

2018 Workshop on Autonomy for Future NASA Science Missions

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Mars Design Reference Mission

Jen Eigenbrode and Eric Lyness

About the Team Leads



Jen Eigenbrode, NASA GSFC

- Astrobiologist
- Working MSL operations for 6 years
- Proposed missions as the lead scientist
- On the executive committee of MEPAG

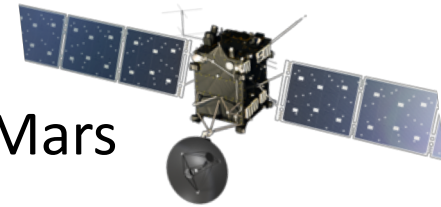


Eric Lyness, NASA GSFC

- Software lead on Mars Organic Molecule Analyzer
- Worked operations for MSL, LADEE and MAVEN
- 30 years as a software architect

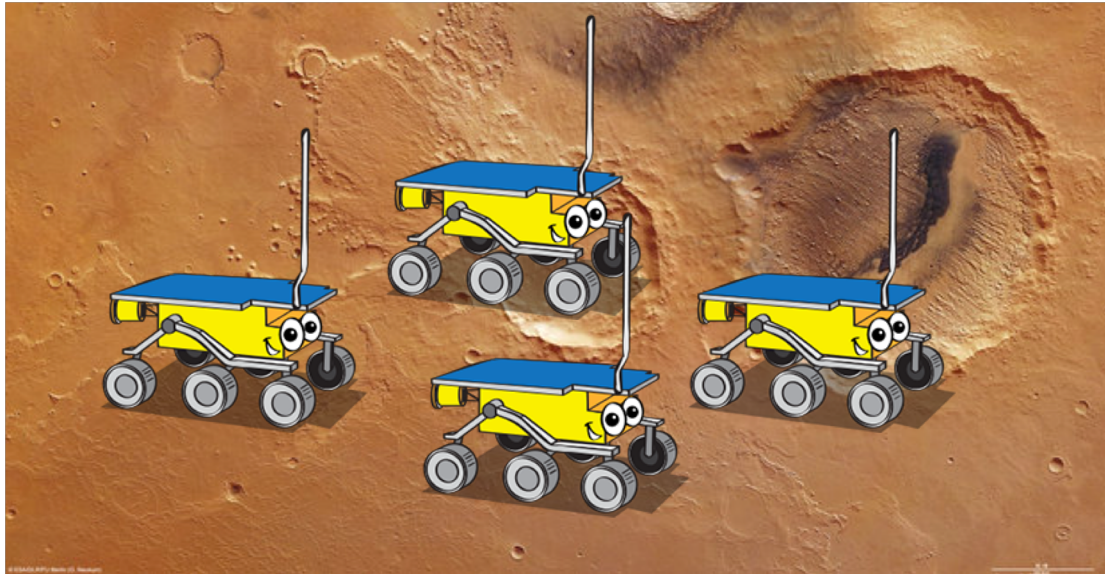
Our perspective is based on planetary science instruments

Subsurface Geohydrology Investigation



Mission Objectives:

- Study and map the geohydrology of TBD location on Mars
- Find water and identify its composition
- Provide information to support future ISRU missions
- Establish a Mars Explorer scalable network for future missions



Engineering Approach

- Team of small, collaborating rovers.
- "Mother" ship coordinating rovers and Earth, providing computing power. Ability to scale for future missions.
- Rovers continue to support astronauts or additional rover teams.

Goal of the mission would be to fully map 100's of square meters of a potential human landing site.

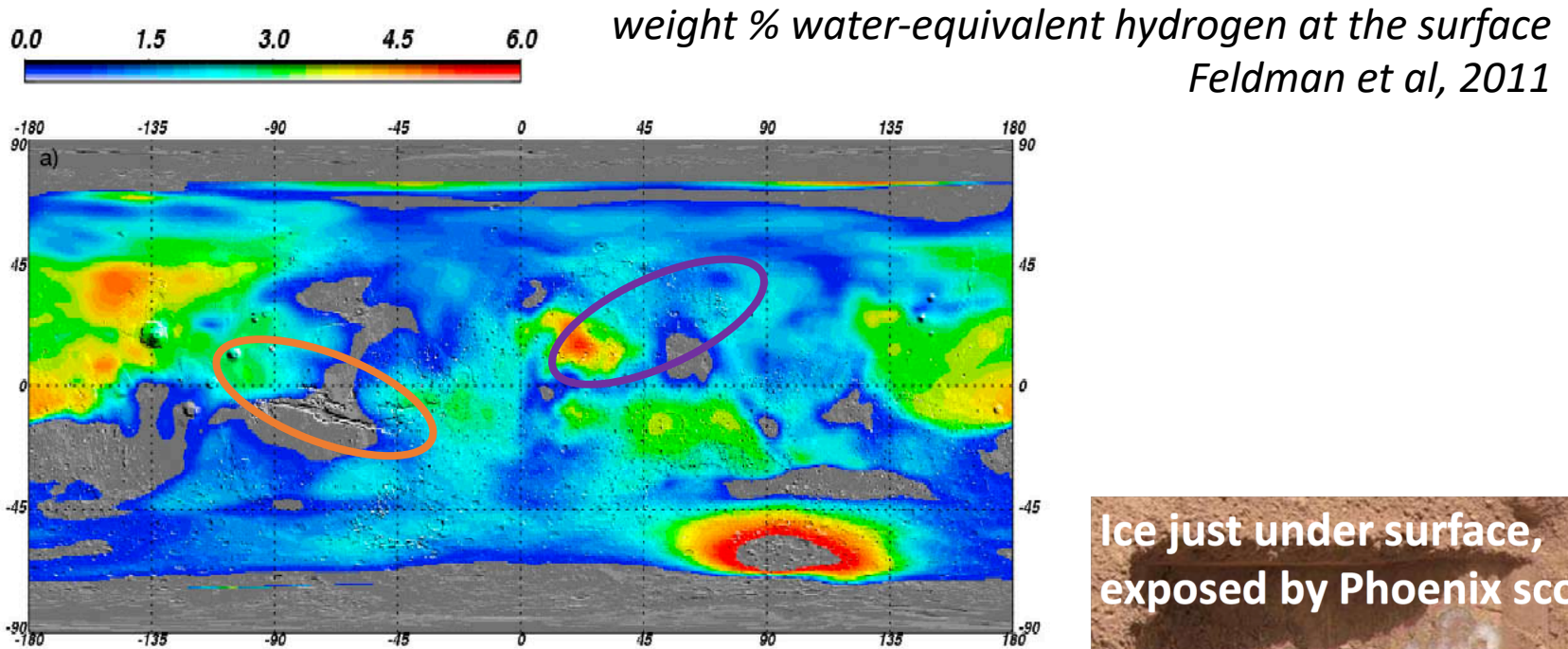
Design Reference Mission



General DRM Goal: Replace most of the tactical and strategic operations teams by automating movement, science analysis, and activity planning.

- Multiple rovers moving at relatively high speed are required to cover the large area.
- Increased science volume will overload operations team. Onboard science analysis and decision making is required to keep pace with rovers.
- Mapping terrain with science data provides ability for rover to make autonomous scheduling and planning decisions

Feasible regions for the DRM



- Water maps are being updated to inform missions that require access to near surface ice (0-5 m) *expected in ~April 2019?*
- Possible exploration regions: **Arabia Terra**, **Hellas Basin**, and polar regions... based on candidate human landing site short list.

