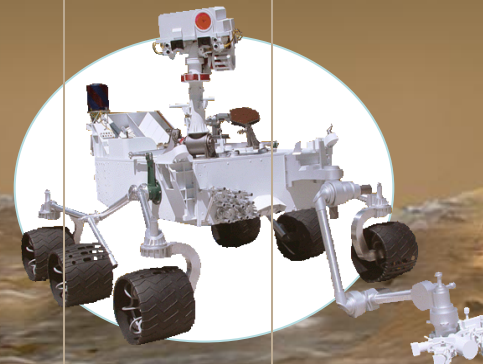
2007

Phoenix
(completed)



2009

MSL/Curiosity



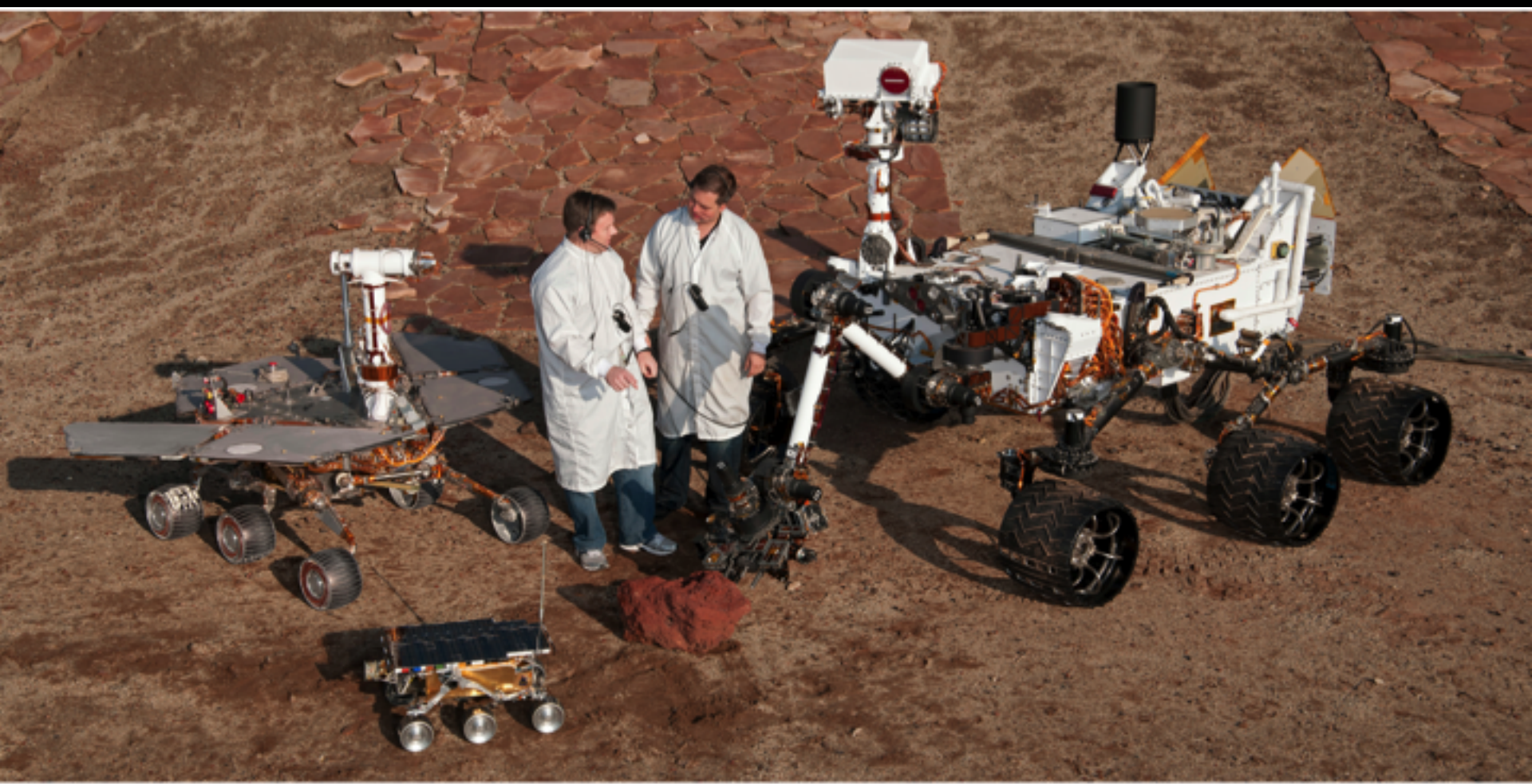
2011

2013



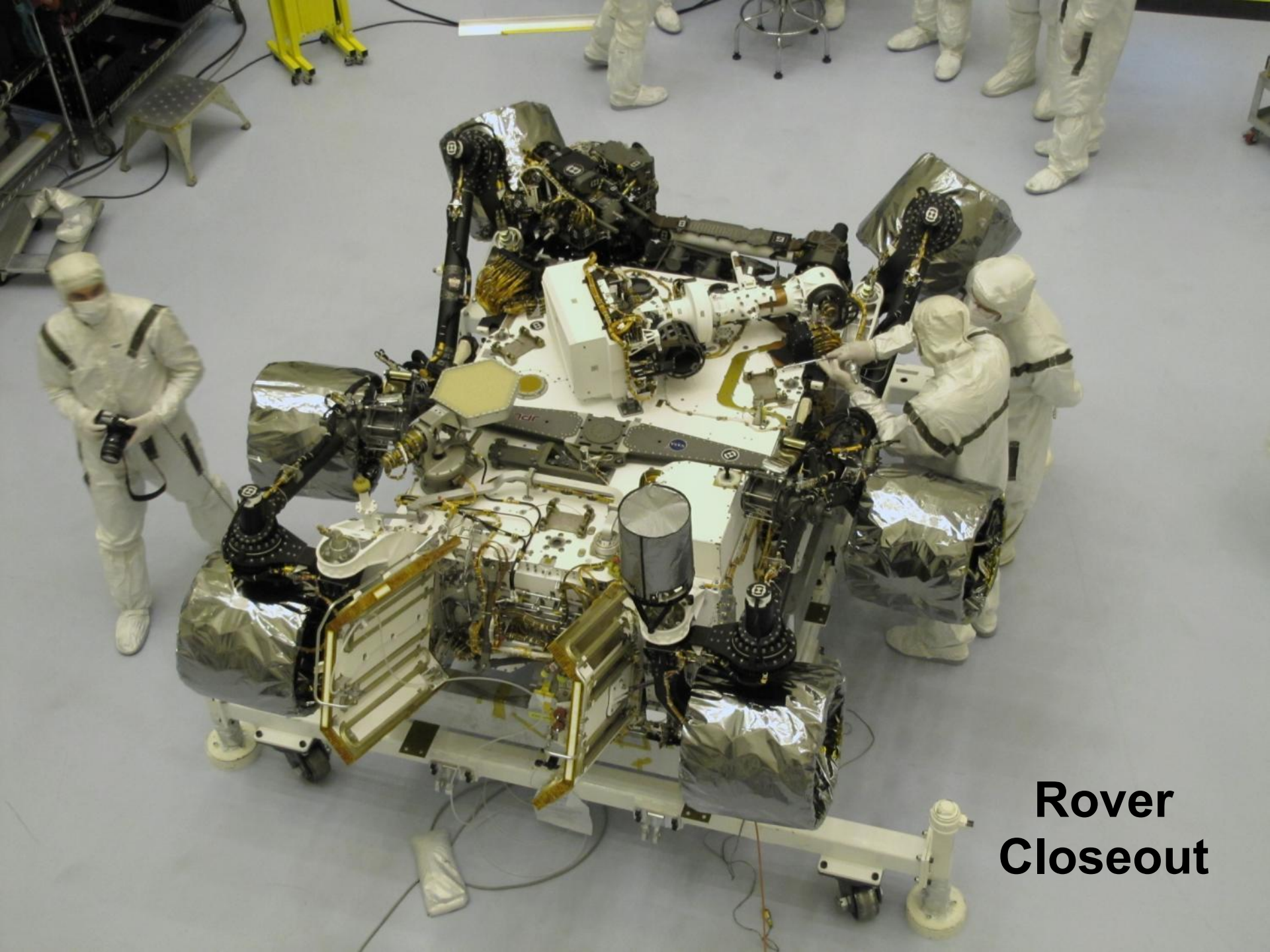
2016 & Beyond

*Mars future
planning
underway!*

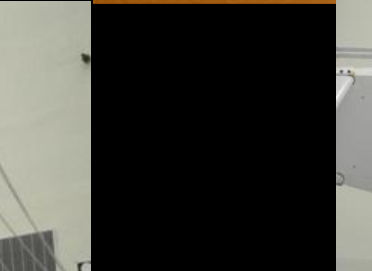


MSL “Curiosity” Rover Final Testing @ JPL





**Rover
Closeout**



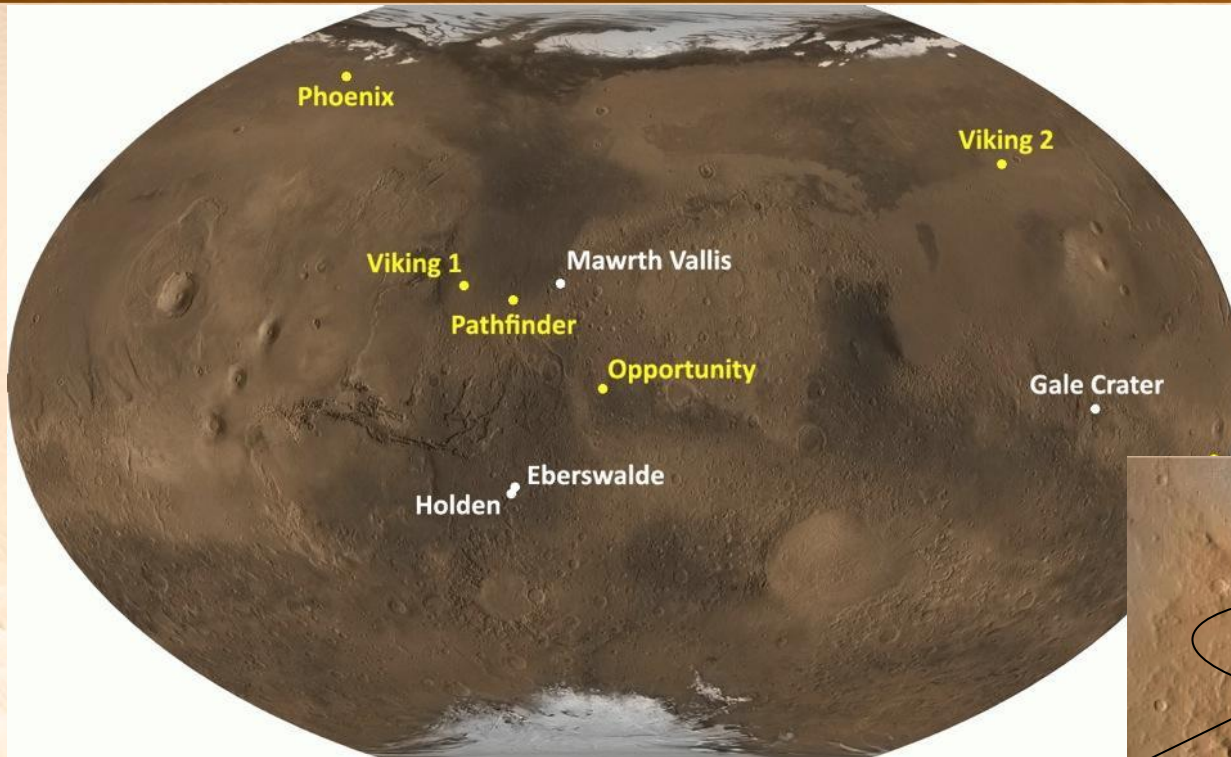
MSL/Curiosity

Path to Launch

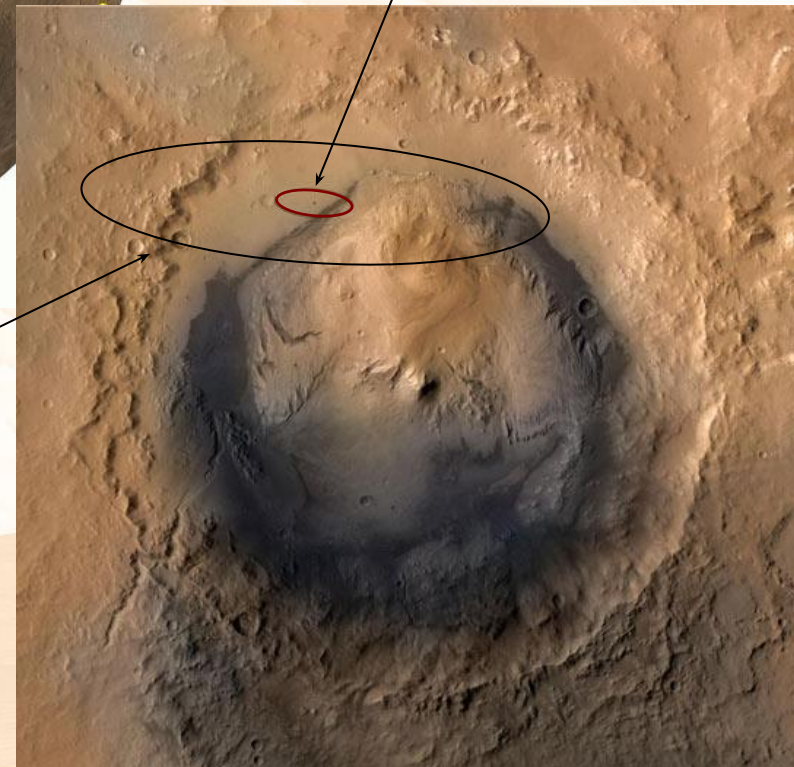




The Advantage of Guided Entry



Landing ellipse for the Curiosity Rover



Approximate landing ellipse capability for the Opportunity and Spirit rovers

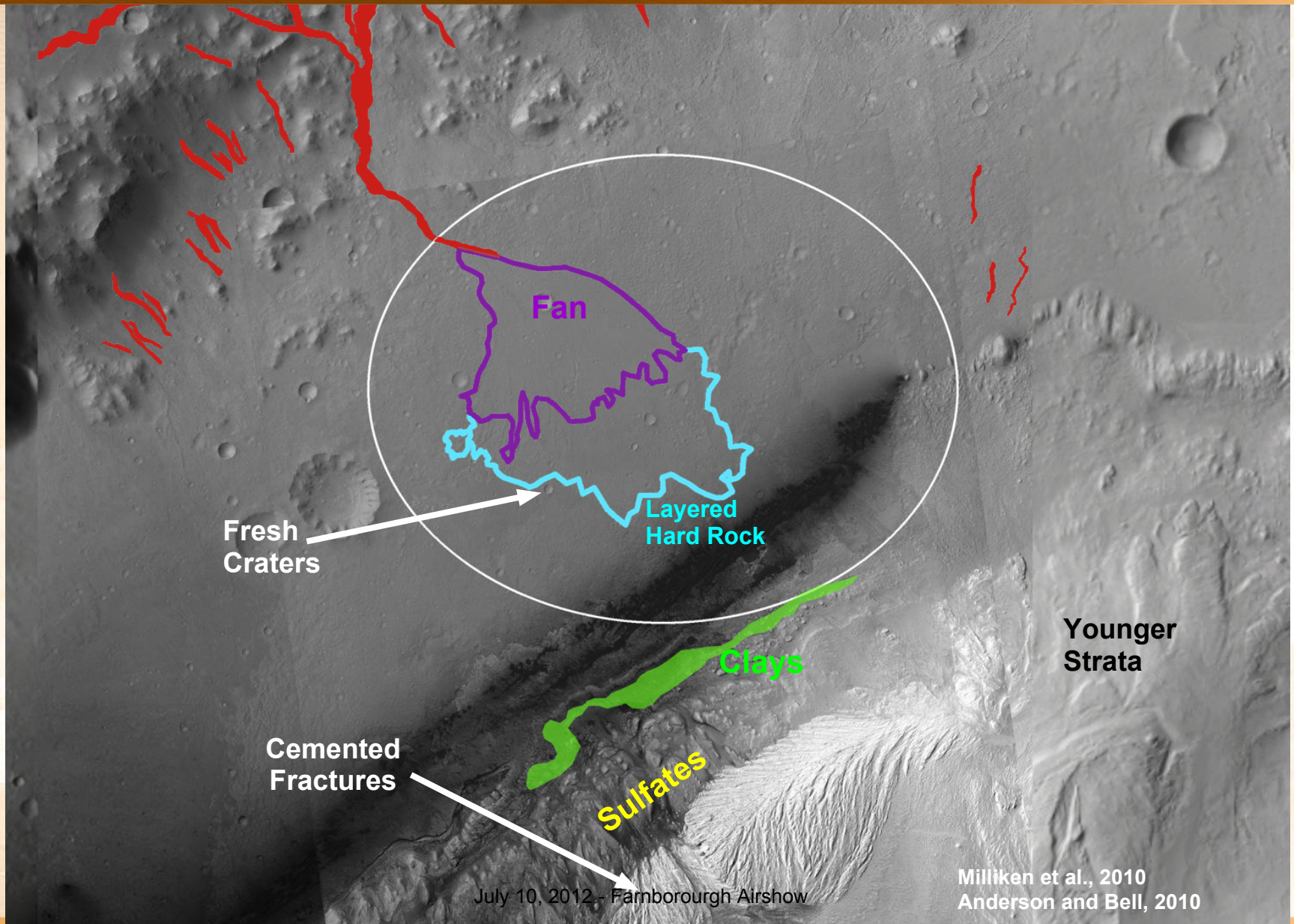


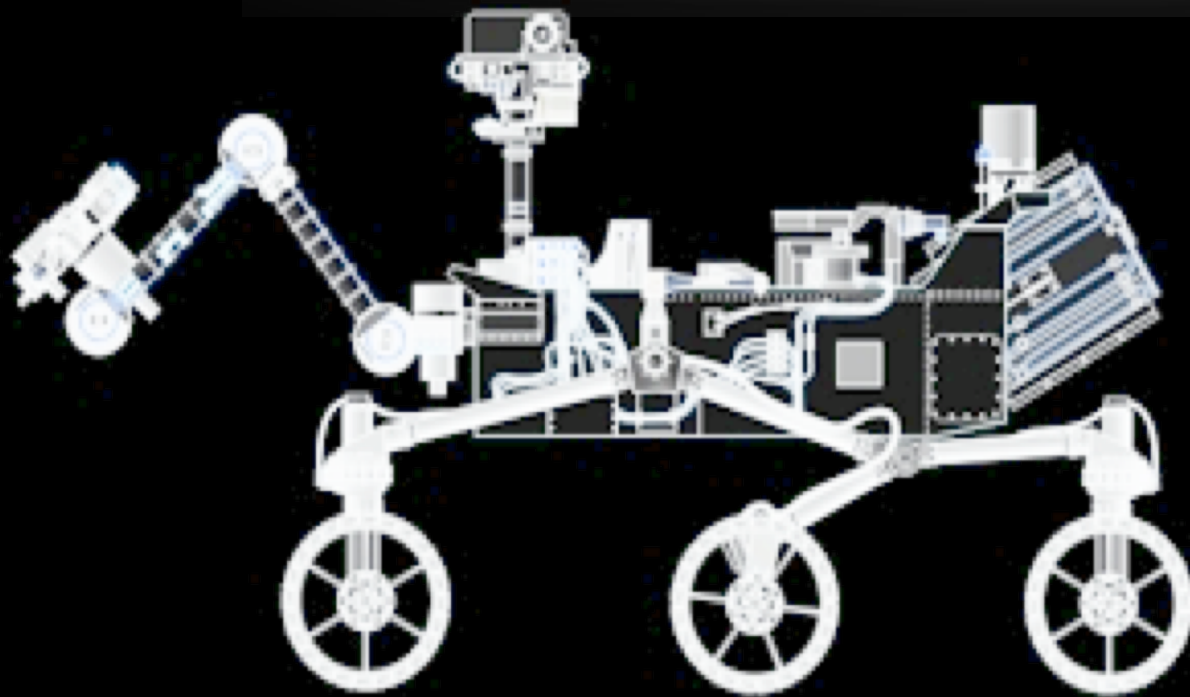
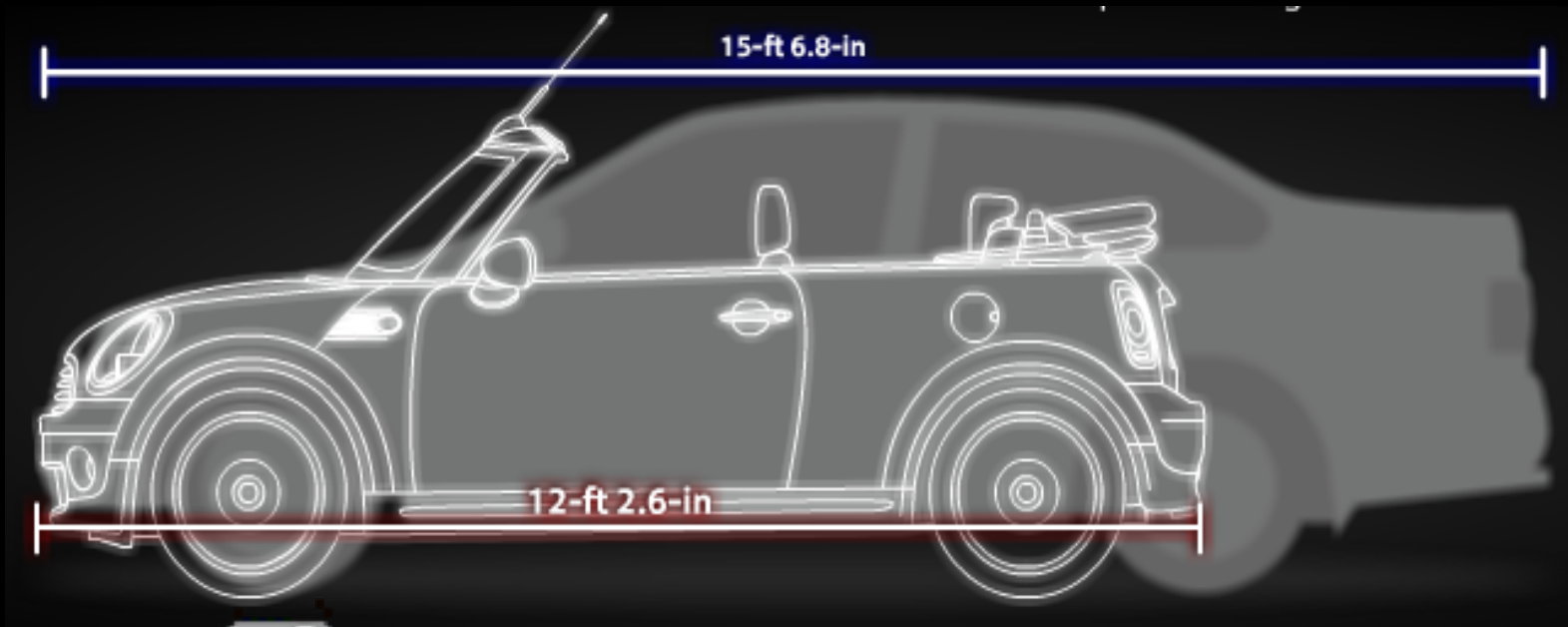
Mt. Sharp

X

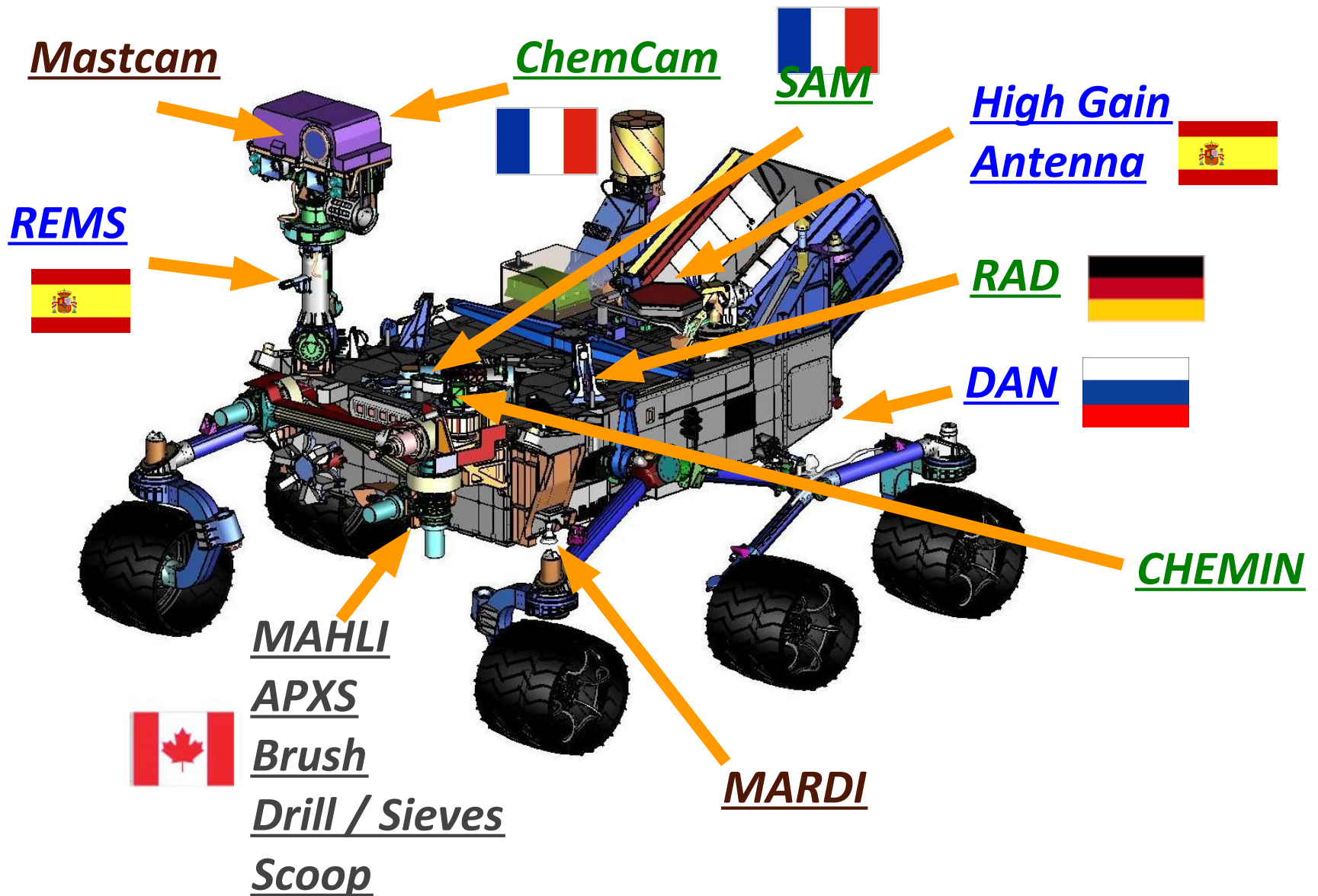
Curiosity Landing Uncertainty Ellipse
(19.7kmX6.9km)

Curiosity Landing Site Gale Crater

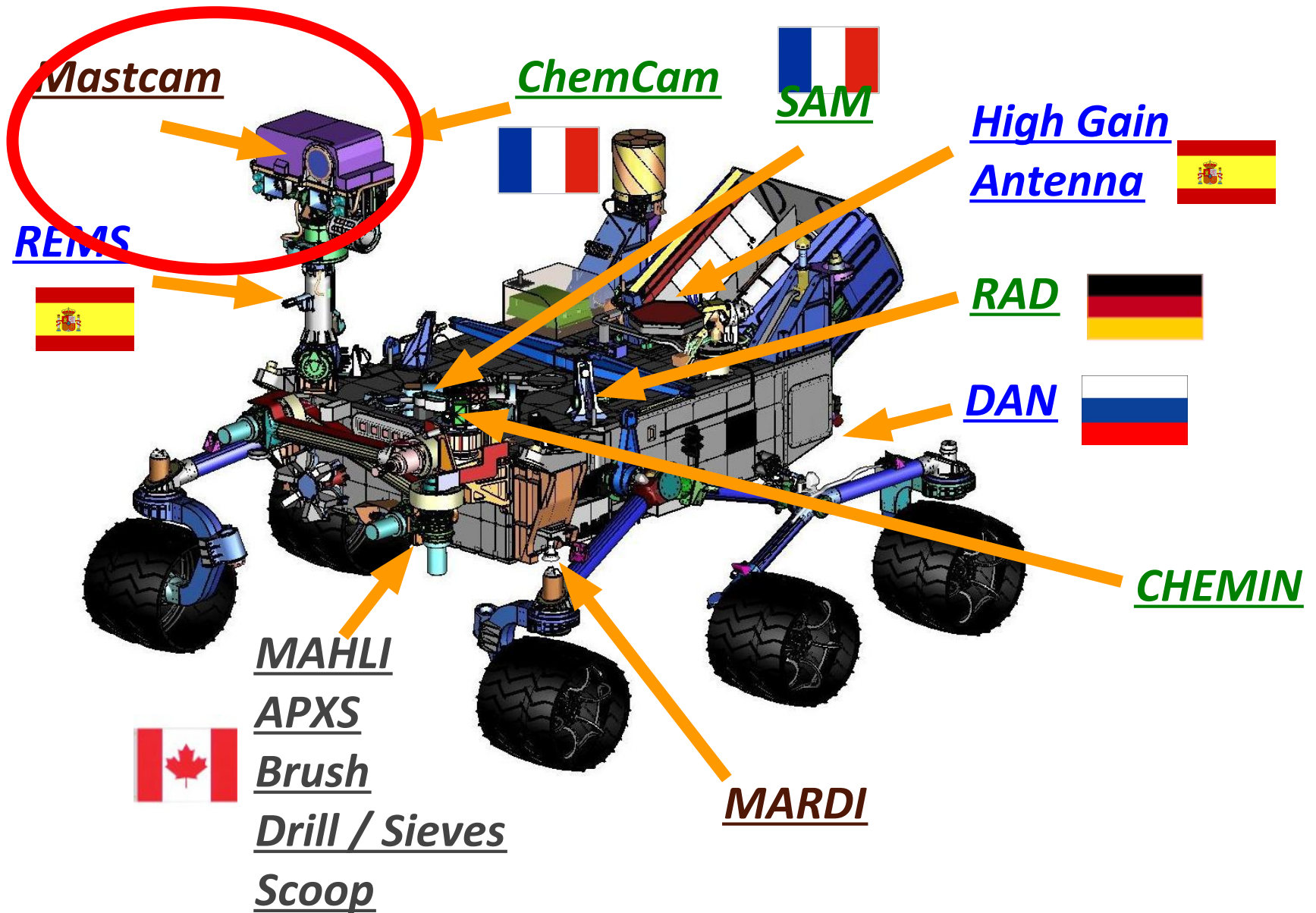




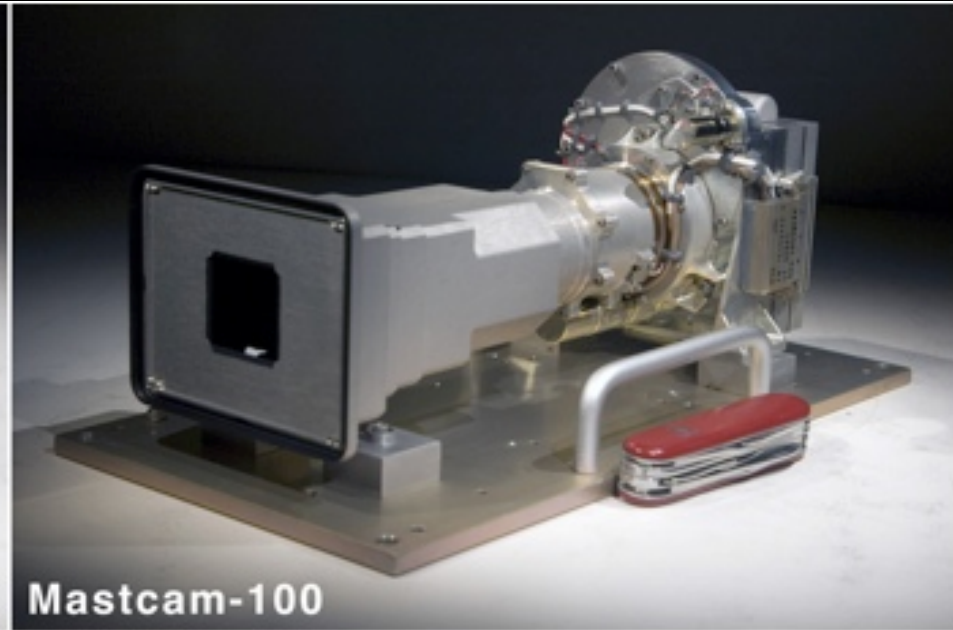
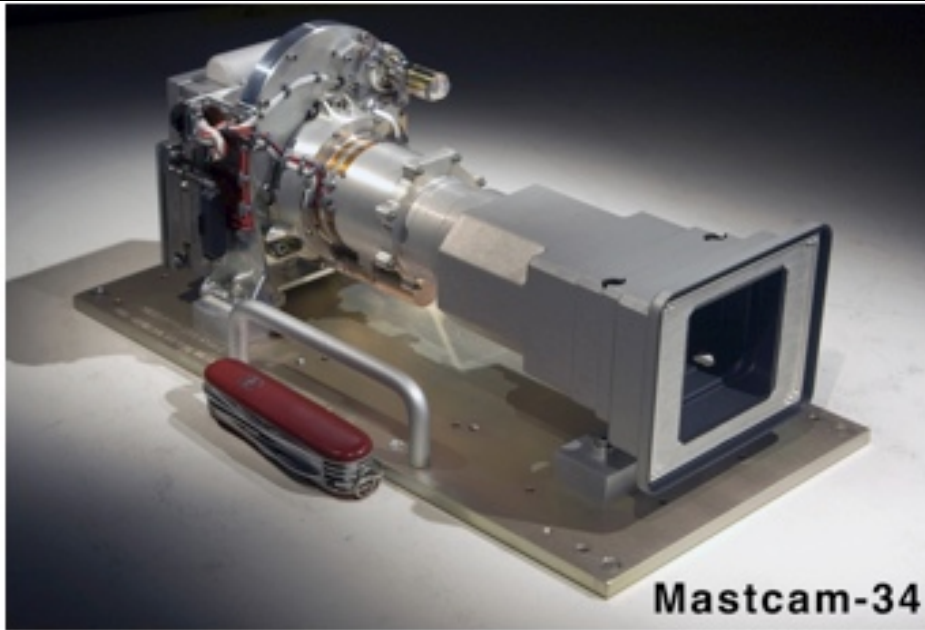
Curiosity Rover



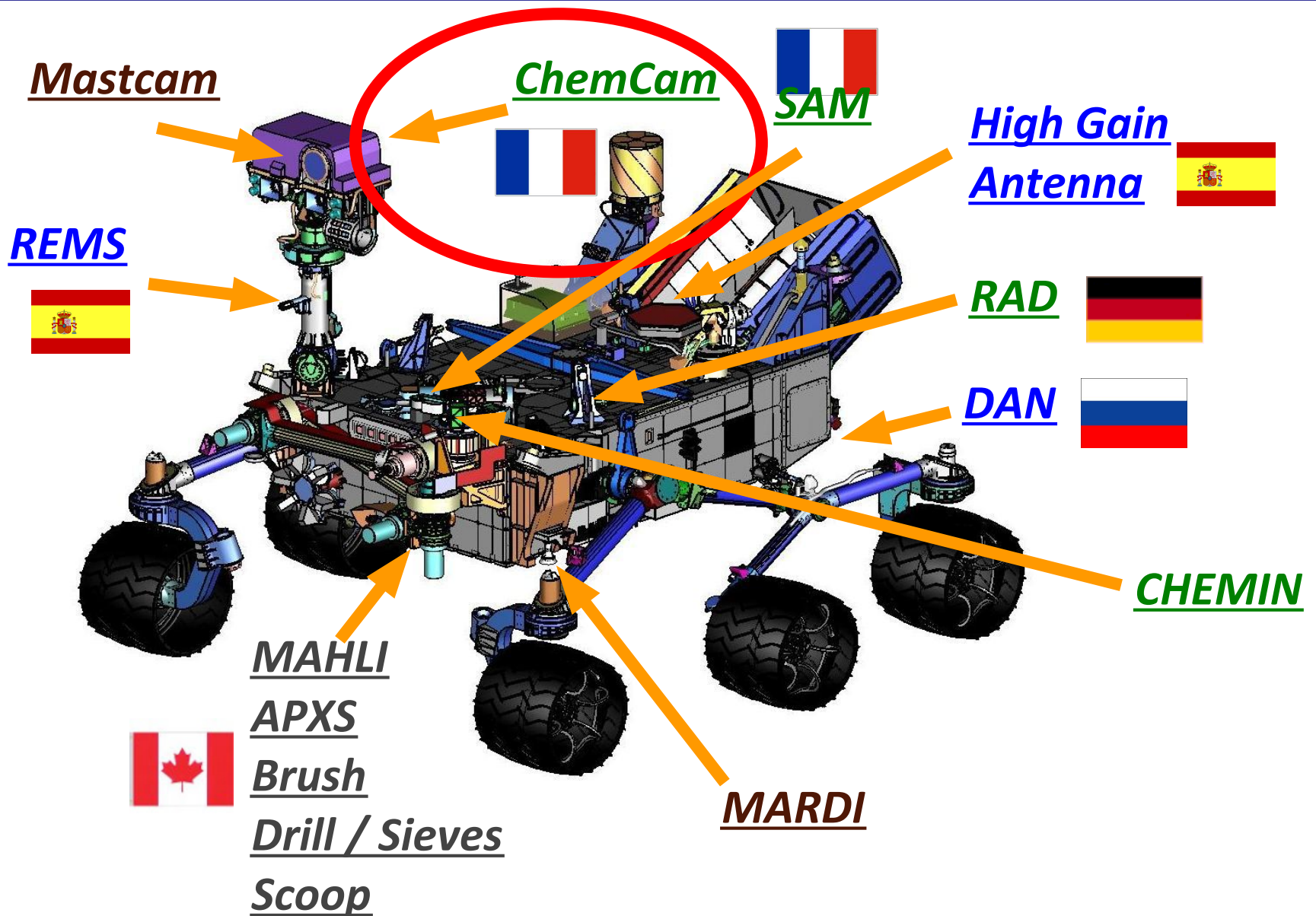
Curiosity Rover



Mastcam - eyeballs



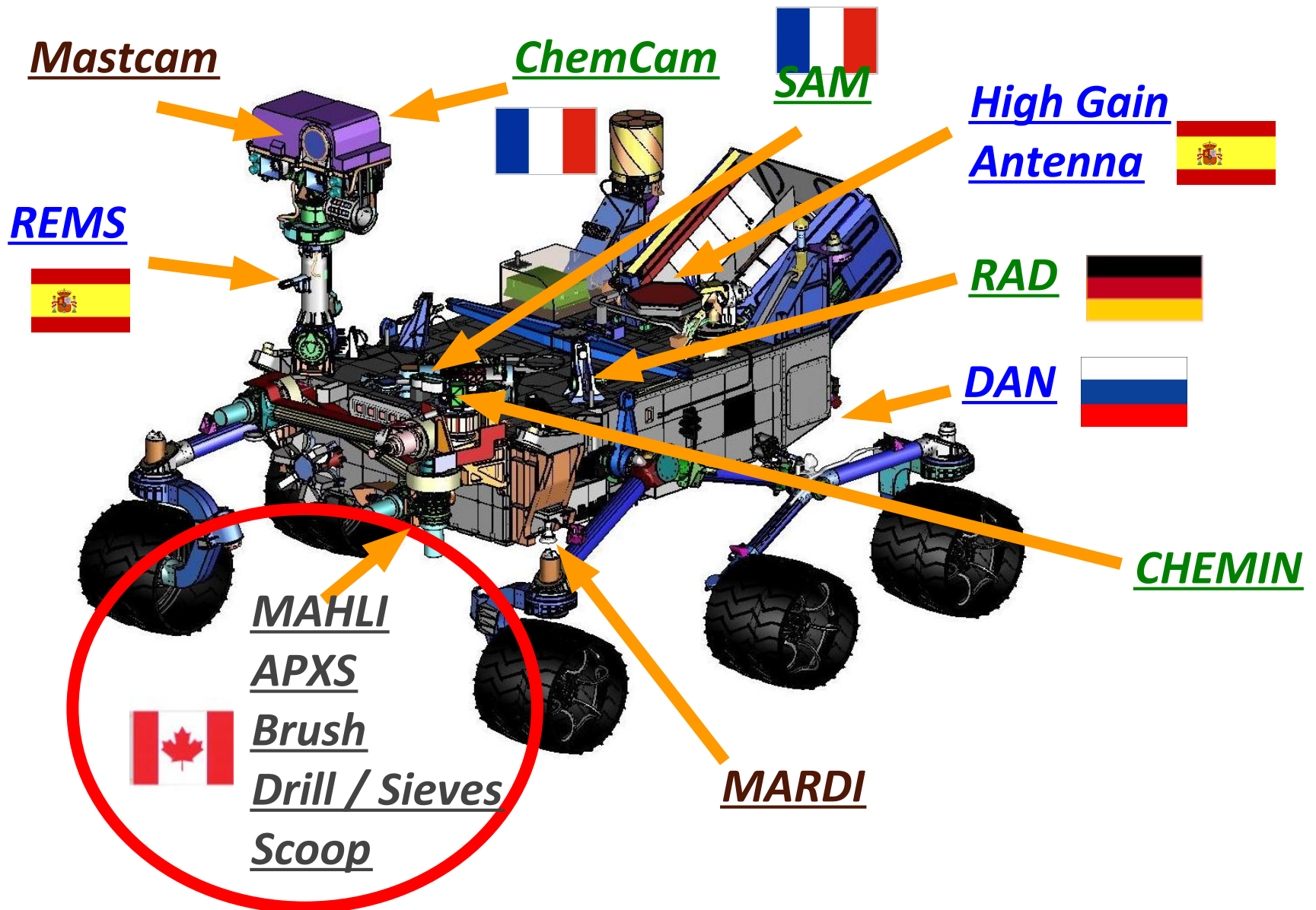
Curiosity Rover

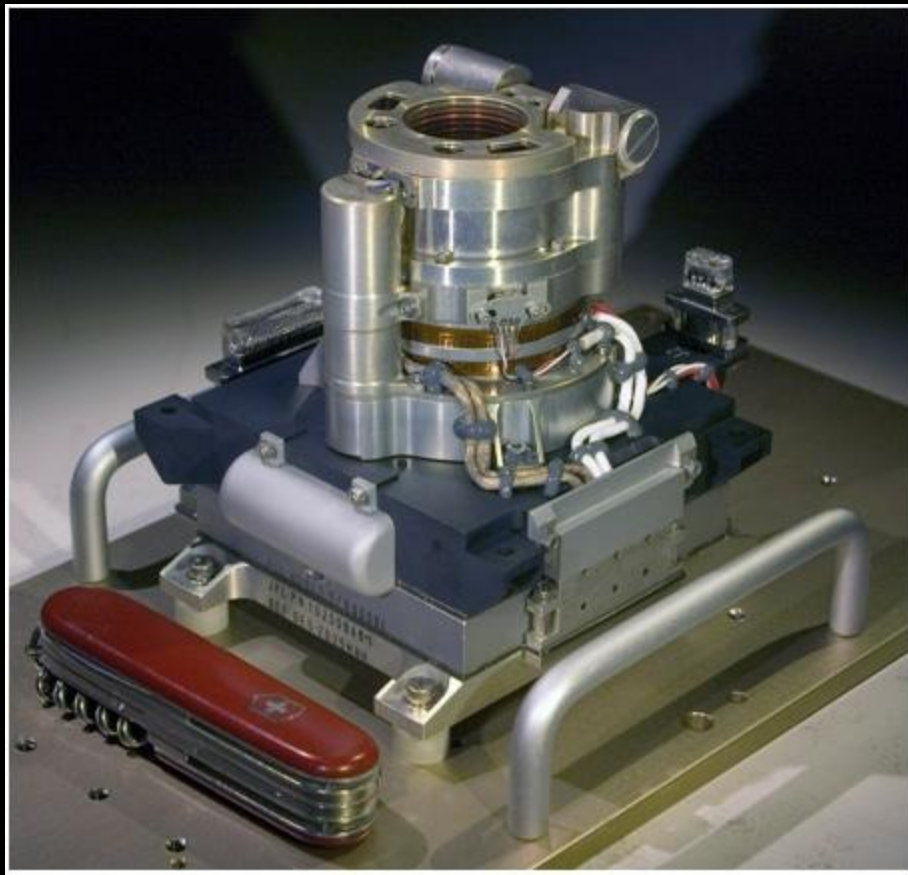


ChemCam - remote chemistry kit



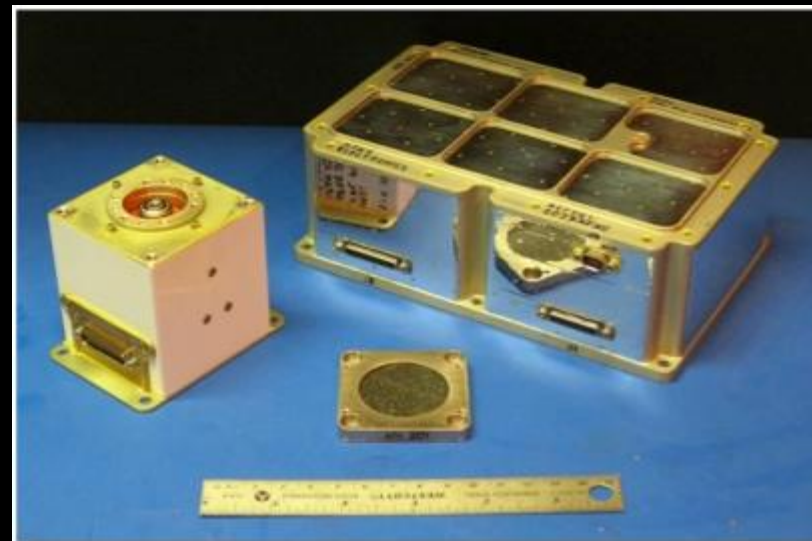
Curiosity Rover



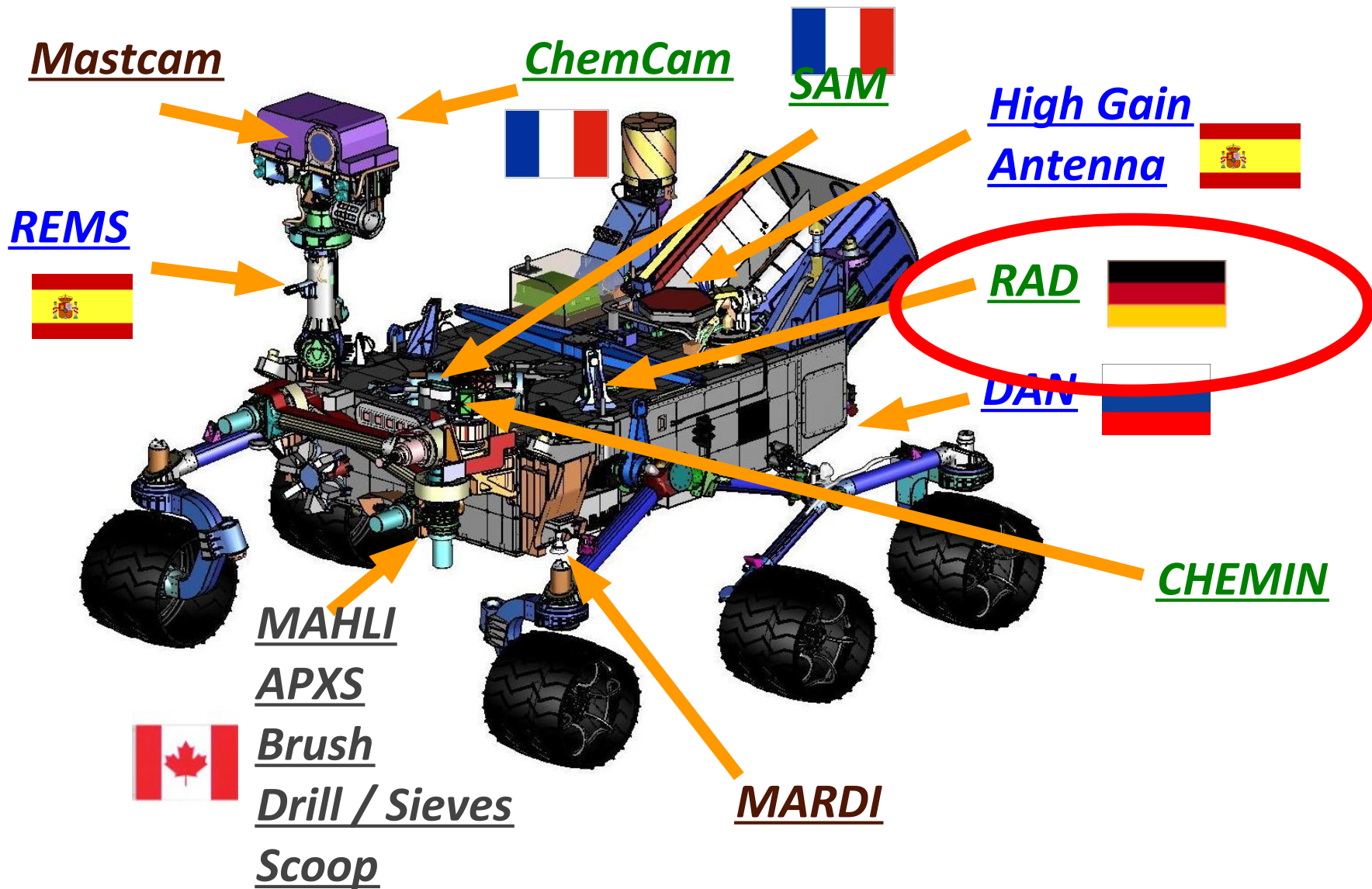


MAHLI -
hand lens and
smartphone
camera

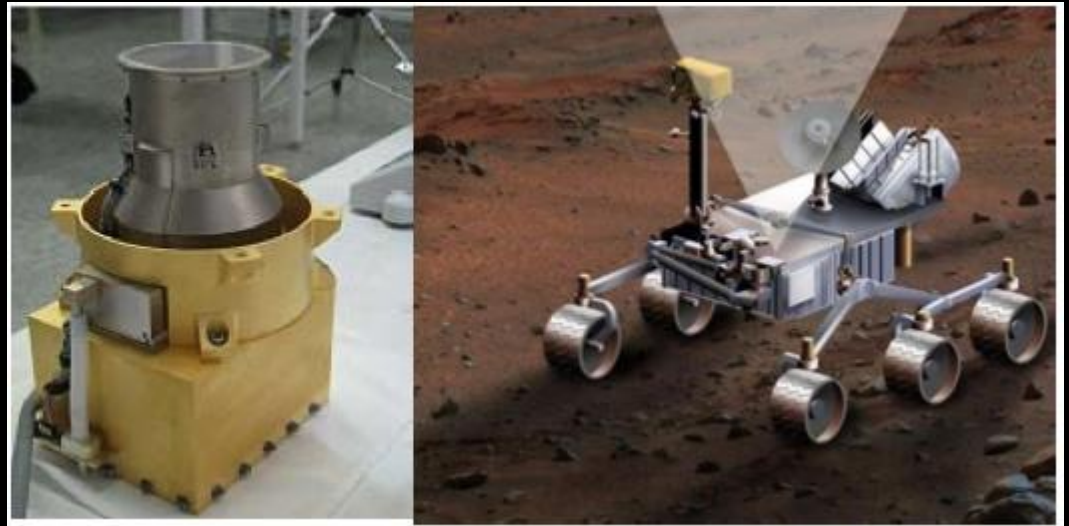
APXS -
elemental
chemistry



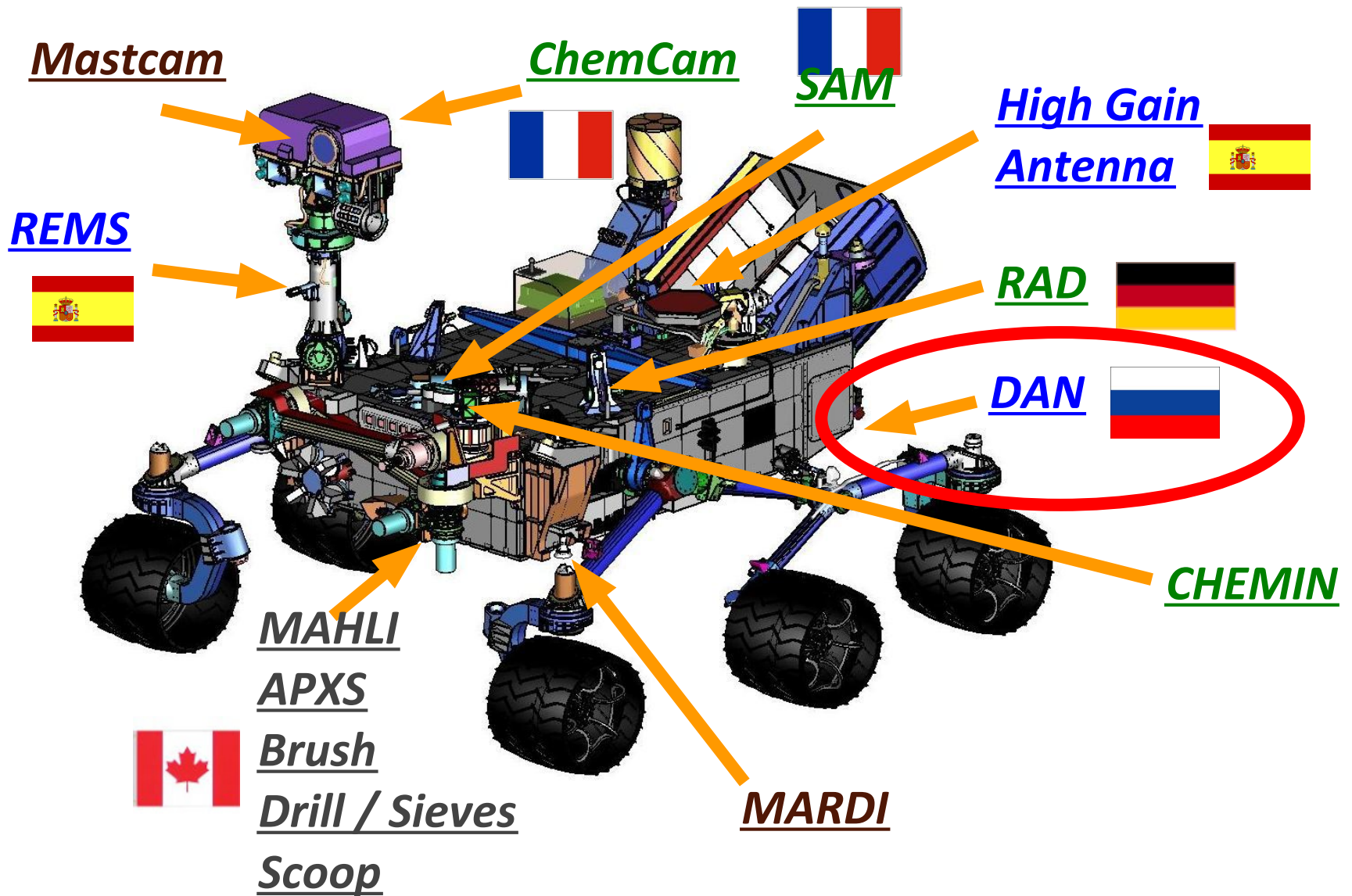
Curiosity Rover



RAD - radiation detector



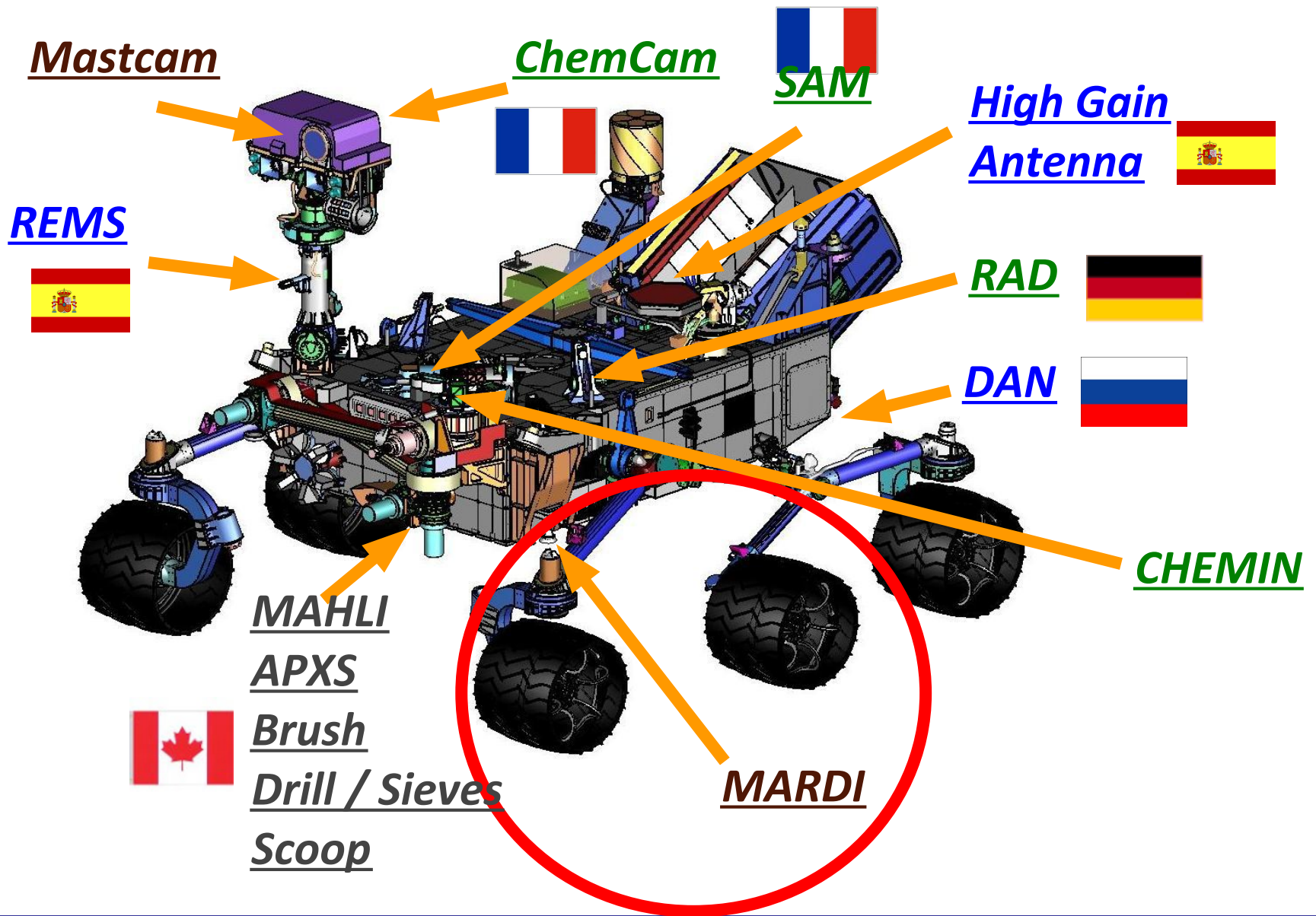
Curiosity Rover



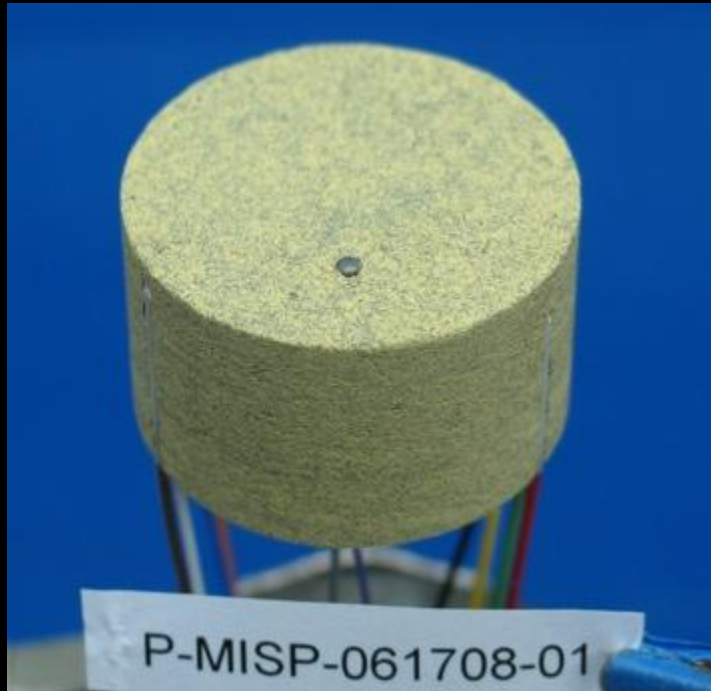
DAN - "divining rod"



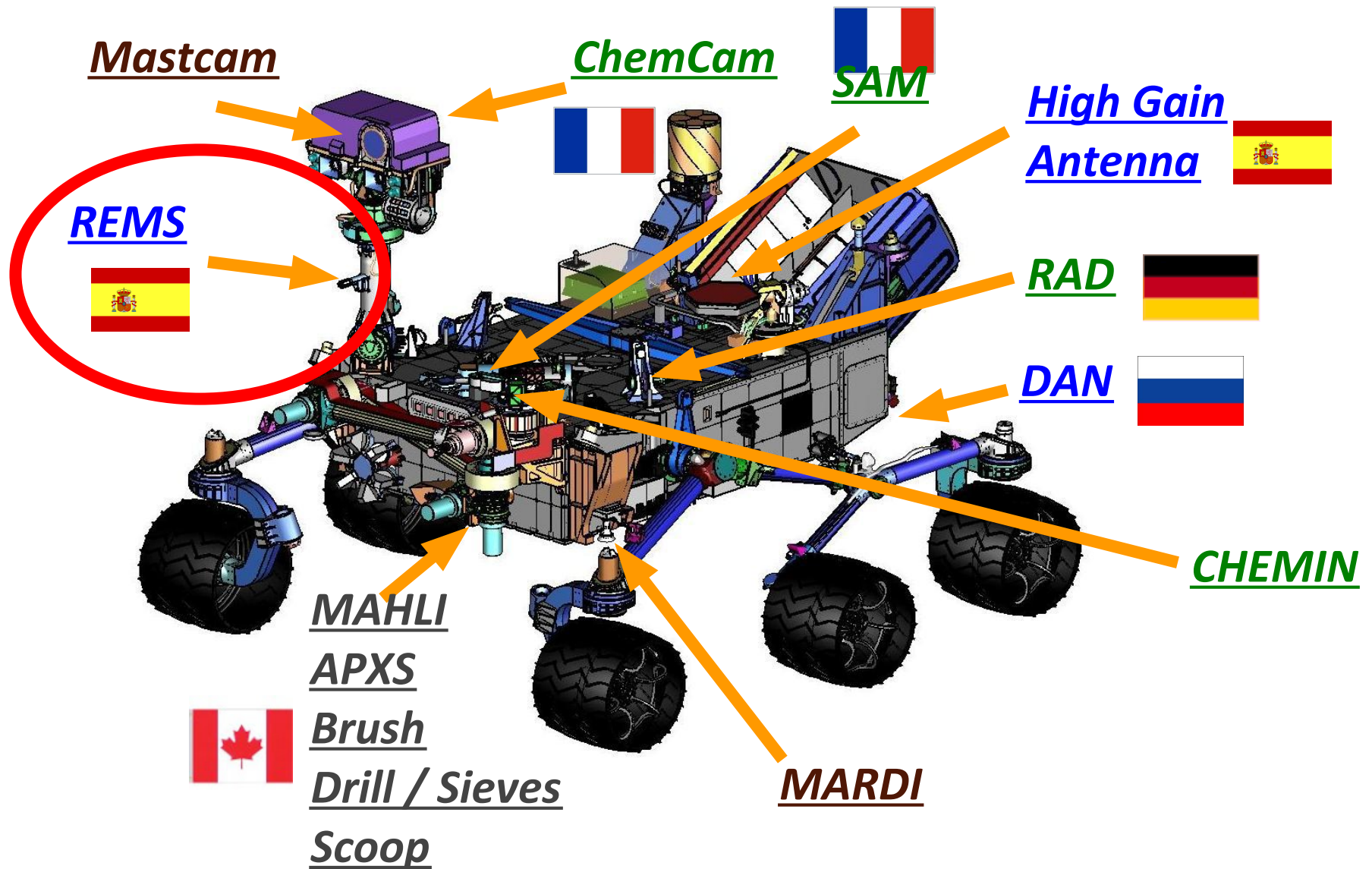
Curiosity Rover



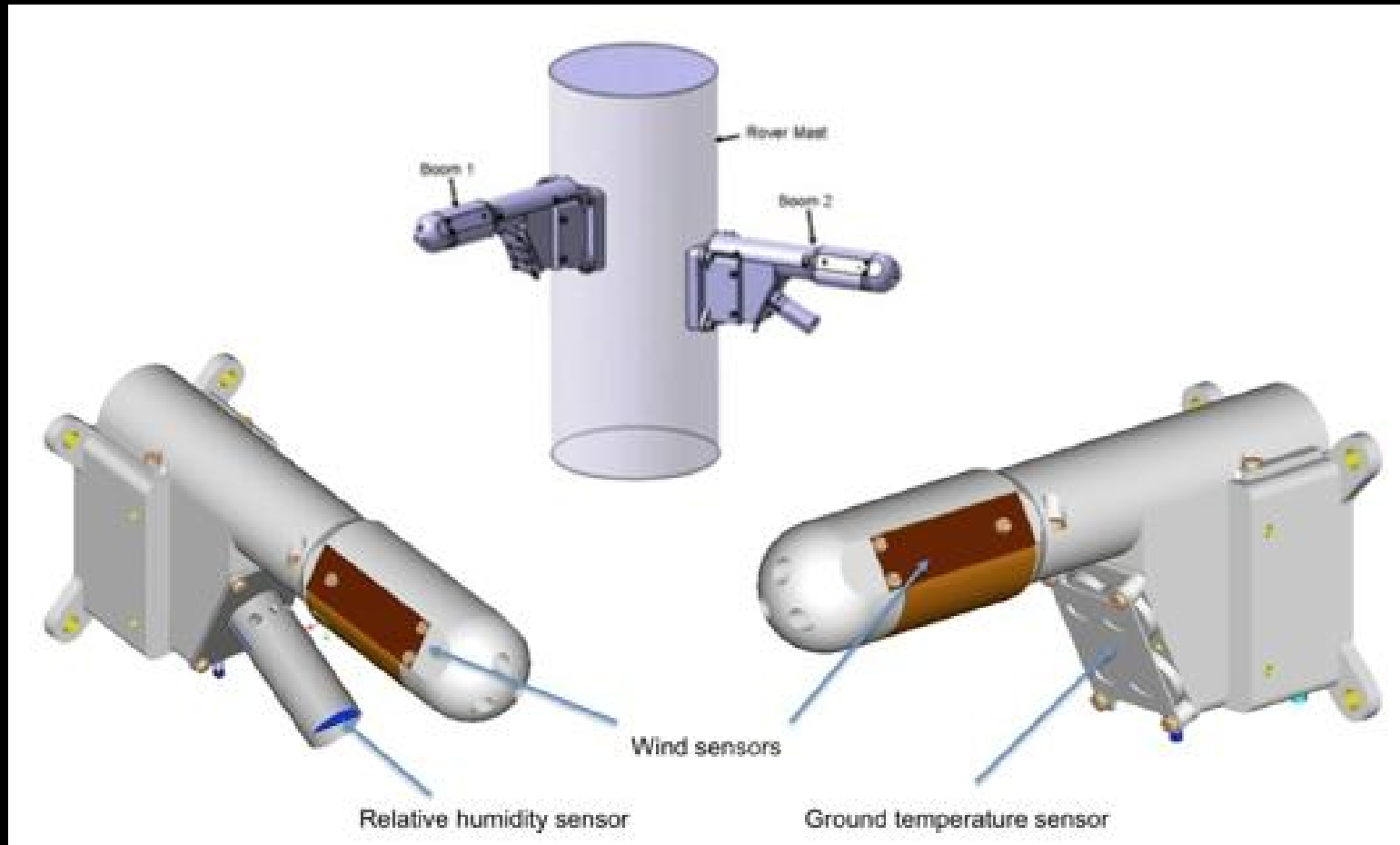
MARDI - descent data



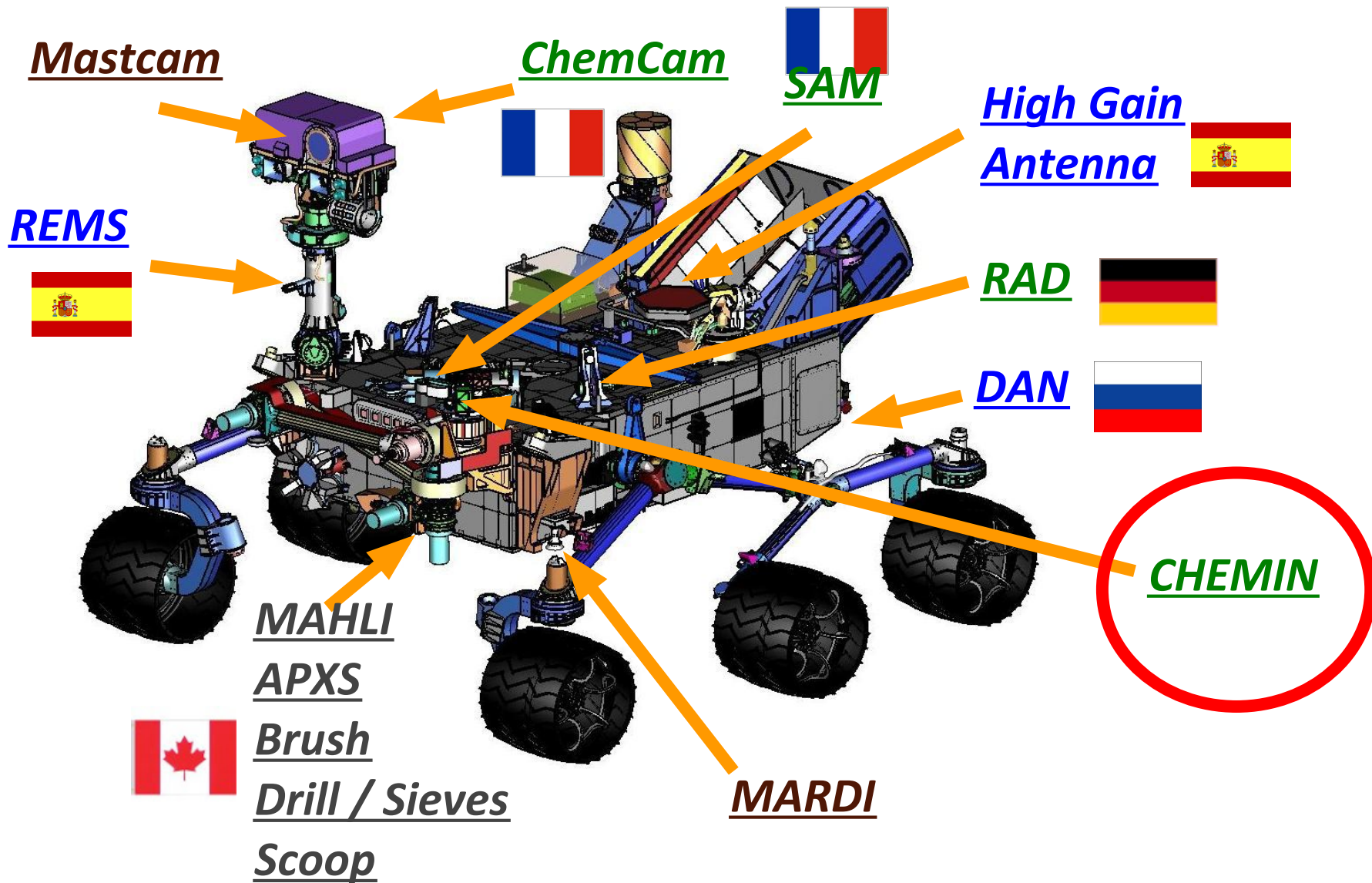
Curiosity Rover



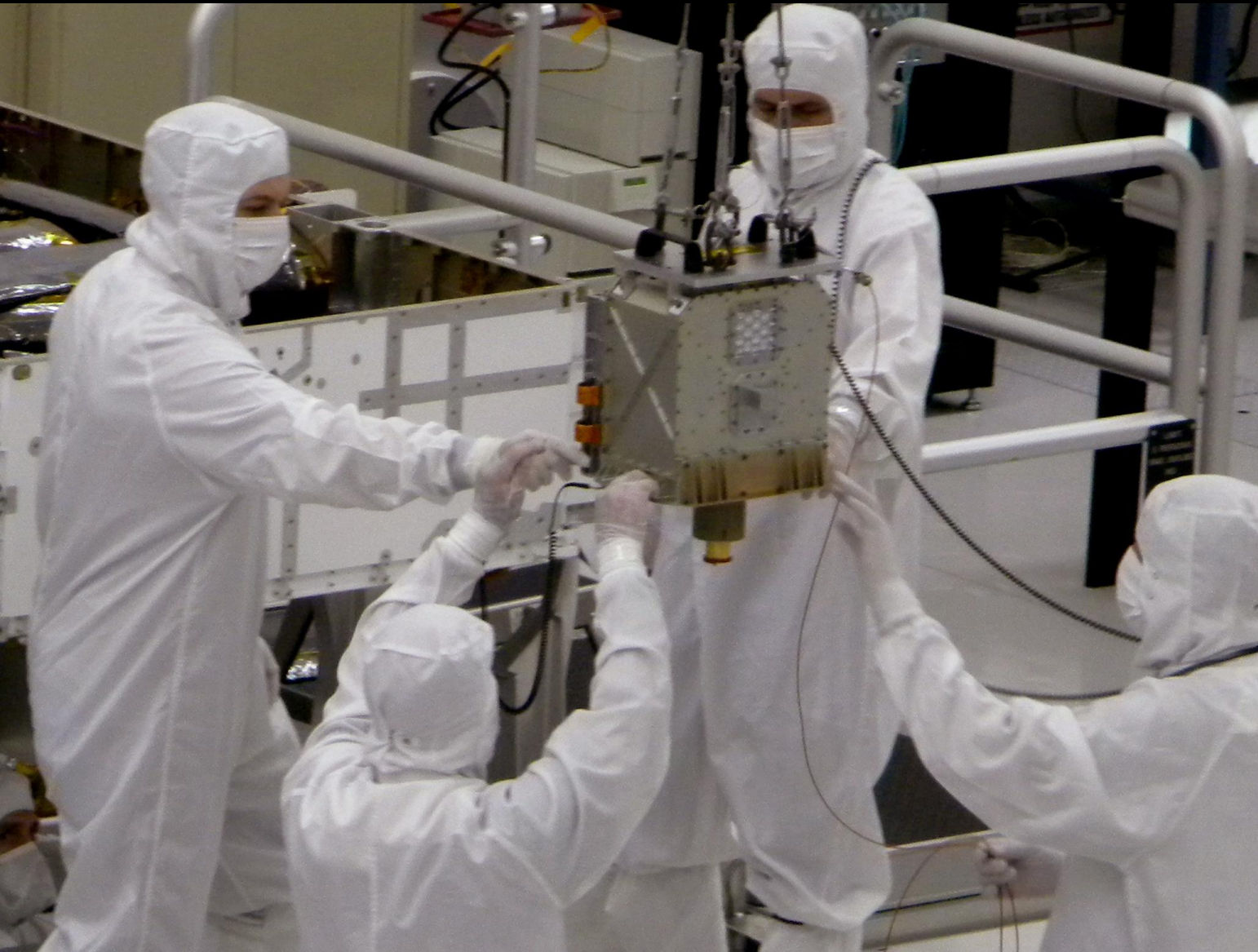
REMS - "your local weather at 10"



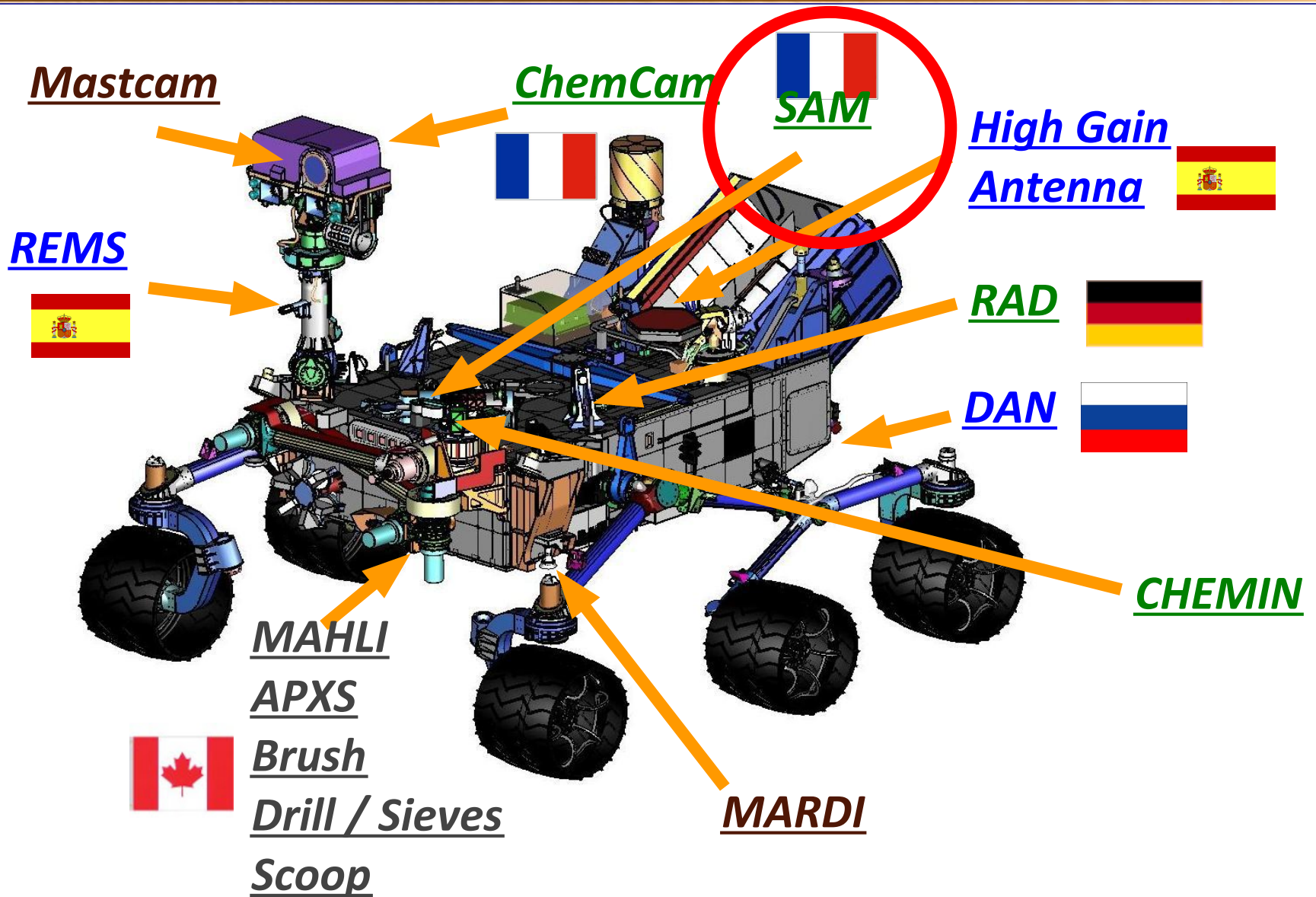
Curiosity Rover



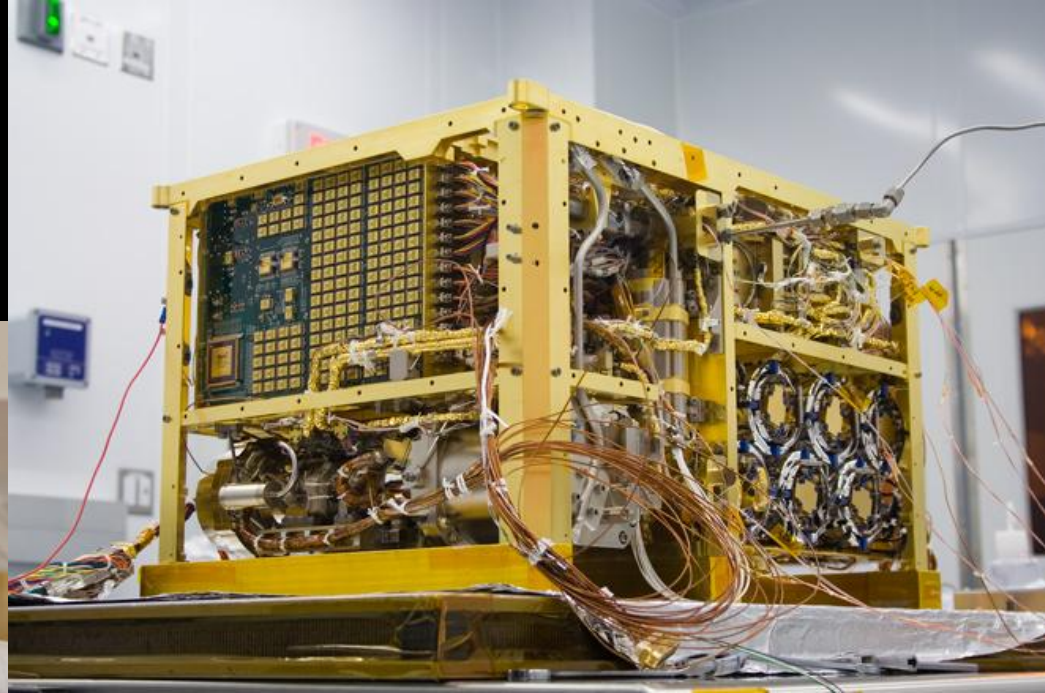
CheMin - "Mineralogy kit"



Curiosity Rover



SAM - "CSI Mars"



Curiosity Rover

