ExoMars

2nd Landing Site Selection Workshop

Final Report

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		Date
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Agreed		
Approved		

ALTEC, 11 December 2014

FINAL REPORT

EXECUTIVE SUMMARY

On 11 December 2014, fifty international scientists, project, and industry engineers gathered at ALTEC, in Torino (ITA) for the second ExoMars 2018 Landing Site Selection Workshop (LSSW#2).

The workshop was co-organised by ESA and IKI/Roscosmos with the support of the ExoMars 2018 Landing Site Selection Working Group (LSSWG). The goal of the meeting was to review and discuss the merits and concerns of the four candidate landing sites under consideration for the mission: Mawrth Vallis, Oxia Planum, Hypanis Vallis, and Aram Dorsum.

The workshop was originally planned to take one-and-a-half days. Unfortunately a nationwide planned air and train strike in Italy complicated the travel arrangements for most participants. It was nevertheless decided to proceed with the entire agenda, but compressing the workshop into a single, extended day.

During the morning, each of the four proposing teams gave a one-hour presentation describing the progress achieved in the scientific understanding of their landing site. The new HiRISE and CRISM data were shown and discussed. Hereafter follow a few summary remarks:

Aram Dorsum
The alluvial sediments are probably older than previously thought (~4.0 Ga). Polygonal fractures can be found at the bottom of pits. The team performed a very useful analysis of how far primary target material would be from any touchdown point within the ellipse if the rover could travel 1 km, 2 km, etc. The LSSWG considered that it would be useful to have this for the other sites as well.

Oxia Planum
This site includes very old terrain (~4.0 Ga) that was buried and exhumed. The phyllosilicates are located at the lowest points (basins?). A vermiculite spectral signature dominates the phyllosilicate signatures in Oxia. Vermiculite can be formed by weathering or hydrothermal alteration of some minerals in the mica family of phyllosilicates, such as biotite or phlogopite. The team suggested that perhaps these phyllosilicates form the base of the sequence that can be observed in Mawrth Vallis.

Mawrth Vallis
Ancient terrains having roughly the same age as those in Oxia (~4.0 Ga). The team presented an interesting analysis of potential Earth analogues. They concluded that the palaeosols at John Day Fossil Bed National Monument, Oregon (USA) seem to provide a good match for the orbital observations. These phyllosilicate-rich deposits are interpreted to be the result of pedogenetic alteration of volcanic ash layers hydrated by fluvial or alluvial flows.

Hypanis Vallis
The distal, fine-grained deltaic deposits that constitute the primary target are more recent than those at the other sites (~3.5 Ga). Many instances of Mg-Fe phyllosilicates signatures have been detected on terrains having a fractured surface texture of unknown origin.

The first part of the afternoon was devoted to discussing the relative scientific merits of the four candidate landing sites. This block started with a talk prepared by the LSSWG that tried to summarise key points about the geologic

context of the phyllosilicate-rich (Mawrth and Oxia) and alluvial (Hypanis and Aram) sites, including the potential for cells having colonised their sediment deposits.

The second half of the afternoon session focused on the work performed to confirm (or otherwise) the current landing site engineering constraints. TAS-I and ESA described the Entry, Descent, and Landing (EDL) system, the evolution of the Descent Module (DM) design since the last workshop, and how the entry corridor analysis is performed for the various candidate sites. They explained that entry corridors have been identified for Hypanis Vallis, Oxia Planum, and Aram Dorsum, but not yet for Mawrth Vallis. The EDL work is on-going as part of the project's development activities. A revision of the Landing Site Engineering Constraints (LSEC) will be made during the second half of 2015. It is expected that for the 2018 launch opportunity the envelope of possible landing ellipse orientations for Hypanis Vallis, Oxia Planum, and Aram Dorsum will be reduced relative to what was included in the LSS User's Manual. Also, it is likely that the orientations for landing ellipses in Mawrth Vallis will be updated —in case a feasible entry corridor can be confirmed. The orientation of the 2020 launch landing ellipses will not change for the time being. Finally, a new definition will be introduced for checking compliance with rock abundance requirements.

Next, a presentation on MSL lessons for ExoMars was given by the LSSWG.

Thereafter, a talk by N. Manaud presented the goals of an ESAC Trainee Project to start in January 2015. It will be devoted to preparing a tool (based on CartoDB) for preparing web maps of the landing sites for public outreach purposes.

The last two presentations showed the results of the worked carried out at TAS-I and at the International Research School of Planetary Science, in Pescara (ITA), for evaluating the presence of rocks and assessing slopes in the four candidate landing sites.

Though the workshop concluded rather late, the participants were very satisfied that the entire agenda could be covered in time to catch flights home. They appreciated the opportunity to be hosted by and to interact with Industry in the future Rover Operations Control Centre (ROCC) and the chance to visit the Mars Landscape Simulator.

The next, third ExoMars Landing Site Selection Workshop will probably take place sometime during Fall 2015.

Desired Future Work

It was agreed that the distance to prime targets for each landing site would constitute a very useful assessment. Please refer to the Aram Dorsum analysis, and if necessary contact the team to ensure a coordinated approach to perform this evaluation.

It would be important to have geological maps for all candidate sites. Do we have one for Oxia Planum? Or should this be added to a "to do" list?

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