

## Summary

### **Venus Exploration Analysis Group (VEXAG) Meeting #9 Tuesday–Wednesday, August 30–31, 2011 Udvar-Hazy Smithsonian Museum, Dulles Airport, Chantilly, Virginia**

Some 70 members of the Venus community met on Tuesday–Wednesday, August 30–31, 2011, at the Udvar-Hazy Smithsonian Museum, Dulles Airport, Chantilly, Virginia, for VEXAG Meeting #9. Following the meeting, a Venus Science Conference on New Results from Venus Express, Ground-based Observations, and Future Venus Missions took place on Wednesday, August 31–Thursday, September 1.

Goals of VEXAG Meeting #9 were to:

- Generate a set of Venus Key Science Questions.
- Generate a set of VEXAG Resolutions via a dialog with the Venus community at the meeting.
- Initiate an engagement with the Venus community to provide feedback on the *Venus Exploration Goals and Objectives* document.
- Create new focus groups in response to Venus exploration community needs.

A key event at this VEXAG meeting was a dialog with the NASA Chief Scientist, Dr. Waleed Abdalati (subsequently updated as “Why Explore Venus Now,” available on the VEXAG website). Topics included a discussion of how Venus atmosphere studies contribute to our understanding of the long-term fate of Earth’s atmosphere and how planets work in general.

Presentations at VEXAG Meeting #9 included:

- Welcome and well-received reports by Jim Green and his colleagues at NASA Headquarters on the status of NASA’s Planetary Science program, as well as the Discovery, New Frontiers, and Planetary Instrument Definition and Development programs.
- An overview by David Grinspoon of the Next Decadal Survey–recommended Venus Climate Flagship Mission.
- A preview by Mark Bullock of the Conference on the Comparative Climatology of Terrestrial Planets to be held in Boulder, Colorado, in June 2012.
- Reports by Håkan Svedhem (ESA, ESTEC) and Masato Nakamura (ISAS) on the current status of the European Venus Express and the Japanese Venus Climate Orbiter (Akatsuki) missions.

There were two open-microphone presentations:

- Challenges associated with supplying carbon phenolic (CP) heat-shield material for future missions (Ethiraj “Raj” Venkatapathy)
- Current status of the Extreme Environments Facility at NASA Glenn Research Center (Tibor Kremic).

VEXAG at this meeting closed out the previous focus groups and created five new focus groups. These new focus groups (in alphabetical order) are:

- Competed Missions and ROSES Focus Group–Lori Glaze (lori.s.glaze@nasa.gov), Goddard Space Flight Center, Lead
- International Venus Exploration Working Group–Mark Bullock (bullock@boulder.swri.edu), Southwest Research Institute, Lead
- Technology Development and Laboratory Measurements Focus Group–Pat Beauchamp (Patricia.M.Beauchamp@jpl.nasa.gov), JPL, and Tibor Kremic (tibor.kremic@nasa.gov), Glenn Research Center, Co-Leads
- Venus Goals and Objectives (Document) and Venus Exploration Sites Focus Group–Buck Sharpton (sharpton@lpi.usra.edu), Lunar and Planetary Institute, Lead
- Young Scholars Focus Group–Stephanie Johnston (planetarygirl@gmail.com), University of Maryland, and Danielle Piskorz (dpiskorz@mit.edu), Massachusetts Institute of Technology/Carnegie Institute, Co-Leads

Proposed key Venus science questions discussed at this meeting address the overarching theme of **“How and when did Venus and Earth diverge?”**

- How has the history of water and other volatiles shaped the evolution of Venus, and what are the implications for Earth-like planets?
- Did Venus ever have Earth-like oceans, tectonics, a dynamo, and a biosphere?
- In the absence of plate tectonics, how does Venus lose its heat, produce tectonic deformation, volcanism, and outgassing? How and when did Venus resurface?
- What processes drive past and present Venus circulation and climate evolution? What are their commonalities with other solar system atmospheres?

VEXAG Resolutions generated via discussion at this meeting were:

1. VEXAG fully supports the Venus Climate Mission recommended by the Decadal Study, and urges the Planetary Science Division to fund a Science Definition Study as soon as practical. As one aspect of the study, VEXAG urges that opportunities for meaningful international cooperation be explored to help to significantly reduce total mission cost to NASA.
2. VEXAG recognizes the importance to support an interdisciplinary approach to study climate, and will continue to spearhead and support the Comparative Climatology Conference in 2012. VEXAG requests the support of NASA to endorse and convene this multidisciplinary approach to climate.
3. VEXAG recognizing the attrition of scientists that the Venus community is experiencing and has formed a “Young Scholar Focus Group” to promote and encourage a new generation of Venus scientists.

4. VEXAG recognizes the importance of Earth stratospheric balloons as viable platforms for planetary and Venus observations and requests NASA PSD to continue to fund such initiatives as part of the suborbital program.

Future VEXAG-sponsored meetings:

Workshop on Exploring the Planetary Science Achievable from a Balloon-Based Observatory —Hosted by Tibor Kremic, NASA Glenn Research Center, Cleveland, Ohio, Wednesday–Thursday, January 25–26, 2012.

<http://spaceflight systems.grc.nasa.gov/SSPO/SP/Balloon Platform/>

A Venus Town Hall Meeting will be held in conjunction with Venus Special Session, Venus Volcanism Viewpoints, at the Lunar and Planetary Science Conference (LPSC), Houston, Texas, March 2012 (Date and location to be announced).

VEXAG will support the June 6, 2012, Venus Transit outreach events and will maintain a list of community events.

Tim Titus (USGS, Flagstaff) invites the Venus Science Community to participate in the Third International Planetary Dunes Workshop, June 12–15, 2012, Flagstaff, Arizona, [www.lpi.usra.edu/meetings/dunes2012/](http://www.lpi.usra.edu/meetings/dunes2012/).

Venus Science Community to participate in the International Planetary Probe Workshop, Toulouse, France, week of June 18–22 2012,

<http://www.planetaryprobe.eu/>A Venus special session will review current projects and studies, and will explore mission concepts and designs, instrumentation, and new and enabling technologies for future Venus entry missions. Lessons learned from earlier missions will also be included.

NASA Conference on Comparative Climatology of Terrestrial Planets (Monday through Thursday) [www.lpi.usra.edu/meetings/climatology2012/](http://www.lpi.usra.edu/meetings/climatology2012/) week of June 25–29, 2012, Boulder, Colorado. Topics for the conference are:

- Climate and Atmosphere
- Clouds, Hazes, and Precipitation
- Interior-Surface-Atmosphere Interactions
- Solar-Atmosphere Interactions
- Exoplanets and Climate

An International Venus Exploration Working Group Meeting is being considered in conjunction with the COSPAR meeting on July 14–22, 2012, in Mysore, India.

A Venus Exploration Regions Workshop and VEXAG Meeting #10 will be held at the Lunar and Planetary Institute, Houston, Texas, Sometime in second half of 2012 (Dates to be announced).

Members of the Venus community are encouraged to participate in:

- The Asia Oceania Geosciences Society (AOGS)–American Geophysical Union (AGU) (Western Pacific Geophysics Meeting–WPGM) Joint Assembly 2012 in Singapore, August 13–17, 2012. Session proposals are due December 5, 2011  
<http://www.asiaoceania.org/aogs2012/public.asp?page=home.htm>
- American Astronomical Society Division for Planetary Sciences (DPS) Annual Meeting, Reno, Nevada, October 14–19, 2012.
- European Planetary Science Congress (EPSC), Madrid, Spain, September 23–28, 2012.



VEXAG Meeting #9 attendees posing in front of the replica of the Vega Balloon, Lander, and Carrier spacecraft at the Udvar Hazy Center, Smithsonian Air & Space Museum

**Agenda**  
**Venus Exploration Analysis Group (VEXAG) Meeting #9**  
**Udvar-Hazy Smithsonian Museum, Dulles Airport, Chantilly, Virginia 20151**  
**Tuesday–Wednesday, August 30–31, 2011**

<b>August 30</b>	<b>Topic</b>	<b>Presenter(s)</b>
10:00 AM	Sign-In/Coffee Welcome Remarks	Ocampo
10:10 AM	9th VEXAG Meeting Overview	Smrekar and Limaye
10:30 AM	Venus Climate Mission	Grinspoon
11:00 AM	Comparative Climatology Conference	Bullock and Young
11:30 AM	NASA and Comparative Climatology	Abdalati
11:40 AM	NASA SMD View/Outlook for Venus	Green
12:00 PM	SMD Competed Missions - NF & Discovery	Hertz
1:00 PM	Lunch	
1:30 PM	Discovery Program	New
2:00 PM	MESSENGER Venus fly-by data	Grayzeck
2:30 PM	Planetary Instrument Definition and Development Program	Buckner (NASA HQ)
3:00 PM	Major Science Questions about Venus	Smrekar
3:15 PM	Venus Goals, Objectives, Investigations, and Measurements	Smrekar/Limaye/ Glaze
3:30 PM	Working Break/Splinter Groups	
4:30 PM	Splinter Group Reports	
5:00 PM	Adjourn	
<b>August 31</b>	<b>Topic</b>	<b>Presenter(s)</b>
10:00 AM	Venus Express Update	Svedhem
10:20 AM	Akatsuki Update	Nakamura
10:40 AM	Earth-based Balloons	Young/Kremic/Hibbits
11:00 AM	Venus Transit—June 6, 2012	All
11:15 AM	Open-Mike Presentations	
11:45 AM	NEXT VEXAG Meeting	Smrekar/Limaye
12:00 PM	VEXAG Findings	Smrekar/Limaye
12:15 PM	Concluding Remarks	Ocampo
12:30 PM	Adjourn	

**Meeting Attendees**  
**Venus Exploration Analysis Group (VEXAG) Meeting #9**  
**Udvar-Hazy Smithsonian Museum, Dulles Airport, Chantilly, Virginia 20151**  
**Tuesday-Wednesday— August 30-31, 2011**

<b>First Name</b>	<b>Last Name</b>	<b>E-mail</b>	<b>Affiliation</b>
Waleed	Abdalati	waleed.abdalati-1@nasa.gov	NASA HQ
Carrie	Anderson	carrie.m.anderson@nasa.gov	NASA GSFC
Ricardo	Arevalo	ricardo.d.arevalo@nasa.gov	NASA GSFC
Sushil	Atreya	atreya@umich.edu	U. Michigan
Kevin	Baines	blueskies4321@yahoo.com	UW-Madison and Caltech/JPL
Jon	Bauschlicher	jon.m.bauschlicher@nasa.gov	NASA KSC– NASA HQ
Patricia	Beauchamp	patricia.m.beauchamp@jpl.nasa.gov	JPL-Caltech
Susan	Benechi	susank@alum.mit.edu	Carnegie DTM
Janice	Buckner	janice.l.buckner@nasa.gov	NASA HQ
Mark	Bullock	bullock@boulder.swri.edu	Southwest Research Institute (SwRI)
Lynn	Carter	lynn.m.carter@nasa.gov	NASA GSFC
Gordon	Chin	gordon.chin.1@nasa.gov	NASA/GSFC
R. Todd	Clancy	clancy@spacescience.org	Space Science Institute
Adarsh	Deepak	a.deepak@stcnet.com	Science and Technology Corp.
Shawn	Domagal-Goldman	shawn.goldman@nasa.gov	NASA ORAU
Rodger	Dyson	rodger.w.dyson@nasa.gov	NASA GRC
Larry	Esposito	larry.esposito@lasp.colorado.edu	LASP, University of Colorado
Kelly	Fast	kelly.e.fast@nasa.gov	NASA HQ
Melissa	Floyd	melissa.floyd@nasa.gov	NASA GSFC
Marie-Ève	Gagné	megagne@atmosp.physics.utoronto.ca	U. Toronto
Lori	Glaze	lori.s.glaze@nasa.gov	NASA GSFC
Eric	Golliher	eric.l.golliher@nasa.gov	NASA GRC
James	Green	james.l.green@nasa.gov	NASA HQ
David	Grinspoon	dgrinspoon@dmns.org	Denver Museum of Nature & Science
Guillaume	Gronoff	guillaume.p.gronoff@nasa.gov	NASA LaRC
Robert	Herrick	rherrick@gi.alaska.edu	U. Alaska Fairbanks
Paul	Hertz	phertz@hq.nasa.gov	NASA HQ
Peter	James	pjames@mit.edu	MIT
Natasha	Johnson	natasha.m.johnson@nasa.gov	NASA GSFC
Stephanie	Johnston	planetarygirl@gmail.com	U. Maryland

<b>First Name</b>	<b>Last Name</b>	<b>E-mail</b>	<b>Affiliation</b>
Clara	Juanes-Vallejo	c.juanesvallejo@cranfield.ac.uk	Cranfield U., UK
Tibor	Kremic	tibor.kremic@nasa.gov	NASA GRC
Rob	Landis	rob.r.landis@nasa.gov	NASA GSFC/ Wallops Flight Facility
Frank	Lemoine	frank.g.lemoine.1@gsfc.nasa.gov	NASA GSFC
Sanjay	Limaye	sanjayl@ssec.wisc.edu	U. Wisconsin
Ralph	Lorenz	ralph.lorenz@jhuapl.edu	JHU APL
Janet	Luhmann	jgluhman@ssl.berkeley.edu	Space Sciences Laboratory /UC Berkeley
Wojciech	Markiewicz	markiewicz@mps.mpg.de	Max Planck Institute for Solar System Research
Erwan	Mazarico	erwan.m.mazarico@nasa.gov	NASA GSFC
Kevin	McGouldrick	kevin.mcgouldrick@lasp.colorado.edu	LASP, University of Colorado
Yasunori	Miura	yasmiura@yamaguchi-u.ac.jp	Yamaguchi University
Karan	Molaverdikhani	karan.molaverdikhani@colorado.edu	U. Colorado at Boulder
Laurent	Montesi	montesi@umd.edu	U. Maryland
Masato	Nakamura	mnakamur@stp.isas.jaxa.jp	ISAS
Curt	Niebur	curt.niebur@nasa.gov	NASA HQ
Adriana	Ocampo	aco@nasa.gov	NASA HQ
Alex	Pavlov	alexander.pavlov@nasa.gov	NASA GSFC
Danielle	Piskorz	dpiskorz@mit.edu or dpiskorz@gmail.com	JPL-Caltech
Christopher	Russell	ctrussell@igpp.ucla.edu	UCLA
Brad	Sandor	sandor@spacescience.org	Space Science Institute
Steve	Saunders	rssaunders@earthlink.net	LPI
Nicholas	Schmerr	nicholas.c.schmerr@nasa.gov	NASA GSFC
Daniel	Schulten	daniel.schulten@mdacorporation.com	MDA
Buck	Sharpton	sharpton@lpi.usra.edu	U. Alaska Fairbanks
Amy	Simon-Miller	amy.simon@nasa.gov	NASA GSFC
Upendra	Singh	upendra.n.singh@nasa.gov	NASA LaRC
Vivek	Singh	cisro@indiagov.org	ISRO
David	Smith	dhsmith@nas.edu	National Research Council/Space Studies Board
Suzanne (Sue)	Smrekar	ssmrekar@jpl.nasa.gov	JPL-Caltech
Manuela	Sornig	sornig@ph1.uni-koeln.de	RIU/Uni Köln
Tom	Spilker	thomas.r.spilker@jpl.nasa.gov	JPL-Caltech
Paul	Steffes	steffes@gatech.edu	Georgia Institute of Technology

<b>First Name</b>	<b>Last Name</b>	<b>E-mail</b>	<b>Affiliation</b>
Jennifer	Stern	jennifer.c.stern@nasa.gov	NASA GSFC
Paul	Stysley	paul.stysley@nasa.gov	NASA GSFC
Håkan	Svedhem	hsvedhem@esa.int	ESA
Silvia	Tellmann	stellman@uni-koeln.de	Rheinisches Institut für Umweltforschung (RIU), Cologne, Germany
Thomas (Tommy)	Thompson	twthompson@jpl.nasa.gov	JPL/Caltech
Constantine	Tsang	con@boulder.swri.edu	SwRI
Gregg	Vane	gregg.vane@jpl.nasa.gov	JPL-Caltech
Ethiraj	Venkatapathy	ethiraj.venkatapathy-1@nasa.gov	NASA ARC
Thomas	Widemann	thomas.widemann@obspm.fr	Paris Observatory/ LESIA
Steven	Williams	steven.williams@nasa.gov	NASA HQ
Eliot	Young	efy@boulder.swri.edu	SwRI