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National Aeronautics and Space Administration

MARS EXPLORATION PROGRAM

Update to the MEPAG

June 25,, 2018

Michael Meyer

Lead Scientist – Mars Exploration Program

MEP News & Status

- All Operating Missions are doing well
  - Opportunity pending

- All Development Missions and systems are progressing
  - M2020 proceeding to Agency KDP-D
    - Helicopter included as Tech Demo
  - MOMA instrument delivered for ESA ExoMars

- MAVEN orbit to be adjusted to facilitate communications relay for M2020
  - Plan to reduce apoapsis for improved relay performance in 2019 & beyond
    - Apoapsis to be reduced from 6200 km to 4000/4500 km
    - Incorporating approaches to preserve fuel and to continue some key MAVEN science

- Progressing in our technology maturation program for key MSR technologies

- Preparing for the next Decadal; considering studies and roadmap activities, and exploring how to leverage nontraditional opportunities for Mars investigations
  - E.g., commercial and strategic mission launch opportunities; secondary & international payloads

MEP Budget News

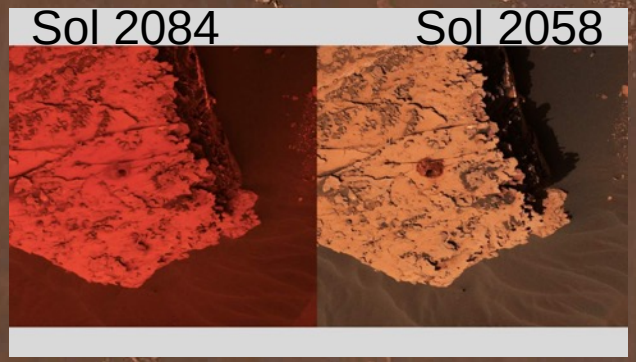
- FY18 Budget Appropriation was favorable for the MEP, receiving ~$75M increase over President's request. Used to:
  - Maintain the high pace of development on M2020, preserving maximum schedule reserves for ATLO
  - Continue all our operating missions within FY18 budget
  - Continue our technology maturation activities
  - Fully fund R&A
- Included was additional funding to explore the feasibility and potential of diverse mission technologies for future application

More Mars News & Status

- InSight launched May 5, 2018 from VAFB!
  - Landing on Nov. 26, 2018
  - 2 MARCO cubesat fly-by's for EDL relay
- TGO now in its 400 km science orbit and finishing commissioning
- NASA providing payloads for JAXA MMX mission
  - MEGANE (JHUAPL) neutron and gamma-ray spectrograph
  - Pneumatic sampler on lander

Mission Updates

- MSL
  - Finished Duluth drilling campaign
    - first successful drilling without drill feed
  - Complex organics on Mars
    - vulcanization as a preservation mechanism
    - Background methane has a seasonal variation



Dust Storm

May 30: MRO MARCI spots a local dust storm, one of many in the polar jet stream at high northern latitudes

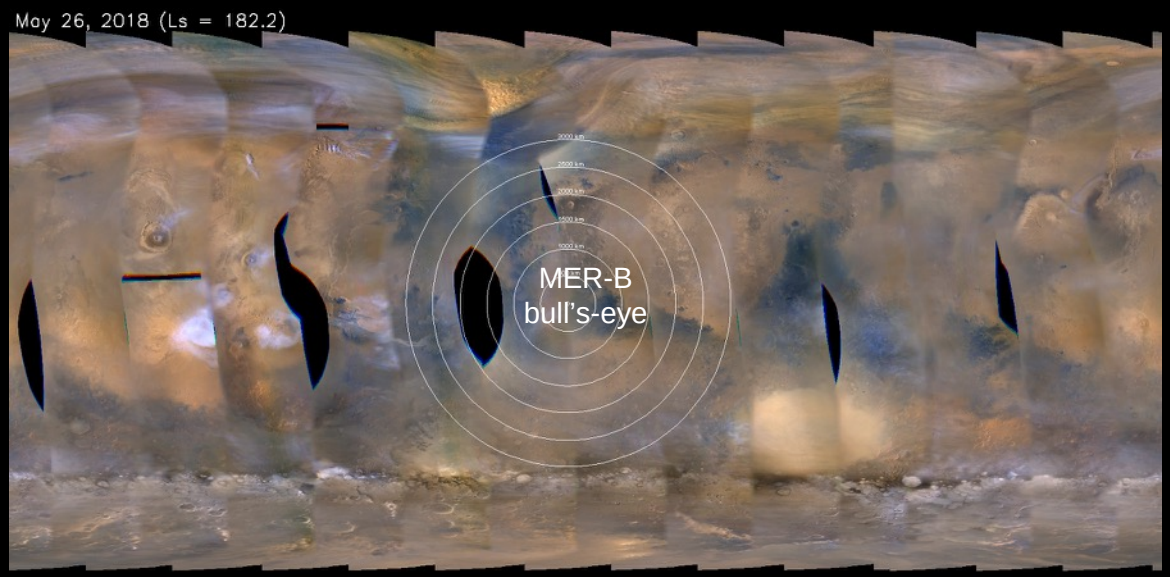
June 1: The local storm moves down the Acidalia storm track; MER alerted

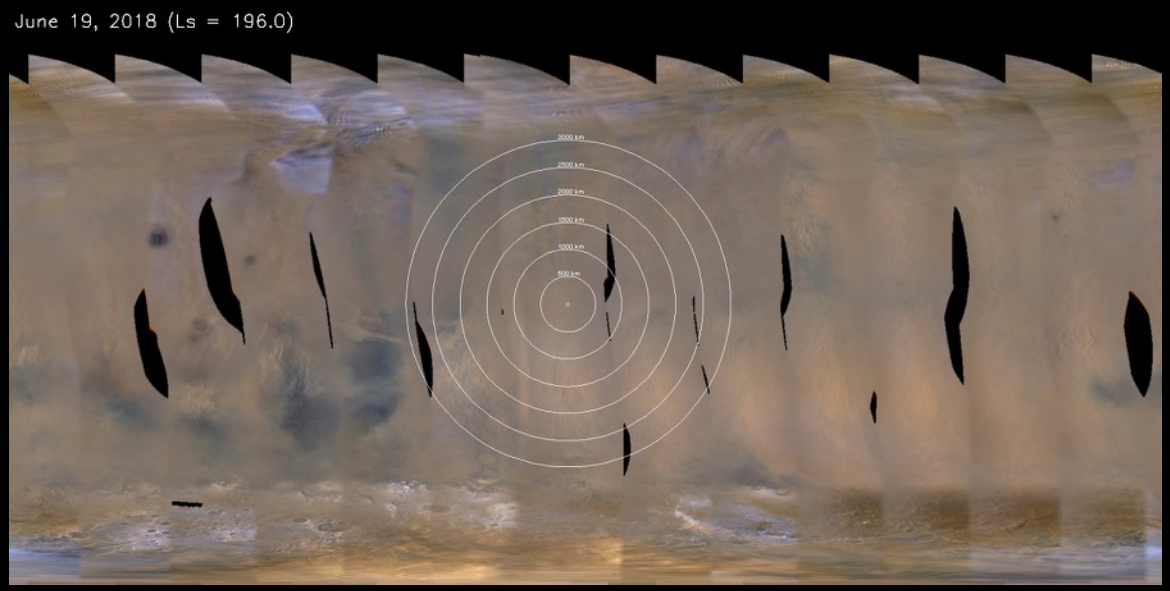
June 2-present: Local dust storm stalls over Meridiani and expands to the east

June 5: Regional storm merges with southern hemisphere local storms to cover most of eastern hemisphere

June 19: New activity in Solis-Sinai Planum pushes storm into the rare category of a Planet-Encircling Dust Event (PEDE 2018a)

Today: Dust-raising centers starting to wane; dust haze will last a month or more; *Opportunity* site still obscured



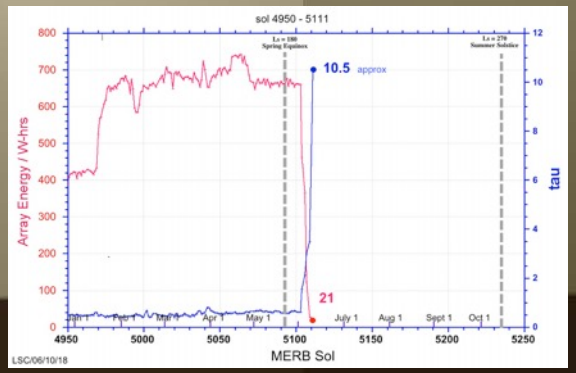


MRO MARCI (*Daily global maps provided by B. Cantor, MSSS/JPL/NASA*)

Dust Storm

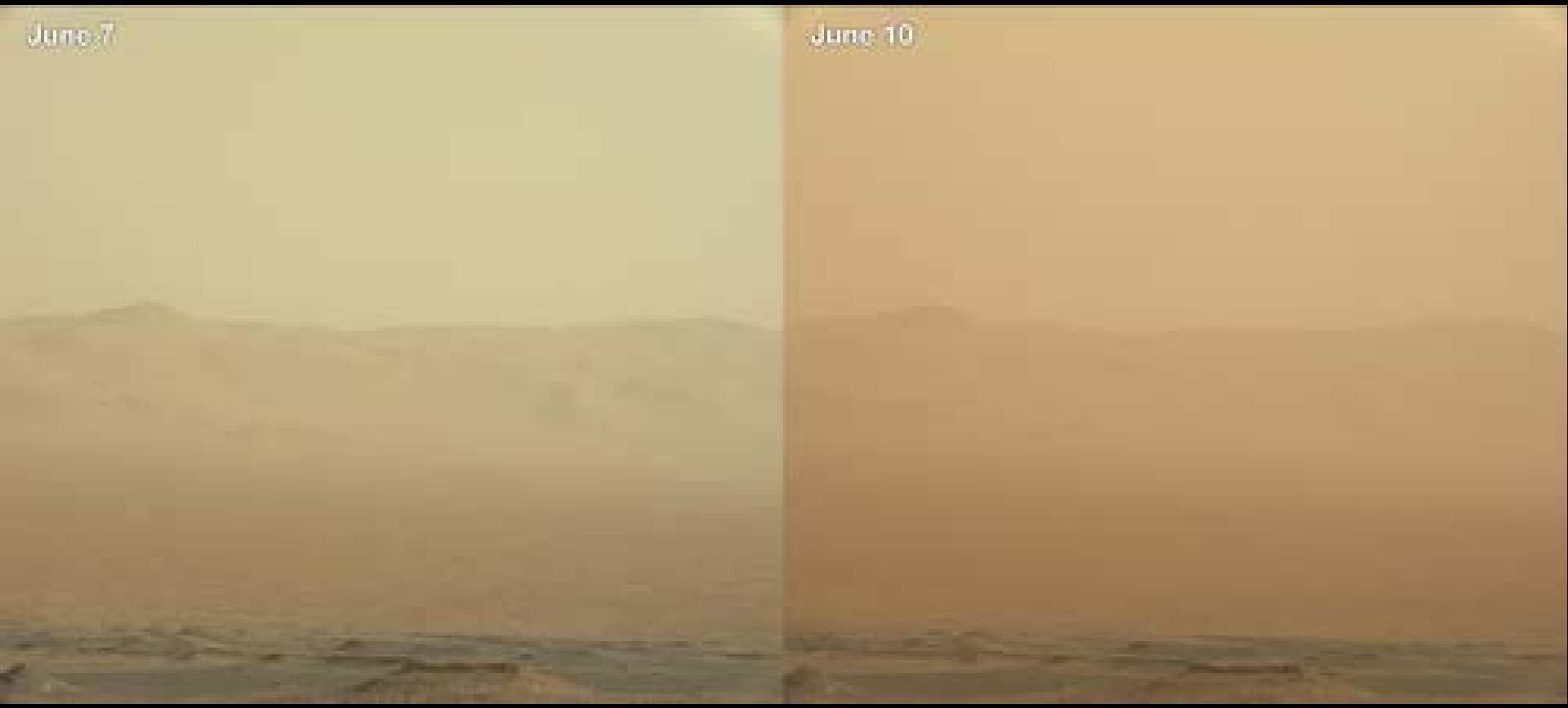
Tau = 1 3 5 7 9 11

Opportunity rover in survival mode
Not expecting contact until dust haze clears



Mid-day skylight at Opportunity as simulated by M. Lemmon from measurements ***MER / JPL / NASA***

Dust Storm

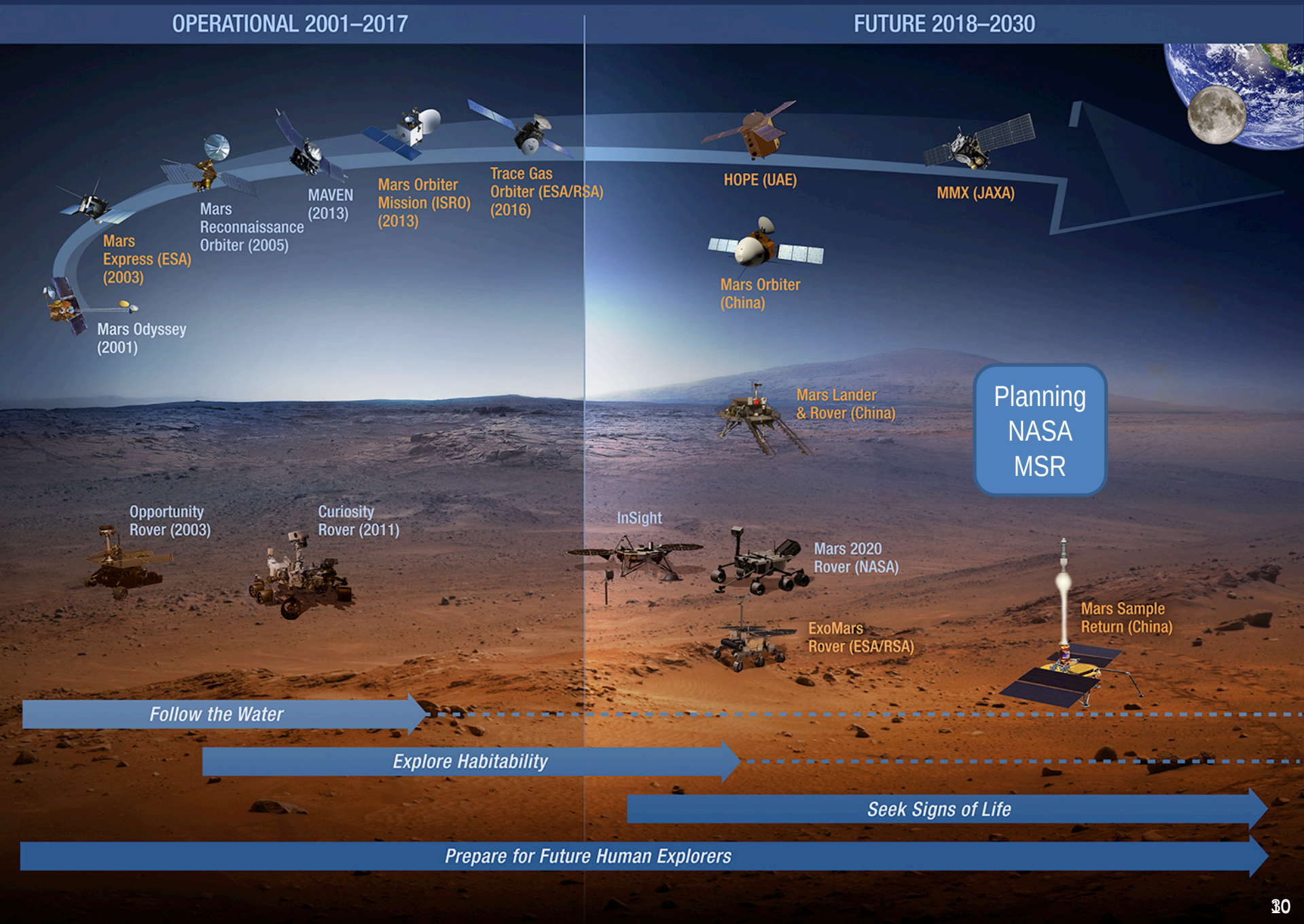


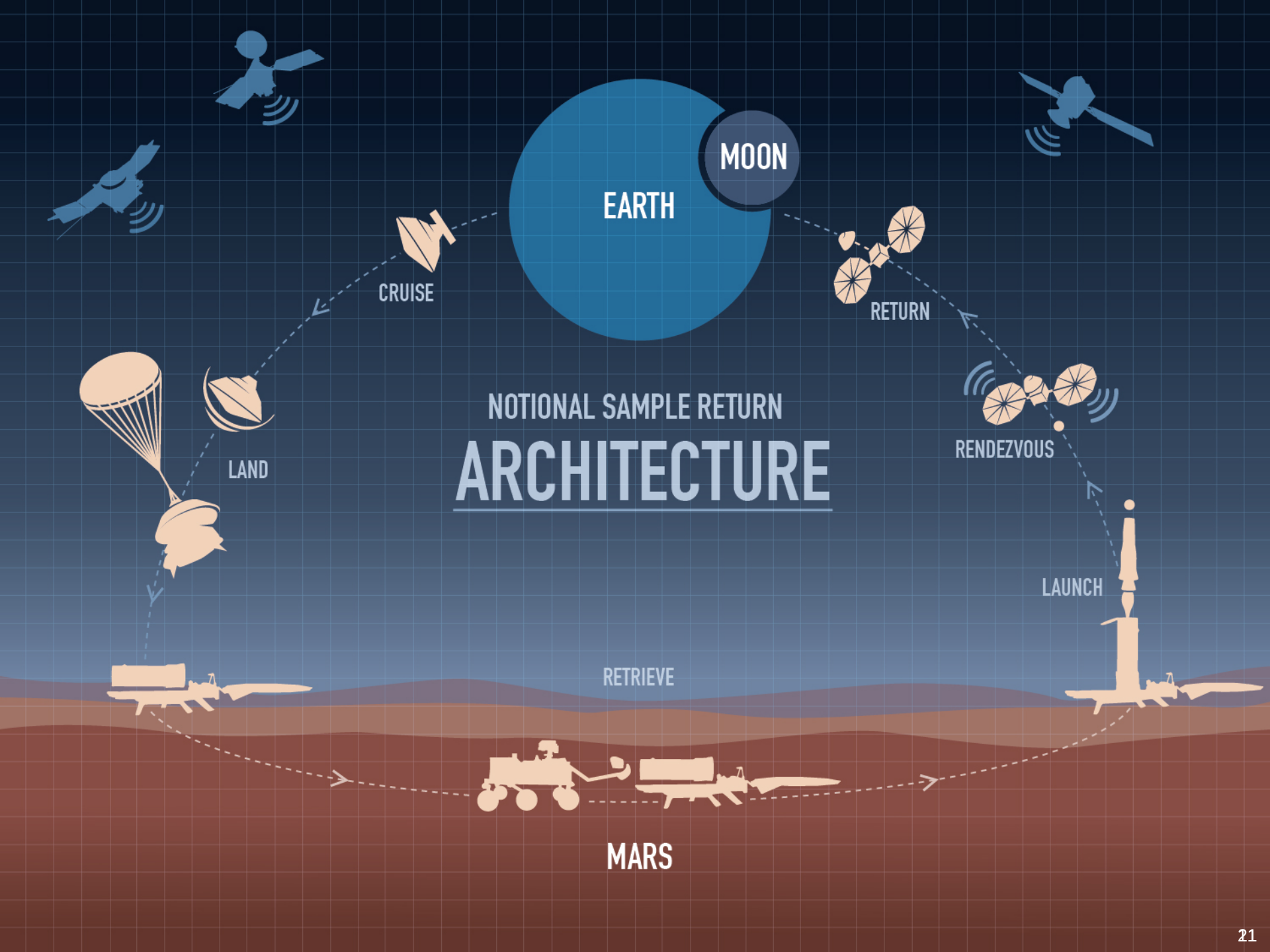
Curiosity looking at Crater Wall
even before the main dust haze had arrived!
MSL / MSSS / JPL / NASA

Launched May 5, 2018 – VAFB
Landing November 26, 2018 – Mars

InSight

MARS MISSIONS




NOTIONAL SAMPLE RETURN
ARCHITECTURE
EARTH
MOON
CRUISE
RETURN
LAND
RENDEZVOUS
LAUNCH
RETRIEVE
MARS

STRATEGIC APPROACH FOR MSR IMPLEMENTATION

"Lean Sample Return" – NOT a compromise on the returned sample science but an affordable approach to the mission set for returning samples

- Returning selected samples is the Level–1 requirement
- Cost & risk are part of the essential trade-space
- Focused scope; no ornaments
- Capitalize on experience base; Limit new development
- Continue early technology investments to mature readiness and minimize cost risks
- Leverage partnerships
- Strong programmatic discipline in execution

Progress

- Partnerships
  - IMEWG/IMSR
  - See later reports in this meeting on iMOST and 2nd International Conference on Sample Return (Berlin meeting, April, 2018)
- United Arab Emirates plans building a Mars City
  - Seeking input on requirements for science laboratory facility
- Mars 2020 sampling status
  - Fluid Mechanical Particle Barrier reviewed by Planetary Protection independent group – positive review and no show stoppers; report pending
- Tech investments continue
- Communications – TGO

MARS EXPLORATION PROGRAM – SUMMARY

MEP today is a healthy program

- Current missions highly productive
- Development missions/systems doing well
- Beginning early-stage work on a potential lower cost MSR mission,
  - A Decadal priority
  - Leveraging international and commercial partnerships
    - NASA-ESA Statement of Intent outlines approach, including roles
      - Agencies will develop technical plan over the next 18 months to better understand flight elements, interfaces and costs
  - Looking forward to agency commitments to next MSR mission steps in the next (FY20) budget cycle and by ESA (December, 2019)
- Beginning preparations for 2019 next Decadal activities
  - Still need to argue for the future: For the next steps in MSR and for opportunities to pursue additional compelling science at Mars