

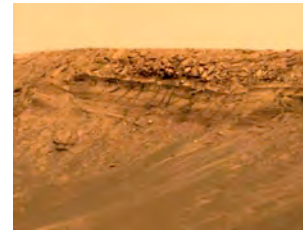


The 2013 Mars Atmosphere and Volatile Evolution (MAVEN) Mission



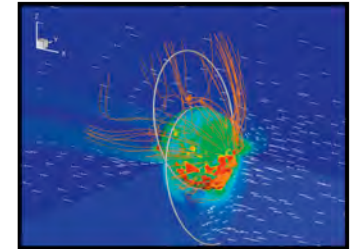
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 Laboratory for Atmospheric and Space Physics
 University of Colorado at Boulder
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 10 July 2009

Potential Importance of the Role of Loss to Space



- The history of liquid water and of the atmosphere determine Mars' potential for life throughout time.
- There is abundant evidence for climate change and atmospheric evolution.
- Loss of atmospheric CO₂, N₂, and H₂O to space has been an important mechanism for atmospheric evolution, and may have been the dominant mechanism.

Only by understanding the role of escape to space will we be able to fully understand the history of the atmosphere, climate, and water, and thereby understand Martian habitability.

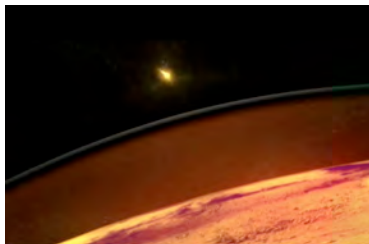


What Science Questions Will MAVEN Address?

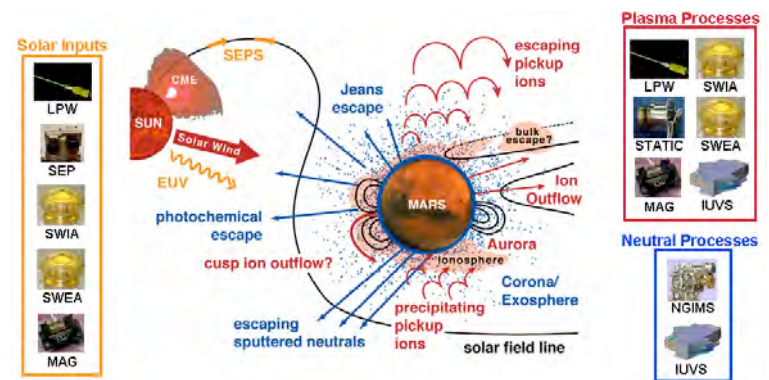


MAVEN will determine the role that loss of volatiles to space has played through time, providing definitive answers about Mars climate history:

- What is the current state of the upper atmosphere and what processes control it?
- What is the escape rate at the present epoch and how does it relate to the controlling processes?
- What has the total loss to space been through time?



MAVEN Will Measure the Drivers, Reservoirs, and Escape Rates



- MAVEN will determine the present state of the upper atmosphere and today's rates of loss to space.

- Essential measurements allow determination of the net integrated loss to space through time.

The MAVEN Science Instruments



Mass Spectrometry Instrument



NGIMS

Remote-Sensing Package



IUVS

Particles and Fields Package



STATIC



SEP



SWEA



SWIA



LPW



MAG

The MAVEN instruments are all closely based on similar instruments that have flown on previous missions.

The MAVEN Science Team



Overall science leads:

Bruce Jakosky (PI)
Bob Lin (DPI)
Joe Grebowski (PS)
Janet Luhmann

NGIMS:

Paul Mahaffy
Wayne Kasprzak

IUVS:

Nick Schneider
Bill McClintock
Erik Richard
Ian Stewart
John Clarke

MAG:

Mario Acuna (deceased)
Jack Connerney

SWEA:

David L. Mitchell
Christian Mazelle
Jean-Andre Savaud
Dominique Toubanc

SWIA:

Jasper Halekas
Davin Larson

STATIC:

Jim McFadden
David Brain
Bill Peterson
Francois Leblanc

LPW:

Bob Ergun
Greg Delory
Laila Andersson
Frank Eparvier
Tom Woods
Phil Chamberlin

SEP:

Davin Larson
Jasper Halekas

AAG:

Richard Zurek
Bob Tolson
Darren Baird

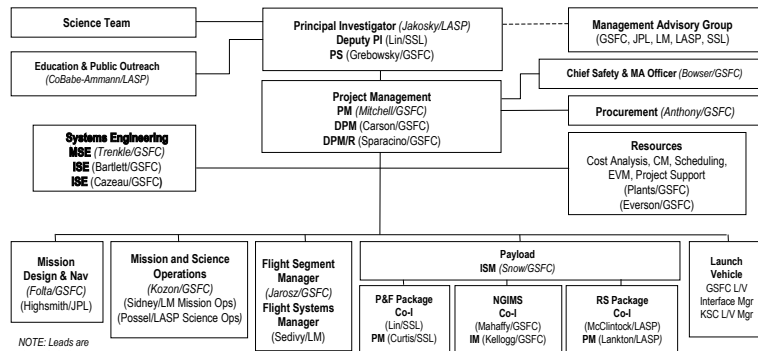
IDS:

Tom Cravens
Xiaohua Fang
Jane Fox
Roger Yelle

EPO:

Emily CoBabe-Ammann

MAVEN Management Structure



The MAVEN Spacecraft

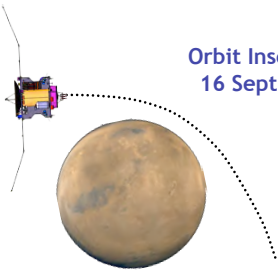
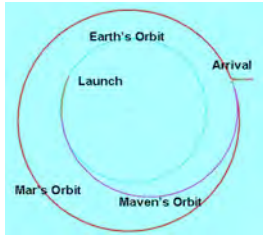


MAVEN Mission Architecture



20-Day Launch Window, Opens Nov. 18, 2013 (EELV - Delta IV or Atlas V)

Ten Month Ballistic Cruise to Mars



Orbit Insertion: 16 Sept 2014

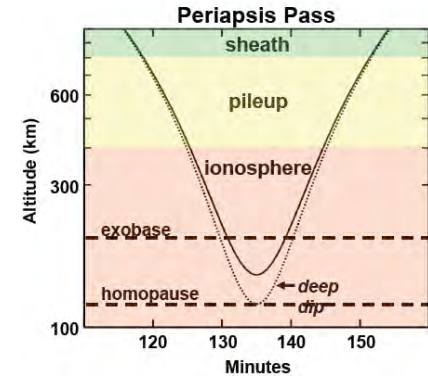
One Year of Science Operations



Elliptical Orbit Allows Measurement of All Relevant Regions of Upper Atmosphere



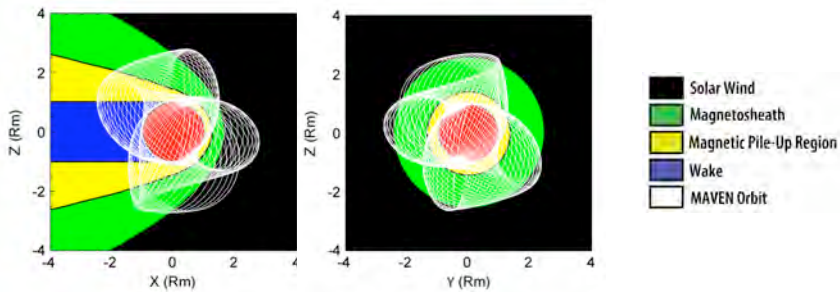
- Nominal periapsis near 150 km.
- Five “deep-dip” campaigns with periapsis near 125 km.



MAVEN Orbit and Primary Mission



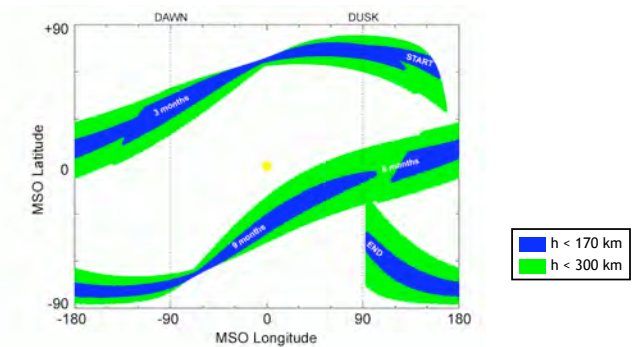
- Elliptical orbit to provide coverage of all altitudes
- The orbit precesses in both latitude and local solar time
- One-Earth-year mission allows thorough coverage of near-Mars space

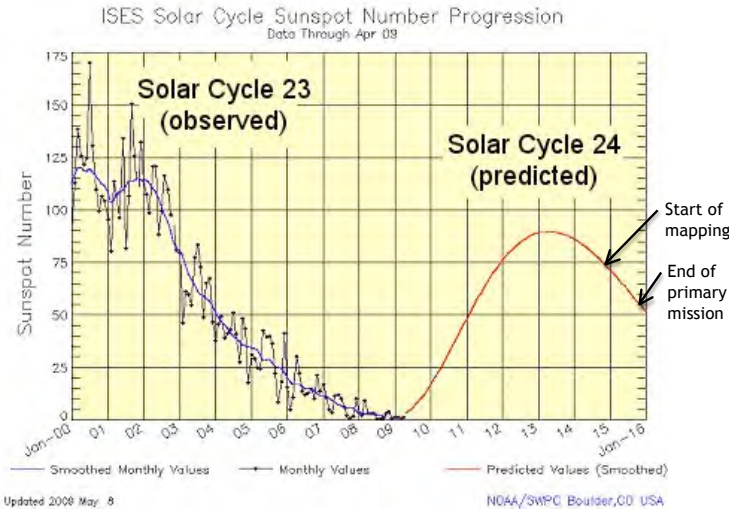


Latitude and Local Time Coverage



- One-Earth-year mission provides coverage of all local solar times and most latitudes.
- Figure shows periapsis regions. Apoapsis is, of course, on the opposite side of the planet.





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- Originally proposed to the Mars Scout AO in 2006
- Phase A Selection Announced by NASA HQ – 1/07
- Phase A CSR submitted to HQ – 10/07
- HQ decision to redo Phase A and slip to 2013 launch -12/07
- Phase A-Prime CSR delivered to HQ – 5/08
- MAVEN Site Visit – 7/08
- MAVEN selected for Phase B beginning with a \$6M Risk Reduction Phase – 9/08

The MAVEN team has been working together for five years.

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- MAVEN is in the “Risk Reduction Phase” portion of Phase B.
 - Limited funding for FY09 of \$6M, outside of \$486M cost cap.
 - Focused risk-reduction activities in s/c and instruments.
 - Preparation for Systems Requirements Assessment.
 - Just completed first meeting with SRB, “MAVEN 101”.
- Systems Requirements Assessment (SRR, but without schedule and cost components) scheduled for August 2009.
- Preliminary Design Review scheduled for July 2010.
- Critical Design Review scheduled for August 2011.
- Launch window opens 18 November 2013.



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- MAVEN has not had any fallout from the MSL problems.
- Significant effort in RR Phase on understanding capability of MAVEN to serve as a relay for surface assets
 - MAVEN will carry an Electra telecommunications package for data relay from surface assets.
 - MSL will be completing its two-year primary mission when MAVEN arrives.
 - There's an inherent trade-off for us between being an effective relay and doing MAVEN science.
 - Carrying out study to determine relay capability and its impact on science (report out to Mars Program Office scheduled for next week).
 - MAVEN is the relay backup for MRO and ODY; strong reassurances from HQ that our science mission comes first.
- MAVEN is on schedule, on budget, and on track.

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