

MARS: MAGMATIC-TECTONIC EVOLUTION OF THUAMSIA VIA A MULTI-INTRADISCIPLINARY APPROACH

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The tectonic activity of Mars is related in space and time to the planet's magmatic evolution. This association is similar to the genetic relations between magmatic-related activity and tectonic structures on Earth. This relationship on Mars is the Tharsis rise, which is the largest volcanotectonic features on the planet covering over 25 % of its surface. This asymmetrically dome-shaped feature is a central source region of magmatic-volcanotectonic activity (where significant releases of the planet's endogenic heat occurred over half of its evolution). Recent detailed digital structural mapping and relative-age determinations of more than 25,000 tectonic and volcanic structures within the Tharsis region, which include faults, rift systems, and volcanoes coupled with comparative and statistical analysis of their temporal and spatial relations using Geographic Information Systems and other state-of-the-art techniques suggest that the Tharsis region comprises a complex system of magmatic-related regional and local coincidental and sequential sources of tectonic activity. Several appear to be located among topographic highs (based on MOLA data). The Thaumasia region (one of several major magmatic-tectonic provinces of Tharsis), for example, comprises well-defined, quasi-circular hierarchical morphostructures (topographic highs and basins) of varying sizes, which include genetically-associated components such as ancient mountain ranges and volcanoes, tectonic plateaus, extensive fault, rift, and ridge systems, successions of lava-flow fields, and integrated valley networks.