

MEVTV Newsletter

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A report of the
Mars: Evolution of Volcanism, Tectonics and Volatiles Study Project

MEVTV WORKSHOP ON TECTONIC FEATURES ON MARS

— Thomas R. Watters and Matthew P. Golombek

One of the most intriguing characteristics of the surface of Mars is the abundance of tectonic features. After almost two decades of photogeologic study of this planet, the description and analysis of landforms indicative of crustal deformation are still ongoing. The investigation of appropriate terrestrial analogs that provide insight into questions about geometry and kinematics and provide a basis for mechanical models is becoming increasingly important in the study of structures on Mars.

The Workshop on Tectonic Features on Mars was held at the Hanford Science Center in Richland, Washington, April 20–22, 1989. Over 30 geoscientists attended the workshop, which was designed to stimulate questions and the free exchange of ideas. The objectives were to determine the state of our knowledge of tectonic features on Mars and assess kinematic and mechanical models for their origin. The Columbia Plateau in eastern Washington was chosen for the location of the workshop because many of the structures that occur in the area may serve as potential analogs to martian tectonic features.

The workshop was organized around three sessions: (1) Wrinkle Ridges and Compressional Structures, (2) Strike-slip Faults, and (3) Extensional Structures. Each session began with an overview of the features under discussion. Following the overview talks on wrinkle ridges and extensional structures, several

keynote addresses were presented by specialists working on similar structures on the Earth.

The controversy over the relative importance of folding, faulting, and intrusive volcanism in the origin of wrinkle ridges was the focus of a number of debates. By the end of the various exchanges it was clear that none of the mechanisms proposed completely explained all aspects of these complex landforms. The origin of compressional flank structures associated with martian volcanoes and the relationship between the volcanic complexes and the inferred regional stress field were also discussed.

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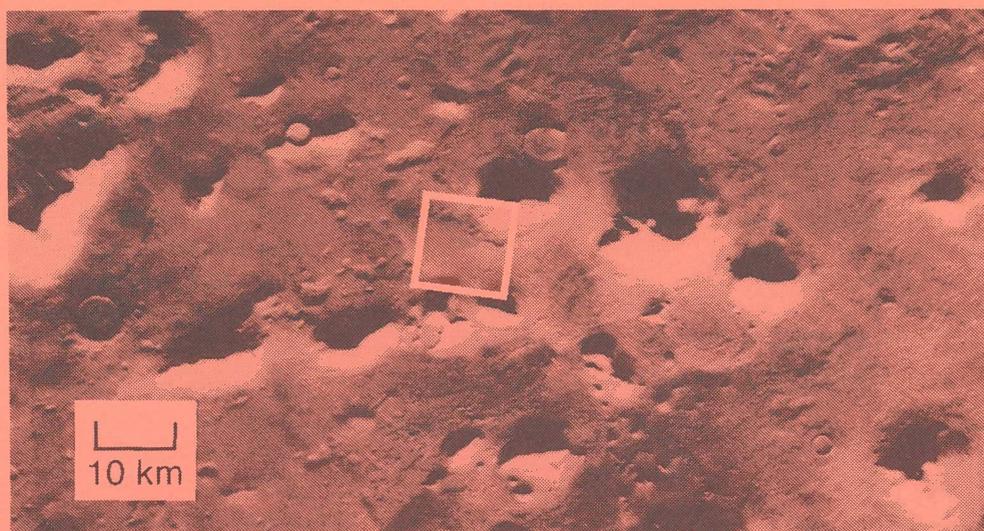
MARS REPRINTS/PREPRINTS AVAILABLE THROUGH THE LPI

A Mars preprint/reprint distribution service, started during the MECA Study Project, will be continued as part of the MEVTV Study Project. Any paper whose scope is encompassed by the research objectives of the MEVTV Study Project, and whose authorship includes at least one member of the Study Group, is a candidate for distribution. Preprints (one unstapled copy) should be submitted in their final form. All duplication will then be provided by the LPI. Reprints should be supplied in quantity (preferably at least 20 copies) by the author. As new papers are received, their titles will be added to the list of available publications. Requests for copies should be addressed to the Editor.

Current Holdings: (R) - reprint, (P) - preprint

- Burns R. G. (1987) Ferric sulfates on Mars. *Proc. Lunar Planet. Sci. Conf. 17th*, in *J. Geophys. Res.*, 91, E570-E574. (R)
- Burns R. G. (1988) Gossans on Mars. *Proc. Lunar Planet. Sci. Conf. 18th*, pp. 713-721. (R)
- Clifford S. M. (1987) Polar basal melting on Mars. *J. Geophys. Res.*, 92, 9135-9152. (R)
- Greeley R. and Spudis P. D. (1981) Volcanism on Mars. *Rev. Geophys. Space Phys.*, 19, 13-41.
- Greeley R. (1987) Release of juvenile water on Mars: Estimated amounts and timing associated with volcanism. *Science*, 236, 1653-1654. (R)

- Greeley R. (1987) The role of lava tubes in Hawaiian volcanoes. In *Volcanism in Hawaii*, pp. 1589-1602. U.S. Geol. Surv. Prof. Paper 1350. (R)
- Mouginis-Mark P. J. (1987) Water or ice in the martian regolith: Clues from rampart craters seen at very high resolution. *Icarus*, 71, 268-286. (R)
- Mouginis-Mark P. J. (1988) Recent water release in the Tharsis region of Mars. Submitted to *Icarus*. (P)
- Mouginis-Mark P. J. (1985) Volcano/ground ice interactions in Elysium Planitia, Mars. *Icarus*, 64, 265-284. (R)
- Mouginis-Mark P. J. (1988) Geologic rationale for a Mars Rover/sample return mission to Northern Elysium Planitia. Submitted to *Earth, Moon and Planets*. (P)
- Mouginis-Mark P. J., Wilson L., and Zimbelman J. R. (1988) Polygenic eruptions on Alba Patera, Mars. *Bulletin of Volcanology*, in press. (P)
- Theilig E. and Greeley R. (1986) Lava flows on Mars: Analysis of small surface features and comparisons with terrestrial analogs. *Proc. Lunar Planet. Sci. Conf. 17th*, in *J. Geophys. Res.*, 91, E193-E206.
- Wilson L. and Mouginis-Mark P. J. (1987) Volcanic input to the atmosphere from Alba Patera on Mars. *Nature*, 330, 354-357. (R)



Viking Frame 338 586. For a high resolution view of 10x10 km. square see the Figure on p. 6.

UPCOMING MEVTV WORKSHOPS ANNOUNCED

WORKSHOP ON THARSIS

A workshop on the origin and evolution of the Tharsis region of Mars will be held at the Aspen Lodge, Estes Park, Colorado, on October 4-6, 1989.

The Tharsis region is an immense physiographic province containing huge shield volcanoes and extensive fracture systems, and having a sizable free air gravity anomaly. It dominates the geology of nearly one-half the planet. Research on the origin and evolution of Tharsis has traditionally joined the disciplines of petrology, tectonics, geological mapping, and geophysics. In the late 1970s, a series of productive workshops was held on the subject of Tharsis, and most of the present models for Tharsis were stimulated by discussions at these gatherings. Now a decade later, it is appropriate to assemble again to review and synthesize the research results of the last ten years.

The main topics to be discussed include:

- (1) Tectonic history
- (2) Volcanic history
- (3) Geological, geophysical, and petrologic constraints
- (4) Tharsis models
- (5) Elysium models
- (6) Origin of Valles Marineris in the context of Tharsis evolution
- (7) Mars Observer tests of models

The conveners of the workshop are K. Tanaka and R. J. Phillips. If you have any questions about the workshop, please contact them at 214-692-3196 (Phillips) or 602-527-7208 (Tanaka).

WORKSHOP ON EVOLUTION OF MAGMA BODIES

A workshop on the evolution of magma bodies on Mars will be held in San Diego, California, January 15-17, 1990, aboard the "William D. Evans," at the Bahia Resort Hotel on Shelter Island.

Mars displays abundant evidence of constructional and plains volcanism, and it is likely that landforms produced by explosive volcanism and volcano/ground-ice interactions also exist. The magma bodies that produced these landforms most likely varied in both space and time as a consequence of the petrologic, tectonic, and thermal evolution of Mars. The goals of this workshop are to bring together experimental petrologists, geochemists, physical volcanologists, and geomorphologists interested in the evolution of these magma bodies on Mars.

The following topics will be considered in the context of the evolution of Mars:

- (1) Timescales for magma evolution
- (2) Differentiation history of magma bodies and lavas
- (3) Geomorphic constraints on lava rheology
- (4) Internal structure of volcanoes
- (5) Depth of origin of magmas
- (6) Tectonic setting of magma bodies and volcanic constructs
- (7) Temperature/pressure regimes of martian magmas
- (8) Rheological and other physical properties of magmas
- (9) Mars Observer tests of models for the evolution of magma bodies

The conveners of the workshop are P. Mougini-Mark and J. Holloway. If you have any questions about the workshop, please call them at 808-948-6490 (Mougini-Mark) or 602-965-6907 (Holloway).

The format of both workshops will stress informal discussion and debate. To maintain an informal workshop atmosphere, it may be necessary to limit attendance. Scientists interested in attending either workshop are asked to submit a brief description of their potential contribution, which may be used as a basis for participant selection. The conveners will appoint discussion leaders for various topics, who will coordinate with other participants in their discipline before the meeting.

MARS SPECIAL SESSIONS AT FALL MEETINGS

American Geophysical Union

The American Geophysical Union meets in San Francisco December 4-8, 1989, and will have three sessions dedicated to martian studies: "Mars Atmosphere and Climate," "Early Mars Environment and the Origins of Life," and "Mars Compositional Mapping from the Recent Opposition." If you are interested in submitting an abstract, an original and two copies should be sent to AGU Fall Meeting, American Geophysical Union, 2000 Florida Avenue, N.W., Washington, DC 20009 by September 6. The June 27, 1989, issue of *Eos* contains complete submission and program information.

Geological Society of America

The Geological Society of America 1989 Annual meeting will be held in St. Louis November 6-9. The symposium entitled "Geological Exploration of the Solar System: Past, Present, and Future" will be of interest to scientists studying Mars. In the words of *GSA News & Information* (June 1989), "This symposium is designed to provide a view of Solar System exploration . . . both from the 'dynamics' perspective and as an analog to extraterrestrial planetary surfaces." Information about the meeting can be obtained by calling GSA at 303-447-2020.

Division of Planetary Science

Providence, RI will be the location for the 21st Annual Meeting of the Division of Planetary Science, American Astronomical Society, October 31-November 3, 1989. The four-day regular meeting will feature abundant scientific presentations. In addition, a special session will highlight results from the Phobos II spacecraft for Mars. For meeting information, call Pam Jones, LPI Projects Office, at 713-486-2150.

NEW MARS RESEARCH PROGRAM ANNOUNCED

NASA announces a new Mars research program, the Martian Surface and Atmosphere Through Time (MSATT). This study program is sequential to MEVTV and continues the long-range plan of focusing data analysis and research efforts on different topic

selections over a period of several years. As the Evolution of Volcanism, Tectonics, and Volatiles on Mars (MEVTV) draws to its conclusion, the study program changes emphasis to the surface and atmosphere and their interactions.

The MSATT study continues the new method of monitoring the individual research tasks through formation of a working group consisting of all interested investigators, and coordination of research efforts through occasional meetings of the group. A staff scientist from the LPI will be assigned to the working group to provide scientific liaison, communication, planning, and management assistance.

The general goal of the MSATT program is to understand the processes that have modified the martian surface and atmosphere. Specific objectives include:

- Understanding the current state of the martian surface and the present physics, chemistry, and dynamics of the atmosphere.
- Understanding why interactions between the surface and atmosphere vary from one martian year to the next.
- Understanding the evolution of the surface over longer (geologic) timescales, with an emphasis on erosional and depositional processes.
- Determining the effects of long-term interactions between the surface and its atmosphere.

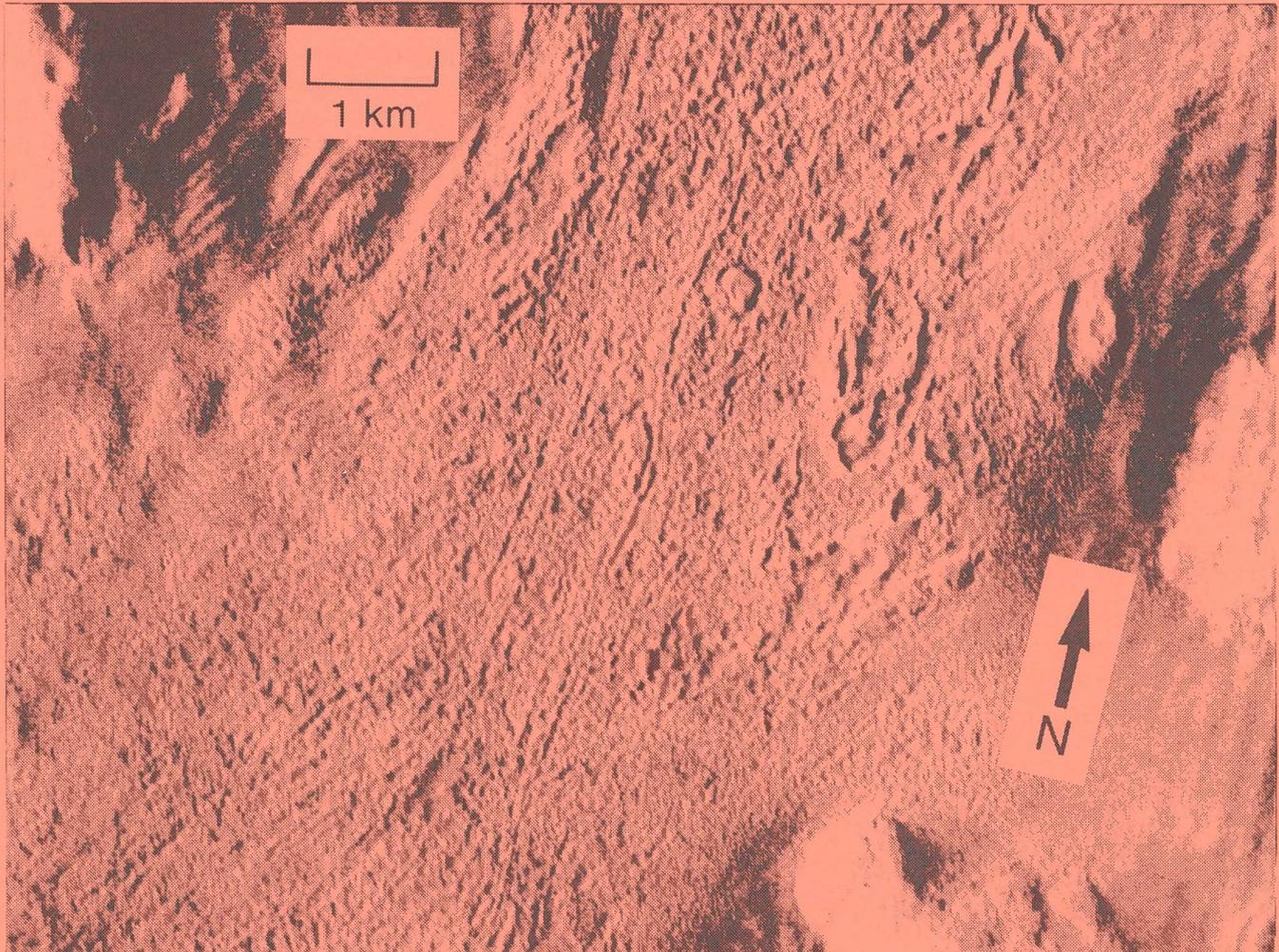
The Request for Proposals and Research Announcement for MSATT is open to all categories of organizations, industry, educational institutions, other nonprofit organizations, and other government agencies. Proposals may be submitted until September 1, 1989 and will be evaluated by scientific peer reviews during October 1989.

You can obtain additional information from:

Mr. Joseph M. Boyce, Discipline Scientist
Planetary Geoscience Programs, Code EL
National Aeronautics and Space Administration
Washington, DC 20546
202-453-1597 or FTS: 453-1597

Submit proposals to:

Lunar and Planetary Geosciences Review Panel
Lunar and Planetary Institute
3303 NASA Road 1
Houston, Texas 77058-4399
713-486-2149



Viking Frame 461 B09. *Amazing, isn't it?*

NEWSLETTER CONTRIBUTIONS

In an effort to keep the Study Group informed about the latest meetings, activities, and other news relevant to MEVTV's goals and Mars in general, contributions to the MEVTV Newsletter are cordially invited. Contributions should be brief and written in newsletter style. Submissions may be either typewritten or transmitted as standard ASCII text files either over the telephone or by sending a standard DSDP diskette (along with a hard copy of the article) to: MEVTV Newsletter, LPI Publications, 3303 NASA Road 1, Houston, Texas 77058-4399.

To send contributions via electronic mail, your modem should be set to either 300 or 1200 baud; to reach the LPI VAX dial 713-486-8214 or 486-9782. The username is "MAILBOX," the password is "LPI" (after each entry hit RETURN). When the prompt "\$" appears on your screen, type "MAIL." All contributions should be addressed to "SHARPTON." When you complete your message hit CTRL-Z and then type "EXIT" in response to the prompt ">." When the symbol "\$" returns to your screen, type "LOG" and then hang up. For electronic mail, any PC or terminal will theoretically work; however, best compatibility is achieved by using or emulating a DEC terminal.

PARTICIPATION IN THE MEVTV STUDY GROUP

An invitation is extended to join the MEVTV Study Group. If you are conducting research that you consider relevant to the goals of MEVTV but are funded via other sources and would like to join the Study Group, please let us know. Simply write to the Steering Committee through the LPI Projects Office outlining the nature of the relevant research so that your name will be added to the mailing list. Please include your electronic mail addresses with your letter.

MEVTV ELECTRONIC MAIL LIST

In order to expedite the exchange of information among the participants in the MEVTV Study Group, a list of electronic mail addresses is being compiled at the LPI. Several nodes now exist that facilitate the transmittal of mail between networks. Along with the list of mail addresses, LPI can provide a list of examples showing how to communicate between various networks. If you would like to be included on the MEVTV electronic mail list, simply send a message to Buck Sharpton containing your mail addresses. The following examples show how to send a message to LPI via three separate networks.

From SPAN—
To: LPI::SHARPTON

From BITNET—
To: SHARPTON%LPI.SPAN@JPL-VLSI.ARPA

From Telemail (message sent to POSTMAN/NASA)—
To: SHARPTON%LPI@AMES-IO.ARPA

PROCEEDINGS OF THE LPSC

The Proceedings of the Nineteenth Lunar and Planetary Science Conference is a volume of papers including original research and reviews of current interest in the planetary sciences. This book is intended to incorporate, but is not limited to, material from the Nineteenth Lunar and Planetary Science Conference held at the NASA Johnson Space Center in Houston, March 1988.

The 19th Proceedings comprises 66 papers, including 7 papers detailing aspects of Mars geology. Other topics covered range from plans to build an inhabited lunar base; to tectonic processes on Venus; to the geochemical distinctions between the Earth and the Moon and how they might be used to determine the origin of the Moon; to the effect of impact events on the Earth. There are also papers on the geology and petrology of the Moon and other planets; meteorites; comets; cosmic dust; solar system geochemistry; and a large section on impact cratering studies.

The Proceedings should be of interest to researchers and their graduate students in all lunar and planetary programs, particularly workers in petrology, geochemistry, geophysics, geology, and astronomy.

The 19th Proceedings costs \$100.00. For information about ordering, please call the publisher, Cambridge University Press, at 1-800-872-7423.

MARS SLIDE SETS AVAILABLE

Volcanoes on Mars. This slide set is the first in the new series on Mars. A total set of 20 slides, it contains some of the best examples of Viking Orbiter images that include constructional volcanic landforms. Almost half of the slides deal with the large shield flows on the flanks of the volcanoes.

Stones, Wind, and Ice: A Guide to Martian Impact Craters. This set of 30 slides, compiled largely from Viking Orbiter and Lander images, illustrates both the diversity of impact craters on Mars and the significance of these features in understanding the geological evolution of this complex planet. Many of the landforms produced by the interaction of the cratering process with the martian environment are seen virtually nowhere else in the solar system. Impact craters also provide a means of deducing the sequence and timing of events that have shaped the Martian surface.

These slide sets are sold through the LPI Order Department; requests for prices or additional information should be directed to: Order Department, Lunar and Planetary Institute, 3303 NASA Road 1, Houston, Texas 77058.

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