

VENUS MODELING WORKSHOP SUMMARY. J. Balcerski¹, P. Steffes², G. Arney³, R. Ghent⁴, T. Thompson⁵

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Background: The Venus Modeling Workshop, held at the Ohio Aerospace Institute in May of 2017, was organized as part of an ongoing series of meetings supporting the Venus Exploration Analysis Group (VEXAG). Previous workshop topics have included exploration targets, instruments, technologies, and upper atmosphere science. Modeling approaches to Venus science continue to produce new results from Magellan-era data and provide new insights into a complex and dynamic planet through incorporation of recent observations from orbital spacecraft and remote observations. Moreover, modeling tools and approaches used for Venus investigations are highly relevant and often directly applicable to other planetary bodies, including many recently detected exoplanets.

Notable objectives of this workshop were to communicate the status of existing models, share recent science obtained via modeling approaches, and identify common needs of the modeling community. Another objective was to explore the ways in which modeling results and needs may inform future mission planning and development (e.g. helping define instrument measurement targets and requirements.) Attendees were encouraged to consider and discuss how modeling may guide reference mission definition, such as that being undertaken by the international Venera-D Joint Science Definition Team (JSDT), or for upcoming National Academies of Science Decadal Surveys.

Organization and Events: A primary goal for this workshop was to foster cross-disciplinary interaction. In order to support this goal, each of the 3 days began with a morning plenary and ended with a collective group assembly to summarize the day's presentations and allow for a guided, open-floor discussion. Following the organization of other similar workshops, the afternoon sessions were separated by discipline (orbital+atmosphere and surface+interior) to allow participants to explore these themes in detail.

Summary and findings: Throughout the event, discussion revolved around several major themes. Based upon the organizers' observations and notes from student reporters and attendees' notes, these broad themes are noted below:

1. The greatest need for advancing Venus modeling is more in situ data. Remote measurements of the full depth of the atmosphere, surface, and interior are challenging and limited by practical constraints. It was noted that the Venus Global Reference

Atmospheric Model (GRAM) will soon be updated with recent mission results. Direct sampling of both the atmosphere and surface are highly desired. Additionally, attendees expressed a strong desire to conduct modeling that enables future Venus missions.

2. Venus is a natural laboratory for comparative planetology. Because of the strong coupling between interior, surface, and atmosphere, efforts are needed to model Venus as a system of interacting phenomena rather than as a set of isolated parts.

3. In exoplanet study, Venus may be more representative of terrestrial planets than Earth or Mars. Models developed for Venus will have wide applicability in gaining insight into exoplanets, and vice versa.

4. Laboratory work is still required to advance understanding of chemical kinetics, spectral properties, and surface-atmosphere interactions. This is critical both for obtaining maximum benefit from existing new data and for preparing for the next generation of high-resolution instruments.

6. The longevity of liquid water on the surface of Venus, the mechanisms by which that water was lost, and the potential for evolutionary pathways for extinct and/or extant microbial life were topics of great interest for attendees and the public.

5. Reference models, lists of updated software, available data sources, and an archive of modeling approaches and resources is desired and in the process of being implemented. This information will be captured online in a wiki format and is in the process of being generated by volunteers from the workshop organizing committee and participants.

Further information: Meeting information and abstracts can be found at: www.hou.usra.edu/meetings/venusmodeling2017

When complete, a workshop report will be available at the address above. The Venus Modeling Wiki will be made publicly viewable and linked from both the VEXAG website and the one above.

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