The MEPAG Goals Document


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MEPAG Goals Document

- Prioritizes “flight” measurements to achieve high priority Mars system science questions
- Periodically updated, in response to new discoveries and research directions
What has been the timeline for this revision?

• Initiated at 9th Mars Conference (July 2019)
• Feedback on first draft (February 2020)
• Released on March 31, 2020

• In time to serve as a reference for Decadal Survey White Papers!
| I. Determine if Mars ever supported, or still supports, life | A. Search for evidence of life in environments that have a high potential for habitability and preservation of biosignatures.  
A1. Determine if signatures of life are present in environments affected by liquid water  
A2. Investigate the nature and duration of habitability near the surface and in the deep subsurface.  
A3. Assess the preservation potential of biosignatures near the surface and with depth | B. Assess the extent of abiotic organic chemical evolution.  
B1. Constrain atmospheric and crustal inventories of carbon (particularly organic molecules) and other biologically important elements over time  
B2. Constrain the surface, atmosphere, and subsurface processes through which organic molecules could have formed and evolved over martian history |
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| II. Understand the processes and history of climate on Mars | A. Characterize the state and controlling processes of the present-day climate of Mars under the current orbital configuration.  
A1. Lower atmosphere dust, water, CO2 cycles  
A2. Volatiles/dust exchange with surface  
A3. Chemistry of atmosphere and surface  
A4. Upper atmosphere/magnetosphere state & controlling processes | B. Characterize the history and controlling processes of Mars’ climate in the recent past, under different orbital configurations.  
B1. Determine recent climate record in polar region  
B2. Determine recent climate record in low- and mid-latitudes  
B3. Recent past atmospheric composition |
| III. Understand the origin and evolution of Mars as a geological system | A. Document the geologic record preserved in the crust and investigate the processes that have created and modified that record.  
A1. Characterize past and present water and other volatile reservoirs  
A2. Document the geologic record in sediments  
A3. Constrain ancient environmental transitions  
A4. Determine the construction and modification of the crust | B. Determine the structure, composition, and dynamics of the interior and how it has evolved.  
B1. Crust-mantle interactions  
B2. accretion, differentiation and thermal evolution |
| IV. Prepare for human exploration | A. Human landing with acceptable cost, risk and performance.  
A1. Atmospheric state affecting orbital capture and EDL for human missions  
A2. Orbital debris environment  
B1. Surface radiation and dust hazards  
B2. Impact of dust on hardware  
B3. Dust storm risks  
B4. Identify landing-site hazards | C. ISRU of atmosphere and/or water with acceptable cost, risk, and performance.  
C1. ISRU resilience to varying environmental conditions  
C2. Characterize water resources for ISRU for long-term human needs | D. Biological contamination and planetary protection protocols with acceptable cost, risk, and performance.  
D1. Definition of “special regions” in the exploration zone  
D2. Crew risk of martian biohazards  
D3. Earth risk of martian biohazards  
D4. Astrobiological baseline of landing site prior to human arrival  
D5. Survivability of terrestrial organisms at Mars | E. Human missions to Phobos or Deimos with acceptable cost, risk, and performance.  
E1. Geology to define science objectives, operations planning and resources  
E2. Surface and orbital conditions for proximity operations |
Changes in Current version from 2018 version

Goal I (Life):
• Removed distinction between extinct and extant life
  – Objective IA. Search for evidence of life in environments that have a high potential for habitability and preservation of biosignatures.
    • i.e., Merging extinct and extant Objectives from prior versions
  – Objective IB. Assess the extent of abiotic organic chemical evolution
    • Balances IA., examining abiotic origins of organics

Goal II (Climate):
• Shortened & updated prose
• Re-prioritized sub-Objectives:
  – Reflecting MAVEN’s advances and a renewed focus on polar science
Goal III (Geology):
• IIIA (Geologic Record) re-organized (concepts conserved)
  – Two new Investigations
    • History of sulfur & carbon
    • Link martian meteorites and returned samples to Mars’ geologic evolution

Goal IV (Human Exploration):
• Significant re-structuring: Mission architecture agnostic
• Updates to:
  – planetary protection (Establish astrobiological baseline before human presence)
  – atmospheric knowledge requirements (supersonic retro-propulsion)
Latest version of the Goals Document always available at:

https://mepag.jpl.nasa.gov/reports.cfm