

**Notes – Venus Town Hall Meeting  
Lunar and Planetary Science Conference (LPSC) Meeting  
Woodlands, Texas – Thursday, March 10, 2011**

Welcome – Sue Smrekar and San Limaye

Sue welcomed the attendees and introduced a number of Venus Exploration Analysis Group (VEXAG) activities, including:

- New: Venus Colloquium Series
- New: Venus Student Group
- Venus Science Workshop and VEXAG Meeting (Aug–Sept 2011, DC area)
- Comparative Climatology of the Terrestrial Planets (Feb. 2012, Boulder)
- Update on Venus Missions
- Top 10 Venus Discoveries List

This was followed by comments on Next Decadal Survey by Ellen Stofan and Steve Mackwell.

Venus Colloquium Series (New)

VEXAG is pursuing a Venus Colloquium series similar to that already in place for the outer planets – See ***outerplanets.jpl.nasa.gov***. This will be a collaboratively planned program of visits by planetary scientists to university campuses and research institutions. This should be in place in March, after LPSC. Once in place, there will be a Planetary Exploration Newsletter (PEN) announcement and the Venus science community will be canvassed for speakers.

VEXAG Student Group (New)

The objectives are to expand the next generation of Venus scientists and give students a voice in VEXAG. This will be accomplished by student presentations at the VEXAG meetings and by forming a new VEXAG Focus Group. There will be PEN Announcement soon to solicit participants and student leaders. As before, students can apply for travel funds to participate in VEXAG Meetings.

Venus Science Workshop and VEXAG Meeting (Aug–Sept, DC area)

The next VEXAG will be a two-day science workshop followed by a one-day VEXAG meeting on Tuesday through Thursday, August 30–September 1, 2011, in the Washington, DC, area. As before, there will be travel grants for students. Possible topics for the science workshop will be

- New results from Venus Express
- Ground-based observations
- Future missions

As follow-up to the VEXAG Science Conference in August 2010 in Madison, Wisconsin and the June 2010 Venus Science Workshop in Aussois, France, there will be a special issue of *Icarus* devoted to Advances in Venus Science. Some 35 to 40 papers have been submitted, and articles should be on-line this summer and published this fall.

### Science Conference on Comparative Climatology of the Terrestrial Planets

This is being pursued by VEXAG, the Outer Planets Assessment Group (OPAG), and Mars Exploration Analysis Group (MEPAG) as a Scientific Workshop on the Climates of Venus, Earth, Mars, and Titan. The conference is currently scheduled for Boulder, Colorado, in mid-February, either the weeks of February 13–17 or 20–24, 2012. Abstracts would be due in late November, early December 2011, a few weeks before LPSC

Candidate discussion topics will be:

- Climates and atmospheres
- Clouds, hazes, and precipitation
- Interior-surface-atmosphere interactions
- Solar-atmosphere interactions

Conveners are Mark Bullock and Eliot Young (Southwest Research Institute, SwRI), and David Grinspoon (Denver Museum of Natural Science, DMNS).

### Updates on Venus Missions

Akatsuki was launched successfully on May 21, 2010, and instruments were successfully validated en route to Venus. On December 7, 2010, there was a failure to get into orbit at Venus that was caused by a short 143-second rocket burn instead of the longer planned 10-minute burn. There was significant pressure drop in one of the two oxygen tanks, which resulted in an off-direction thrust. This, in turn, induced a safe-mode. This was a new rocket design using ceramic nozzles. The spacecraft and instruments remain in excellent health. There is plenty of fuel, and a return to Venus in 4 to 5 years is being worked. There will be some spacecraft rocket thrust testing this spring.

Venus Express has been approved by the European Space Agency for extended mission operations through 2014, subject to a validation review in mid 2012.

Operations are nominal with more data posted to Planetary Science Archive & PDS

European Cosmic Vision – The proposed Venus EVE (a balloon-based) and ENVISION (radar-based) missions were not selected out of the 40 proposals submitted.

NASA New Frontiers & Discovery Programs – The New Frontiers Venus SAGE (Surface Atmosphere Geophysical Explorer) Concept Study was delivered to NASA Headquarters on January 28<sup>th</sup>. Site Visits will be in mid-April with a selection in late FY11 or early FY12. There were several Venus Discovery proposals submitted last September with selection of 1, 2, or 3 for Pre-Phase-A Studies expected in late FY11 or early FY12.

### Top 10 Venus Discoveries List

The objective is to develop a list of high-level, interesting Venus topics to distribute to the general public via a one-page discussion and graphic. A candidate list will be posted on the VEXAG web-site, and the Venus community will be asked to vote in order for a final vetting at the next VEXAG meeting.

### Comments on Next Decadal Survey – Ellen Stofan and Steve Mackwell

Ellen and Steve provided an overview of the 2011 Decadal Survey, Vision and Voyages for Planetary Science in the Decade 2013–2022, by sharing slides shown by Steve Squyres when the Decadal Survey was rolled out on Monday night. Venus, Mercury, and the Moon were topics in the Inner Planets Panel that Ellen and Steve chaired. The inputs from VEXAG and the Lunar Exploration Analysis Group (LEAG) were particularly useful. VEXAG and other Advisory/Assessment Groups will also be particularly useful to NASA as the ramifications of the Decadal Survey are being digested.

The Inner Planets Panel, like the Decadal Survey, addressed crosscutting science themes associated with Climate and the Working of the Solar System from interiors to surfaces, to atmospheres and interactions with the Solar Wind. There were detailed mission studies of a number of Inner Planet targets, including:

- Mercury Lander Network
- Venus Tessera Lander
- Venus Mobile Explorer
- Venus Atmosphere Explorer
- South Pole–Aitken Basin Sample Return
- Lunar Geophysical Network

As these mission studies were funded by NASA, they are in the public domain. The Decadal Survey considered the resources for NASA-only missions, although the Decadal Survey stresses the need for international collaboration. In addition, Research and Development (R&A) and Technology Development were recognized as items that are critical and need to be supported. Technology Development needs to address how new technologies progress from Technology Readiness Level (TRL)-4 to TRL-6.

The Decadal Survey recommends that the Discovery Program continue and that Discovery opportunities be issued at a regular cadence for missions with a \$500M cost cap. Also, the Decadal Survey recommends that two New Frontier missions be flown in 2013–2022, with the each mission costing \$1.0B exclusive of launch vehicle costs. With no relative priorities identified, recommended missions for the first of the two New Frontiers missions were:

- Comet Surface Sample Return
- Lunar South Pole–Aitken Basin Sample Return
- Saturn Probe
- Trojan Tour and Rendezvous
- Venus In Situ Explorer

Also with no relative priorities, recommendations for the second New Frontiers missions were:

- The remaining candidates from previous New Frontiers solicitations
- Io Observer
- Lunar Geophysical Network

Although the Decadal Survey does not specify targets for Discovery missions, it was noted that Venus has an advantage of having a number of important science questions that can be addressed with Discovery-level missions.

Decadal Survey recommendations for Flagship missions in priority order were:

1. Begin NASA/ESA Mars Sample Return campaign: *De-scoped Mars Astrobiology Explorer-Cacher (MAX-C)*
2. Detailed investigation of a probable ocean in the outer solar system: *De-scoped Jupiter Europa Orbiter (JEO)*
3. First in-depth exploration of an Ice Giant planet: *Uranus Orbiter and Probe*
4. Either *Enceladus Orbiter* or *Venus Climate Mission*.

The Venus Climate Mission would be a de-scoped version of the mission of that was derived by the Venus Science and Technology Definition Team in 2008 and 2009, as presented to the community at the 2009 Fall AGU Venus Town Hall Meeting. It will take a year or more for NASA to determine which of these missions should be pursued. At the same time, VEXAG needs to assess what needs to be done with the Decadal Study recommendations and to deliver the assessments to NASA via VEXAG's inputs to the Planetary Science Subcommittee. It was noted that it is important to get mobile systems (balloons and/or probes) to Venus; and that these Venus missions can be carried out with available technologies.

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