Draft Revised MEPAG Goals II & III

Don Banfield, MEPAG Goals Committee Chair

Outline:

1. How, when, and by whom is the Goals Document revised?
2. What revisions are under consideration now?
3. How can I give feedback?

How/when/by whom are MEPAG Goals revised?

https://mepag.jpl.nasa.gov/reports.cfm?expand=science

- Revised in: 2001, 2004, 2005, 2008, 2010, 2012, 2015
- Usually prompted by a workshop/conference report, where a *potential disconnect* is identified
- If the MEPAG Goals Committee identifies sufficiently large potential disconnects, they propose edits to the Goals Document
- When ready, proposed edits are put to the community for comment (~1 month)
- After considering this input, Goals Representatives finalize their edits and the MEPAG Executive Committee reviews
- The Updated Goals Document is published.
- (and the cycle begins again)

Last (2015) & Next (2019) Major MEPAG Goals Updates

- Last major (full) revision followed the 8th International Conference on Mars (2014)
  - >650 attendees from 21 countries
  - Based on program content and synthesis-focused discussion
  - Re-evaluation of full Goals Document content and structure
- Next major (full) revision will follow 9th International Conference on Mars (2019)
  - In time for use in the next Decadal Survey

Current (minor) MEPAG Goals Update

- Currently in process: Polar Science and present-day activity
  - Prompted by 6th International Mars Polar Science and Exploration Conference
    - https://www.hou.usra.edu/meetings/marspolar2016/
    - Generated summary report, outlining Polar Science priorities
  - MEPAG ExComm requested Goals Committee look into these areas
  - Initial report from Polar Science representatives was delivered June 2017, with iterative discussion with Goal II and III Representatives since
  - **Proposed edits are now available for community comment!**

Summary of Changes

- Changes only occur in Goals II & III
- Includes more explicit mention of ice (including frozen CO_2 and icy landforms/terrains) and dust.
- Shifts/refines some polar-focused investigations to better reflect present state of understanding and open questions.
- More explicitly and comprehensively includes focus on present-day changes and related science questions.

- You need to read the draft documents to properly evaluate the changes.

Mars Exploration Program Analysis Group (MEPAG)

Life	**I. Determine if Mars ever supported life.**	A. Determine if environments having high potential for prior habitability and preservation of biosignatures contain evidence of past life B. Determine if environments with high potential for current habitability and expression of biosignatures contain evidence of extant life
Climate	II. Understand the processes and history of climate on Mars.	A. Characterize the state of the present climate of Mars' atmosphere and surrounding plasma environment, and the underlying processes, under the current orbital configuration B. Characterize the history of Mars' climate in the recent past, and the underlying processes, under different orbital configurations C. Characterize Mars' ancient climate and underlying processes
Geology	III. Understand the origin and evolution of Mars as a geological system.	A. Document the geologic record preserved in the crust and interpret the processes that have created that record B. Determine the structure, composition, and dynamics of the Martian interior and how it has evolved C. Determine the manifestations of Mars' evolution as recorded by its moons
Human Exploration Source: MEPAG 2015	IV. Prepare for Human Exploration.	A. Human mission to Mars orbit with acceptable cost, risk, and performance B. Human mission to the Martian surface with acceptable cost, risk, and performance C. Human mission to the surface of Phobos or Deimos with acceptable cost, risk, and performance D. Sustained human presence with acceptable cost, risk, and performance

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Life	**I. Determine if Mars ever supported life.**	
Climate	II. Understand the processes and history of climate on Mars.	A. Characterize the state of the present climate of Mars' atmosphere and surrounding plasma environment, and the underlying processes, under the current orbital configuration B. Characterize the history of Mars' climate in the recent past, and the underlying processes, under different orbital configurations
Geology	III. Understand the origin and evolution of Mars as a geological system.	A. Document the geologic record preserved in the crust and ~~interpret~~ **INVESTIGATE** the processes that have created **AND MODIFIED t**hat record
Human Exploration Source: MEPAG 2015	IV. Prepare for Human Exploration.	

Goal	Objective	Sub-Objective	Investigation
II. Understand the processes and history of climate on Mars	A. Characterize the state of the present climate of Mars' atmosphere and surrounding plasma environment, and the underlying processes, under the current orbital configuration	A1. Constrain the processes that control the present distributions of dust, water, and carbon dioxide in the lower atmosphere, at daily, seasonal and multi-annual timescales.	2. Characterize dust **AND OTHER AEROSOLS**, water vapor **AND CARBON DIOXIDE** and **THEIR** clouds in the lower atmosphere.
		A4. Constrain the processes by which volatiles and dust exchange between the surface and atmospheric reservoirs.	1. ~~Measure~~ **CHARACTERIZE** the ~~turbulent~~ fluxes **AND SOURCES** of dust and volatiles between surface and atmospheric reservoirs.
			2. Determine how the ~~exchange of~~ **PROCESSES EXCHANGING** volatiles and dust between surface and atmospheric reservoirs ~~has~~ HAVE affected the present **HORIZONTAL AND VERTICAL** distribution of surface and subsurface water and CO_2 ice.
			3~~. Determine how the exchange of volatiles and dust between surface and atmospheric reservoirs has affected the Polar Layered Deposits (PLD)~~.**DETERMINE THE ENERGY AND MASS BALANCE OF THE SURFACE VOLATILE RESERVOIR OVER RELEVANT TIMESCALES, AND CHARACTERIZE THEIR FLUXES.**

Goal	Objective	Sub-Objective	Investigation
II. Understand the processes and history of climate on Mars	B. Characterize the history of Mars' climate in the recent past, and the underlying processes, under different orbital configurations.	B1. Determine how the chemical composition and mass of the atmosphere has changed in the recent past.	2. **DETERMINE HOW AND WHEN THE BURIED CO2 ICE RESERVOIRS AT THE SOUTH POLE FORMED**.
		B2. Determine the **CLIMATE** record of the recent past that is expressed in geological, **GLACIOLOGICAL**, and mineralogical features of the polar regions.	1. ~~Map the ice and dust layers of the PLD and determine the absolute ages of the layers.~~ **DETERMINE THE VERTICAL AND HORIZONTAL VARIATIONS OF COMPOSITION AND PHYSICAL PROPERTIES OF THE MATERIALS FORMING THE POLAR LAYERED DEPOSITS.**
			2. DETERMINE THE ABSOLUTE AGES OF THE LAYERS OF THE POLAR LAYERED DEPOSITS
			~~2. Obtain compositional and isotopic measurement of gases trapped within the PLD.~~ **3. DETERMINE WHICH ATMOSPHERIC AND SURFACE PROCESSES ARE RECORDED DURING LAYER FORMATION.** (NOTE, WAS B2.2, NOW B2.3)
			4. CONSTRAIN MARS' POLAR AND GLOBAL CLIMATE HISTORY BY CHARACTERIZING AND INTERPRETING THE RELATIONSHIPS BETWEEN ORBITALLY-FORCED CLIMATE PARAMETERS AND THE LAYER PROPERTIES OF THE POLAR LAYERED DEPOSITS.

Mars Exploration Program Analysis Group (MEPAG)

Goal	Objective	Sub-Objective	Investigation
II. Understand the processes and history of climate on Mars.	B. Characterize the history of Mars' climate in the recent past, and the underlying processes, under different orbital configurations.	B3. Determine the record of the climate of the recent past that is expressed in geological and mineralogical features of low- and mid-latitudes.	~~1. Identify and map the location, age, and extent of glacial and peri-glacial features and quantify the depth to any remnant glacial ice.~~ **CHARACTERIZE THE LOCATIONS, COMPOSITION, AND STRUCTURE OF LOW AND MID-LATITUDE VOLATILE RESERVOIRS AT THE SURFACE AND NEAR-SURFACE.**
			2. DETERMINE THE CONDITIONS UNDER WHICH THE LOW AND MID-LATITUDE VOLATILE RESERVOIRS ACCUMULATED AND PERSISTED UNTIL THE PRESENT DAY, AND ASCERTAIN THEIR RELATIVE AND ABSOLUTE AGES.

Goal	Objective	Sub-Objective	Investigation
III. Understand the origin and evolution of Mars as a geological system.	A. Document the geologic record preserved in the crust and ~~interpret~~ **INVESTIGATE** the processes that have created **AND MODIFIED** that record.	A1. Identify and characterize past and present geologic environments and processes relevant to the crust.	4. Identify **FROST AND** ice-related processes and characterize when and how they have modified the Martian surface.
			6. DETERMINE THE PROCESSES THAT CREATE DUST AND DISTRIBUTE IT AROUND THE PLANET, IDENTIFY ITS SOURCES, AND FULLY CHARACTERIZE ITS COMPOSITION AND PROPERTIES. (NOTE: FORMER A1.6->A1.7)
		A3. IDENTIFY AND CHARACTERIZE PROCESSES THAT ARE ACTIVELY SHAPING THE PRESENT-DAY SURFACE OF MARS. (NOTE: FORMER A3->A4)	**1. IDENTIFY PRESENT-DAY CHANGES WITHIN THE ROCKY OR ICY SURFACES OF MARS, AND ESTIMATE PAST AND PRESENT RATES OF CHANGE.**
			2. DETERMINE RELEVANT SURFACE AND ATMOSPHERIC ENVIRONMENTAL CONDITIONS AND/OR PROCESSES THAT CAUSE OBSERVABLE SURFICIAL CHANGES OVER DIURNAL, SEASONAL, AND MULTI-ANNUAL TIMESCALES.
			3. EXTEND THE EVOLVING KNOWLEDGE OF ACTIVE SURFACE PROCESSES TO OTHER LOCATIONS ON THE PLANET AND BACKWARD IN TIME.

URLs for Drafts and Feedback

Draft versions of Goals II & III are available at:https://mepag.jpl.nasa.gov/reports.cfm?expand=science

We solicit your feedback at: https://docs.google.com/forms/d/e/1FAIpQLSeoPm58KmknUKBShK4fGFrzskplKdFP8d0pKRsn1UHq3Z0RGg/viewform

Please read the drafts and give us feedback via the web-form!