

## Summary

Venus Exploration Analysis Group (VEXAG) Meeting #5  
Wednesday-Thursday, May 7-8, 2008  
The Inn and Conference Center, University of Maryland

Some 60 to 70 members of the Venus science community met on May 7th and 8th at Inn and Conference Center, University of Maryland for the 5<sup>th</sup> Venus Exploration Analysis Group (VEXAG) meeting. The primary goals of this meeting were to provide Venus community feedback on the science objectives of the STDT Flagship mission study and to provide community update of VEXAG Goals, Objectives, and Measurements. Earlier in the week, the NASA's Venus Science and Technology Definition Team (STDT) held their meeting at the same location. On the day after this VEXAG Meeting, the chairs for the Venus STDT and VEXAG provided NASA Headquarters with a summary of these two meetings.

Presentations at this meeting included:

- 2 welcome and well-received reports from NASA Headquarters,
- 2 reports from the current Venus missions (the European Venus Express, and the Japanese Venus Climate Orbiter, VCO),
- A Progress Report on Venus STDT activities, particularly Venus Flagship Mission Architectures and Technology Developments
- A Progress Report on Venus-Earth Climate Connections as follow-up to the special session on Venus-Earth Climate Connections at the last VEXAG meeting
- 3 Special Science Reports on Comparative Planetary Processes on Venus, Earth and Mars, on Venus Atmospheres as determined from drag measurements, and on Venus Surface Composition from Venus Express observations
- 7 open-mike presentations, primarily future Venus exploration instrumentation.

Other presentations reported on a number of parallel activities such as:

- Plans for a European Venus-Earth Climate Workshop
- Venus Laboratory Measurements
- Magellan Aerobraking
- NASA's In-Space Propulsion Program
- Education and Public Outreach

The science talks illustrated the need to study Venus to understand terrestrial planet evolution, particularly with respect to climate as well as understanding the interior, surface, and atmosphere as a system. Studying Venus in conjunction with Mars and the Earth will provide us an understanding of the evolution and fate of habitable worlds. There is significant enthusiasm for new avenues of Venus research and exploration.

VEXAG strongly endorsed Venus STDT science goals and processes. The Venus STDT received valuable input and support from community. An additional avenue for input will be via new VEXAG website designed to provide community comments. VEXAG's Technology Focus Group endorsed the needs identified by STDT, and advocated for prioritization and near-term technology investments.

The near-term technology investments would be in system-level technologies. (such as high temperature sample acquisition and handling, pressure and temperature mitigations and environmental testing), in instruments such as an orbital interferometric SAR, in long lived seismic package, in long traverse floaters, and in aerocapture. In addition, a Venus environmental testing facility is needed. Needed laboratory measurements include:

- Fundamental Thermo-physical Data, such as Specific Heat (Cp) Measurements, Speed of sound, and Equation of State
- Thermal Expansion Coefficient at Venus conditions
- Cloud Chemistry and Microphysics involving aerosol formation and understanding the mysterious UV absorber
- Spectral Properties of Atmosphere Gases at Venus Surface Conditions for spectroscopy and radiative transfer.
- Photo-absorption cross-sections, upper atmosphere.
- Dielectric properties for Orbital Remote Sensing and Magnetotelluric Measurements
- Vis-NIR spectroscopy at high temperatures and pressures, studying the shift in ferrous/ferric absorption edge as well as Reflectance and Emittance
- Reaction rates and mechanisms for potential sinks / buffers of gases (e.g., SO<sub>2</sub>, CO<sub>2</sub>, OCS) with the surface. e.g., wollastonite buffer of CO<sub>2</sub>.
- Decomposition rates of potential hydrous / hydrated minerals.
- Other chemical weathering reactions (products and rates)
- Mobilization of volatile elements and atmosphere transport (e.g., Te, Pb)

VEXAG science focus groups endorsed a Comparative Climatology research program with a possible ROSES 2009 amendment, a special union session at the Fall AGU meeting, a future Chapman Conference, and a continued outreach to the Earth, Mars and Venus science communities. VEXAG also endorsed a new Venus Laboratory Research Initiative for both atmospheres and surface/interior communities. There is a significant list of needed measurements. A Geochemistry Workshop February 2009 is in works. In addition, international coordination is needed. In summary, the Venus research community would benefit from renewed emphasis in R&A programs (PGG, Atmospheres, etc.)

The next VEXAG meeting is tentatively scheduled for February 2009, likely at the Lunar and Planetary Institute in conjunction with a Venus/Planetary Geochemistry Conference that is being hosted by Allan Treiman and Steve Mackwell.

# VEXAG MEETING #5 SIGN-IN SHEET

Adelphi, Maryland      May 2008

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**Agenda**  
**Venus Exploration Analysis Group (VEXAG) Meeting #5**  
**Wednesday-Thursday – May 7-8, 2008**

Wednesday – May 7, 2008

8:30 AM - Sign-In / Pick-up Handouts / Coffee and Pastries

9:00 AM - VEXAG Meeting #5 Overview and Objectives – Ellen Stofan

- Provide feedback on objectives of the STDT Flagship mission study
- Community update of white paper goals-objectives-measurements

9:20 AM - Status Report on Venus Express - Hakan Svedhem

9:40 AM - JAXA's Venus Climate Orbiter - Masato Nakamura and Takeshi Imamura

**10:00 AM – Coffee Break**

10:15 AM – Report on Venus-Earth Climate Connections – David Grinspoon

10:30 AM – ISSI Venus-Earth Climate Workshop – Dima Titov

10:45 AM - Comparative Planetary Processes: Venus-Mars-Earth- Jim Head

11:15 AM - Venus Laboratory Measurements- Alan Tremain

11:30 AM – NASA Headquarters Perspective on Venus Exploration - Jim Green

12:00 AM - Venus Technology Development via PIDAP – John Rall

**12:15 PM – LUNCH**

1:15 PM - STDT Report and Discussion – Mark Bullock

3:15 PM - VEXAG Goals and Objectives Document (White Paper) – Ellen Stofan

3:25 PM - Focus Group Preview of Splinter Sessions– Review of White Paper

–David Grinspoon, Kevin Baines, Steve Mackwell, Jim Cutts, Mark Allen

3:50 PM – Focus Group Splinter Sessions

- Review STDT progress and coordinate feedback, alterations to white paper

5:10 PM- Focus Group Mini-reports

**5:30 PM – ADJOURN**

Thursday – May 8, 2008

8:00 AM - Sign-In / Pick-up Handouts / Coffee and Pastries

8:30 AM – Focus Group Meetings

9:30 AM – Special Science Report – Gerald Keating

9:50 AM - Venus Surface Composition from Venus Express- Joern Helbert

10:05 AM - Update on VEX Science from Participating Scientists – Kevin Baines

**10:20 AM – Coffee Break**

10:35 AM – Special Report –NASA's Plans for Aerocapture/Aerobraking  
and Radioisotope-Powered Spacecraft. - Leonard Dudzinski

10:50 AM – Magellan Aerobraking – Dan Lyons

11:00 AM - Education and Public Outreach – Rosalyn Pertzborn

11:15 AM - STDT Wrap up- Mark Bullock

11:30 AM - Open Mike Presentations (1-2 slides, up to 10 minutes)

- *Provide your presentation to the projectionist during the coffee break*

**12:30 – LUNCH**

1:30 PM – In-Space Propulsion Program – Michelle Munk

1:45 PM - Focus Group Reports

–David Grinspoon, Kevin Baines, Steve Mackwell, Jim Cutts, Mark Allen

2:45 PM - Wrap-up - Next Meeting - Recommendations - Action Items –Ellen Stofan

**3:00 PM – ADJOURN**