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Amazonis and Elysium basins and Their Link, Marte Vallis (AME), Tharsis/Elysium Corridor, Mars

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The geologic provinces of Mars, as identified through a synthesis of geologic, paleohydro-logic, topographic, geophysical, spectral, and elemental information [1], are windows into its evolution, with the youthful province, the Tharsis/Elysium corridor [2-4], recording hydrologic, tectonic, and volcanic activity, including fissure-fed eruptions and shield-volcano field development, within at least tens of millions of years.

Geologically recent activity in the Tharsis/Elysium corridor region is particularly high-lighted in the Amazonis and Elysium basins and their link, Marte Vallis (hereafter referred to as AME). A youthful shield-volcano field with at least seven gentle sloping shield volcanoes and fissure-fed vent structures have been identified, mapped, and characterized in the western part of the Elysium. In addition, the lava flows on and near the margins of the shield volcanoes display crenulated lava flow margins, possibly marking lava-water-ice interactions. Both the shield volcanoes and pristine lavas located within AME, which are marked by a paucity of relatively small (˜few-km-diameter) superposed impact craters and modified by faults and fractures and valleys, point to geological and hydrological activity on Mars in recent geologic time, making AME a significant target for future reconnaissance, including testing the hypotheses of whether Mars is geologically, hydrologically, and biologically active.

Specifically, the following questions might be addressed through international reconnaissance missions to AME, which would include instrument suites with optimal geologic, geochemical, geophysical (including seismic), environmental, and biological capabilities, including whether Mars: (1) is geologically and hydrologically active, (2) contains salty groundwater and magma at relatively shallow depths, (3) has sustained elevated heat flow, (4) records seismic activity, and (5) comprises fossilized and/or extant life.

References

[1] Dohm, J.M. et al., (2013?in press), Nova Science Publishers, Inc.
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[4] Miyamoto, H., (2004) Journ. of Geophy. Res. 109, E06008, doi:10.1029/2003JE002234.