

Planetary Science Sub-committee Meeting

VEXAG Status Update

by

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<http://www.lpi.usra.edu/vexag/>

Recent Activities

Completed:

- **12 White papers** on Venus were submitted to the **National Academy Planetary Science Decadal Survey** in September 2009
- **8th Low Cost Planetary Missions Conference (IAA)**
 - Presentations on **VCO, EVE** and **VALOR**
 - Posters on NASA's **Flagship Mission to Venus** and VEXAG
- **VEXAG** session held on 4 October 2009 at the **DPS Meeting** in Fajardo, Puerto Rico
- **VEXAG Co-Chairs** provided **initial** input to the **Decadal Survey Inner Planets Panel** Open Meeting in Irvine, California on October 26, 2009
- **7th VEXAG** Meeting held in Irvine, California (28-29 October 2009) immediately after the Decadal Survey Inner Planets Panel (IPP) meeting, focusing on mission concepts as input for the IPP

Upcoming:

- **VEXAG** Steering Committee lunch meeting during AGU (16th Dec)
- **VEXAG** session during **2010 LPSC** in Houston
- **8th VEXAG** Meeting and “**Venus Atmosphere: Surface to Thermosphere**” conference in Madison, Wisconsin 30 August – 2 September 2010

Decadal Survey Inputs: White Papers

- Venus Atmosphere: Major Questions and Required Observations *by* **Limaye**, et al.
- Venus: Constraining Crustal Evolution from Orbit Via High-Resolution Geophysical and Geological Reconnaissance *by* **Garvin** et al.
- Comparative Planetary Climate Studies *by* **Grinspoon**, et al.
- Venus Geochemistry: Progress, Prospects, and Future Missions *by* **Treiman**, et al.
- Previously Overlooked/Ignored Electronic Charge Carriers in Rocks *by* **F.Freund**
- Mission Concept: Venus in situ Explorer (VISE) *by* **Esposito** et al.
- Venus Atmospheric Explorer New Frontiers Mission Concept *by* **Baines** et al.
- The Venus Flagship Mission Study *by* **Bullock** et al.
- Technologies for Future Venus Exploration *by* **Balint** et al.
- Thermal Protection System Technologies for Enabling Future Venus Exploration *by* **Venkatapathy**, et al.

International Venus Exploration Efforts

- **Venus Climate Orbiter (VCO)** to be launched by **JAXA** in May/June 2010 and begin operations in December 2010
- **European Venus Explorer (EVE)** being developed for proposal to **ESA**'s Cosmic Vision Program
 - EVE will be re-proposed in 2010 to ESA Cosmic Vision
- **Venera-D** being developed by **Russia** for launch in ~ 2016
- **Venus Flagship Mission** study was completed and submitted to the Decadal Survey Inner Planets Panel as a white paper

Informal overtures being made to ISRO for potential interest in missions to Venus.

ISRO expected to nominate a person for participating in VEXAG

NASA Exploration Missions to Venus – when?



Status

No missions to Venus have been selected so far for implementation in NASA's Discovery, despite proposals deemed selectable

The rich science questions about Venus, spanning from surface, interior, atmosphere, and ionosphere, will require many missions for answers.

No large, multi-element mission to Venus is likely before 2020.

Technology development, including precursor missions, is needed to enable many key missions for Venus.

Venus Climate Flagship Mission (VCF) or Flagship "Lite" discussed by VEXAG Steering Group and was presented to the IPP along with the options for developing an orbiting communication relay capability for atmospheric mobile platforms and surface landers as opportunities arise

VEXAG Proposal:

Long-term communications capability with an orbiter

- ❖ A long term communications satellite would enable more robust balloon and lander missions which will occur in the future.
- ❖ The same capability will also enable mutual radio occultations with other orbiters to arrive at Venus to provide data on the Venus atmosphere.
- ❖ Options exist to create such an asset:
 - Collaborate other space agencies to create an orbiting communications capability by contributing a transceiver
 - Provide credit and/or equipment to Venus Discovery or New Frontiers orbiter missions for providing long-term communications capability
 - Decadal Survey endorsement of this concept is needed

Why Venus...

- Relevance of Venus in understanding the evolution of terrestrial planets not just in our solar system
 - Relevance to Earth's future climate
- Venus Community: In danger of becoming extinct?
 - Looking for # proposals submitted/funded
 - No dedicated NASA missions
 - PS budgets too small for to do much “science” with Venus Express.

Why Venus? Why now?

Venus, Earth and Climate Change

- Venus is an extreme case of global warming.
 - Provides an active example of runaway greenhouse warming and the role of cloud-climate feedback
- Venus provides our closest (and only) planetary analog for many important terrestrial climate processes.
 - Ozone loss on the Earth was discovered due to the study of Venus upper atmospheric chemistry
- Simulating the extreme climate of Venus can:
 - help to validate terrestrial general circulation models and increase understanding of nonlinear climate feedbacks
 - expose limitations of current climate models.
- Many scientific problems of common interest to both Venus and Earth climate studies:
 - Aerosol microphysics and radiative properties, cloud morphologies and climate forcings, mesoscale and vortex dynamics, atmospheric responses to short and long term solar forcing
 - Volcano-climate interactions
 - Atmospheric angular momentum and exchange with solid planet
 - Venus dynamical phenomena compared Earth stratospheric oscillations