National Aeronautics and Space Administration

EXPLORE MARS

Eric Ianson
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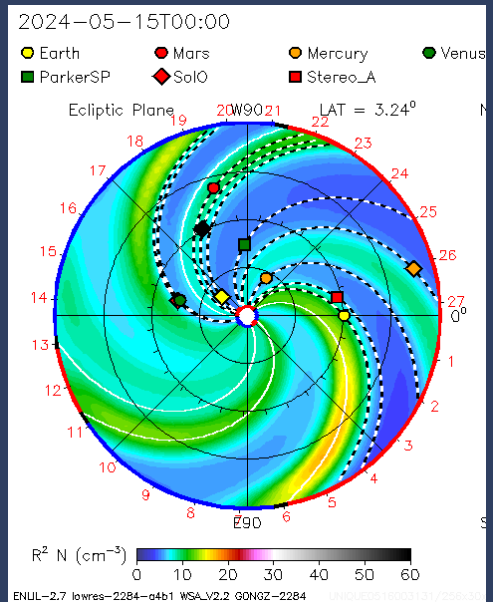
NASA Planetary Science Advisory Committee (PAC) Meeting
July 9, 2024

Mars Exploration Program Highlights

- NASA and ESA signed a Memo of Understanding (MOU) for ESA's Rosalind Franklin Mission. The MOU formally expands NASA's contributions to include launch, descent engines, RHUs and support
- Odyssey completed 100,000 orbits around Mars! During its 23 years, it has taken 1.4 million images
- Concept studies awarded to investigate how commercial services can be utilized for missions to Mars
- Solar maximum activity is generating excellent opportunities to study space weather at Mars



Left: Signing of the RFM MOU.
Right: A model of a Coronal Mass Ejection that hit Mars (red dot upper middle-left) on May 18. Credit: GSFC

New MEP HQ Staff

Cerese Albers, Ph.D. – Planetary Data System and RFM Deputy Program Executive
Cerese has worked across SMD and SOMD at MSFC and HQ, most recently serving as the Program Executive for Earth Science Data Systems. She possesses a diverse background of experiences in program leadership, project management, scientific research, numerical modeling, mission science and field work, and managing operational payload software interface requirements development, design, and testing. Her science focuses on tropical meteorology and data assimilation for numerical weather prediction. Cerese obtained her bachelor's, Master's, and PhD in Meteorology from Florida State University.

J Michael Newman – Technology Portfolio Program Executive
J Michael has worked within SMD, STMD, and ESDMD, and supported efforts across the life cycle of small-to-large projects, most recently serving as a Mission Integration Manager for the Radioisotope Power Systems Program. He has operated in a variety of engineering and management roles and brings diverse experience working across NASA Centers, other government agencies, industry, and international partners. J Michael obtained his bachelor's in Mechanical and Aerospace Engineering from the University of Dayton, and his Master's in Space Engineering from the University of Michigan.

Mars Exploration Program Budget

President's Budget Request Released March 11, 2024

- Operating under Fiscal Responsibilities Act through FY 2025
- Operating missions
  - Funds continued operations for all missions
  - MAVEN funding ends in FY 2026 (see below)
- Sample Receiving Project funding reduced pending decisions on MSR architecture
- Rosalind Franklin Mission funding supports CY 2028 launch
- MEP Technology Program boosted in FY 2025 (indicates support for future of MEP)

Planning, Programming, Budgeting & Execution (PPBE) process for FY 2026 underway

- Considering options to restore MAVEN funding beyond FY 2026
- Plan for senior review results of operating missions

Commercial and Technology Outlook

Awarded commercial studies to 9 companies to assess the cost, feasibility, and technological maturity for Mars science enabling services

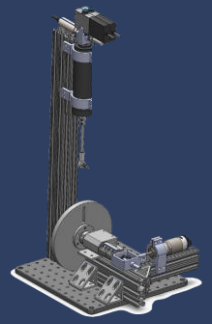
- Results will inform future MEP plans to foster commercial services for Mars

Future Plan technology strategy addresses future needs

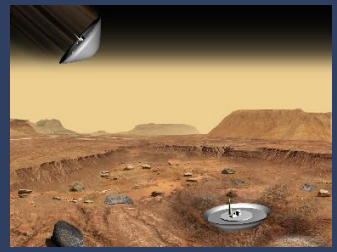
- Focused technologies that are enabling for future missions (e.g. Entry, Descent and Landing; Aerial and Surface Mobility; and Subsurface Drilling)
- Cross-cutting technologies (e.g. Autonomy, Instruments, and Telecommunications)

MEP is planning near-term technology efforts in anticipation of the $40M increase in the FY 2025 technology budget

- Investigating combination of directed projects at NASA Centers (including JPL) and broadly competed projects for industry and academia



Deep Subsurface Drill Concept



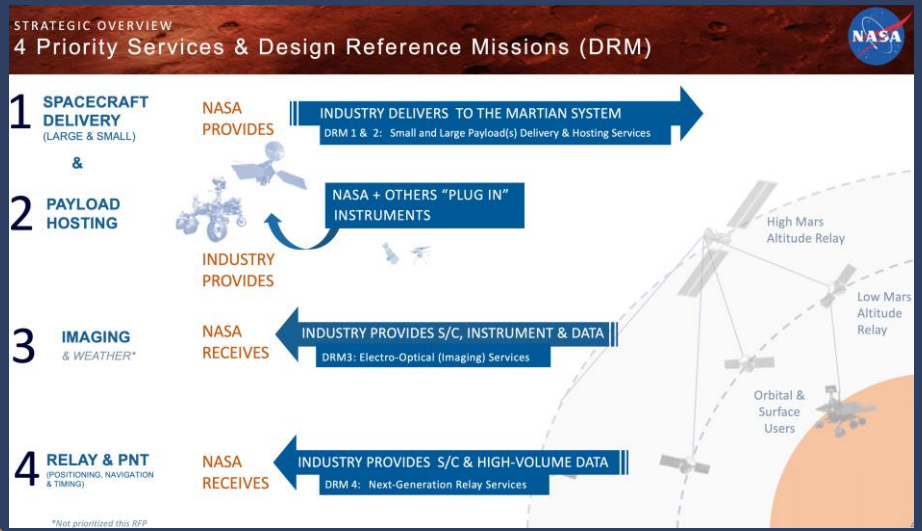
Hard Lander Concept

Science Helicopter Concept

Credits: JPL/Caltech

Commercial Studies Awards

DRM 1	Firefly Aerospace	Impulse Space	Lockheed Martin
DRM 2	Astrobotic	Blue Origin	United Launch Alliance
DRM 3	Albedo	Astrobotic	Redwire
DRM 4	Blue Origin	Lockheed Martin	SpaceX



Initiates Three Studies per DRM

- Provide higher level of confidence with DRM estimates
- Increased diversity across the US space industry
- Some ability to cross-correlate study results

Upcoming Activities

Search for Life Science Analysis Group (SFL-SAG)

- Purpose: Refine the recommendation for a ‘Search for Life’ mission in the Decadal Survey by narrowing down the type of environment, identifying the specific science and technology needs, and identifying those mission elements that will offer the most conclusive answers, for a mission of this class, to the question of ‘Are we alone?’
- Self-nominations closed June 26

10th International Conference on Mars (Pasadena, CA)

- July 22-25
- Purpose: Capture the breadth of current Mars knowledge, identify crucial planetary science questions and measurements, and aid in planning for the next decade at Mars

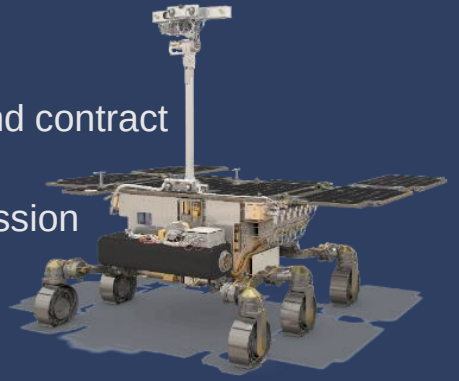
The Science and Planetary Protection in Advance of Human Exploration Virtual Seminar and Virtual Workshop

- July 31-Aug 1 and Oct. 15-17, respectively
- Purpose: A series of discussions centered on the priority science goals and planetary protection knowledge gaps that NASA should address in advance of human presence on the surface of Mars

MEP Pre-Formulation Efforts

NASA Rosalind Franklin Mission Project (NRP)

- Mission partnerships further elaborated by new NASA/ESA MOU and contract signed between ESA and Thales Alenia Space
- ESA successfully completed Preliminary Design Review on their mission elements
- NASA Key Decision Point A/B on July 16



Credit: ESA

Sample Receiving Project (SRP)

- Received draft Sample Safety Assessment Protocol (SSAP) report developing the necessary steps for sample release from high containment. Report is under review by independent experts and stakeholders, with final due to PSD July 30.
- Draft Measurement Definition Team (MDT) report, identifying instruments for sample safety assessment, curation, and initial science, is also under review.
- Developing a Study Agreement between ESA and NASA to continue SRP study phase activities necessary to develop SRP ground-based infrastructure
- Planning a meeting with ESA to discuss SRP infrastructure governance and prepare for an SRP MOU

Mars 2020

Perseverance Odometer: 27.35 km

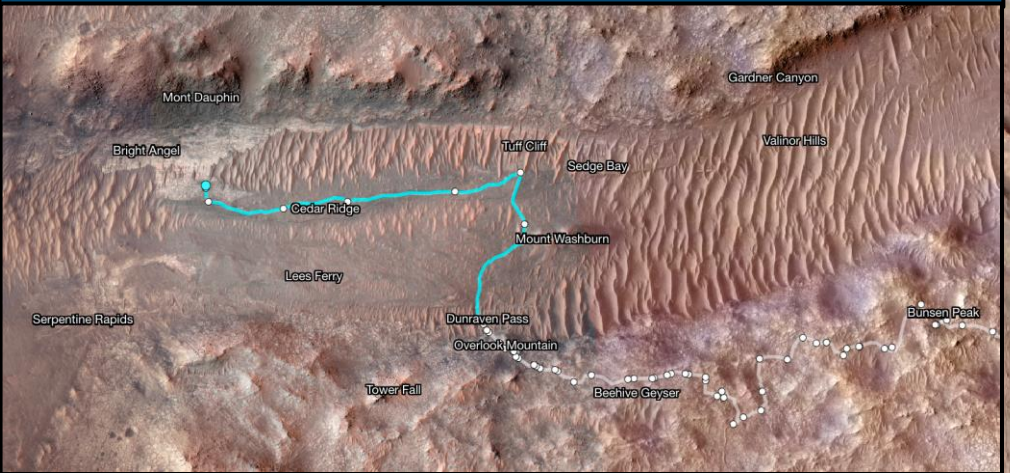
As of July 1, 2024

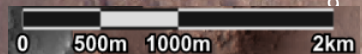
Margin Campaign

Delta Top Campaign

Three Forks

Perseverance's path between Jan. 21 and June 11. White dots indicate where the rover stopped after completing a traverse beside Neretva Vallis river channel. The pale blue line indicates the rover's route inside the channel.
Credit: NASA/JPL-Caltech/University of Arizona

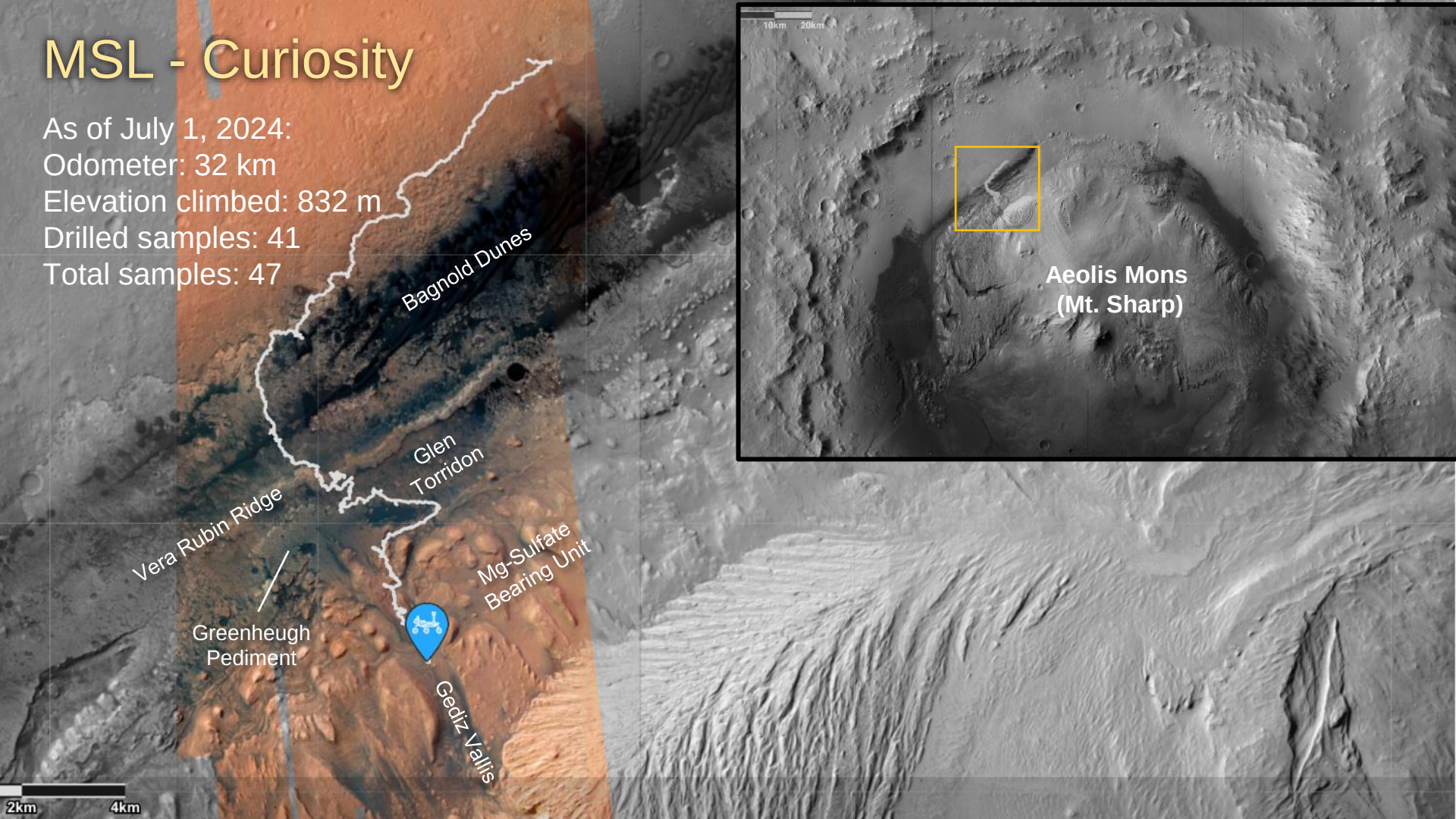




Margin Unit Campaign

- First Martian anorthosite (right) named Atoko Point found in the middle of the river channel Neretva Vallis (below).
- The rover has reached the Bright Angel location in the Neretva Vallis (see box below). The team is finding a mix of sulphate and phosphate lithologies and is analyzing their relationship with the margin unit.

NASA/JPL-Caltech/ASU/MSSS


MSL - Curiosity
As of July 1, 2024:
Odometer: 32 km
Elevation climbed: 832 m
Drilled samples: 41
Total samples: 47
Bagnold Dunes
Glen Torridon
Vera Rubin Ridge
Greenheugh Pediment
Mg-Sulfate Bearing Unit
Gediz Vallis
2km
4km
10km
20km
Aeolis Mons (Mt. Sharp)

Mars Science Laboratory (MSL) Curiosity

Curiosity continues to explore the Mg sulfate-bearing unit and Gediz Vallis ridge and channel

- Curiosity is investigating the interior of the debris-filled bedrock channel in Gediz Vallis that may hold the most recent evidence of surficial liquid water accessible to the mission
- Recently collected 41st drilled sample (“Mammoth Lakes”) to learn more about the channel interior deposits
- Curiosity also has been measuring the effects of recent extreme solar activity at the Martian surface, providing valuable insights to understanding radiation hazards for future astronauts

Mastcam mosaic showing field of bright rocks inside Gediz Vallis channel

Mastcam image of the “Mammoth Lakes” drill hole

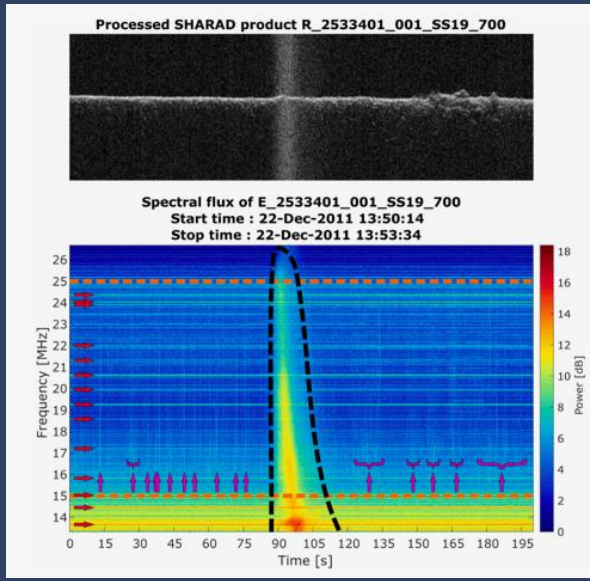
Nighttime MAHLI image showing crystalline material crushed by a wheel

Image credits: NASA/JPL-Caltech/MSSS

MEP Orbiter Science

Mars Reconnaissance Orbiter (MRO)

- The SHARAD (SHAllow RADar) instrument has been demonstrated to observe solar radio bursts in a new article by Gerekos et al. The study compared the SHARAD sensitivity to type III solar radio bursts to results from the STEREO and Wind heliophysics missions. The authors note that the “extremely high resolution of the instrument, both in temporal and frequency directions; its bandwidth; and its position in the Solar System enable SHARAD to make significant contributions to heliophysics.”

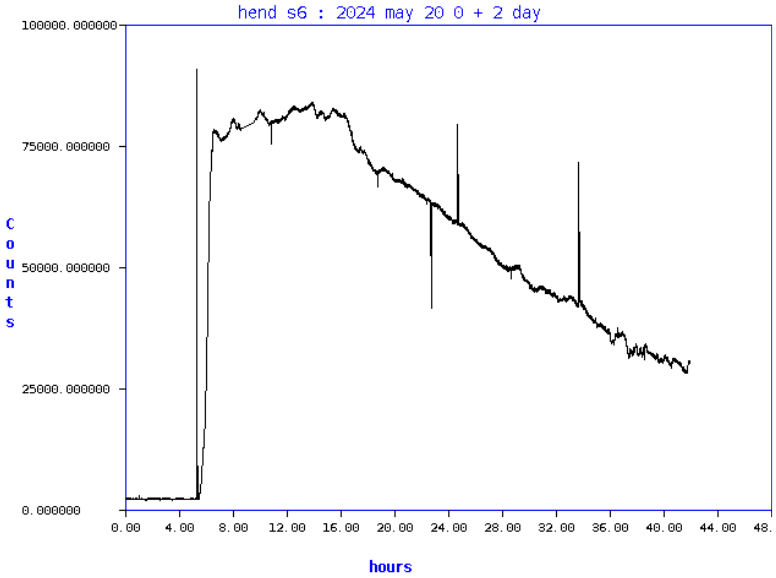


Odyssey

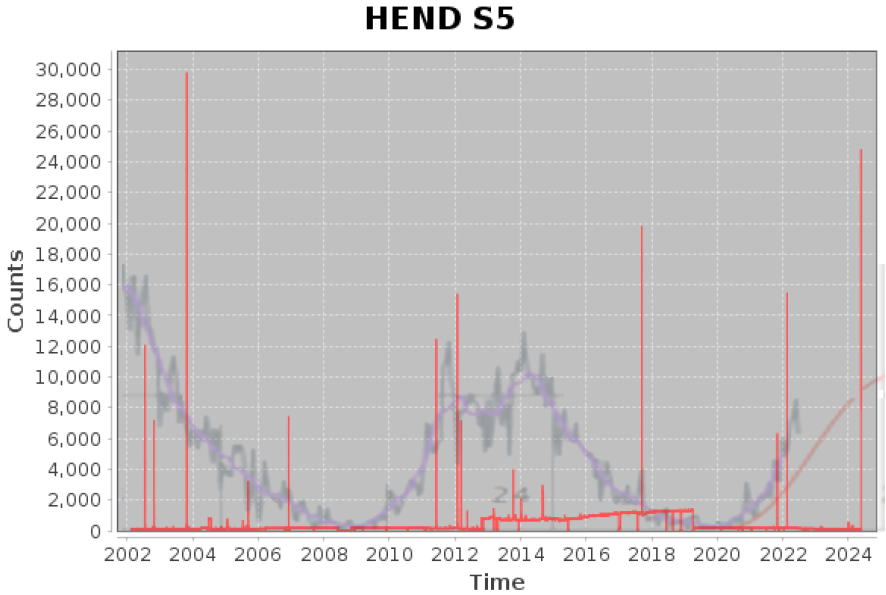
- Odyssey captured this single image of Olympus Mons, the tallest volcano in the solar system, on March 11 using the Thermal Emission Imaging System (THEMIS). In the atmosphere, a bluish-white band hints at dust presence, the purplish layer is likely a mixture of dust and water-ice clouds, and a blue-green layer shows where water-ice clouds reach up about 50 kilometers into the sky. The image is part of a continuing effort by the Odyssey team to provide high-altitude views of the planet’s horizon.

Recent Solar Activity at Mars

Data from the High Energy Neutron Detector (HEND) on Odyssey



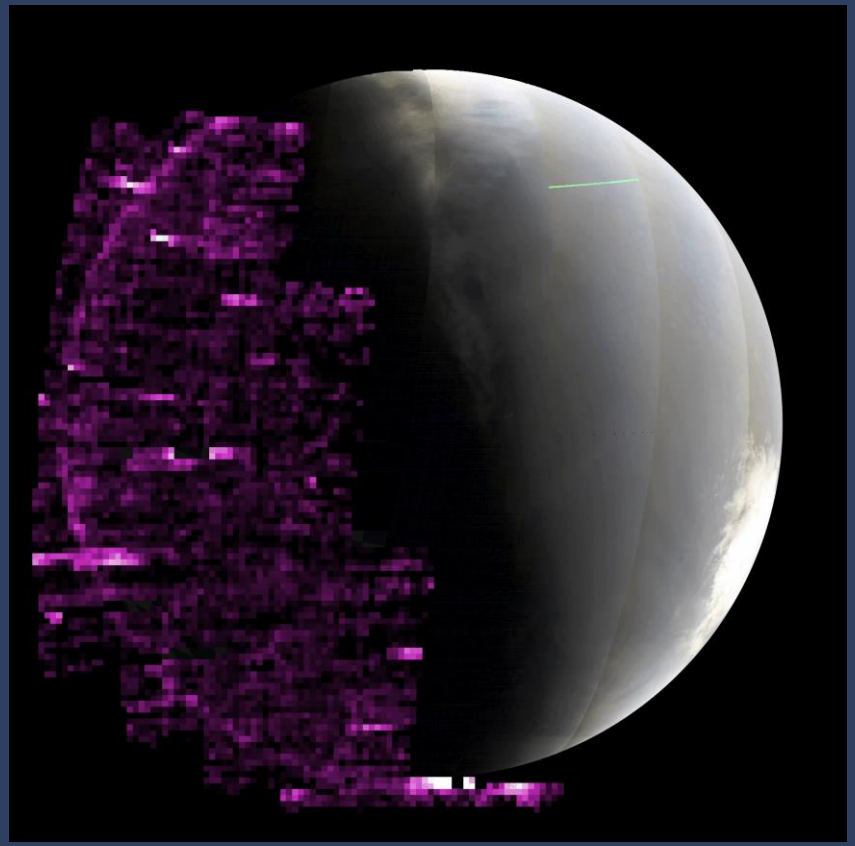
Count rates from HEND channel S6 for May 20-21, 2024. A large solar flare was detected at 5:17, followed by a high flux of solar energetic particles for the next several days.



Count rates from HEND channel S5 for the entire Odyssey mission (red). The recent event was the largest since 2003. Sunspot counts of the 11-year solar cycle are shown in blue.

NASA/JPL-Caltech/University of Arizona

Recent Solar Activity at Mars



MAVEN's Solar Energetic Particle instrument captured auroras on Mars' nightside created by the flow of energetic particles over the planet between May 14 and 20, 2024. The brighter the purple, the more auroras that were present.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