USING MULTI MISSION GIS (MMGIS) FOR THE EXOMARS ROVER MISSION

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Introduction: Preparations for science operations of the ExoMars 'Rosalind Franklin' Rover support the primary mission goal of searching for signs of life [1]. The science team are prepared to investigate the geology and geochemical signatures in rocks at the Oxia Planum landing site, which are interpreted to have formed during the Noachian when habitable environments were likely more prevalent on Mars.

As part of these preparations, the Rover Science Operations Working Group (RSOWG) performed a group mapping exercise using the Multi-Mission Geospatial Information System (MMGIS), a spatial data infrastructure for planetary missions developed by a team at NASA/Caltech JPL and publically available for use by the science community [2].

Deployment: The production instance of MMGIS is deployed on the cosmos.esa.int domain. The UI and data configuration is easily administered via its configuration interface. A version controlled repository of co-registered remote sensing image mosaics, covering the 3-sigma landing ellipse envelope, was generated for use with MMGIS for the mapping project, and is maintained by the project science team. Data for mapping originated from MRO HiRISE and CTX, ExoMars TGO CaSSIS, and Mars Express HRSC. For use with MMGIS orthorectified mosaics were converted into hierarchical tiled format.

Group Mapping of Oxia Planum: The mapping campaign and coordination/leadership team began planning in Q4 2019 and work was arranged into 3 phases: Training, Mapping and Reconciliation. The training programme involved 9 sessions on data and tool familiarization, mapping techniques and best practices. Mapping volunteers were required to complete the training sessions, using MMGIS to follow presentations and exercise its functions.

84 mapping volunteers associated with RSOWG were assigned and mapped quads at a fixed scale. Data from mapped quads was delivered by Q4 2020 to a small reconciliation team, who began the process to reconcile scientific observations made by individual mappers to form a unified set of interpretations [3]. The geologic map is in the final stages approaching readiness for peer-review [4]. Meanwhile, preparations have been made to continue to use MMGIS for the ExoMars Rover during simulations and operations, as a geospatial workspace for use by the science team during rover activity planning and interpretation of science results.

Conclusion: MMGIS has enabled the ExoMars Rosalind Franklin Rover science team to work together to perform geologic mapping of a large area of the Oxia Planum landing site. Moreover, MMGIS provides a basis for surface mission science preparations of the ExoMars Rover mission, as a platform for effective navigation, interrogation and annotation of co-registered orbital datasets. The science team, a large and geographically distributed group of experts, as well as colleagues with little or no GIS experience, continue to use MMGIS to jointly view, interrogate and interpret data to visualise hypotheses using the geospatial tools that MMGIS provides.

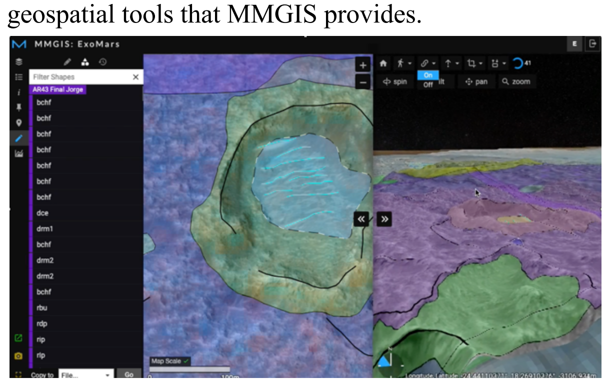

Figure 1: MMGIS interface – Digitisation of geologic contacts and features.

References: **[1]** Vago, J. L. et al., (2017) A*strobiology 17* (6–7), 471–510. **[2]** Calef, F. J. et al., (2019) in *4th Planet. Data Work.*, Vol. 2151. **[3]** Sefton-Nash, E. et al., (2021) in *52nd Lunar Planet. Sci. Conf.* **[4]** Fawdon, P. et al. (2022) in *Lunar Planet. Sci. Conf.*, Abs. 2210.

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