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Welcome to this update from VEXAG on topics dealing with Venus research and exploration. Your contributions, comments and suggestions welcome.

Sanjay Limaye

10th VEXAG Meeting, Washington, DC, 13-15 November 2012

The meeting took place in the James Webb Auditorium in the NASA HQ building, facilitating interactions with many NASA HQ staff during the meeting. Not only did the VEXAG audience hear from NASA/SMD Associate Administrator, Dr. John Grunsfeld, the attendees included NASA Administrator, Cmdr. Charlie Bolden towards the conclusion of the meeting. The main topic of the meeting was to consider updates to the “Goals and Objectives” document to account for new results and questions raised by ESA’s Venus Express mission. The meeting included a presentation of the preliminary results from the Hubble Space Telescope on the SO₂ abundance above the Venusian cloud layer by Kandi Jessup, and an update on the ground-based radar observations of Venus.



From right to left: A. Ocampo, K. Fast, C. Bolden (obscuring J. Green), H. Svedhem and S. Limaye on the last day of VEXAG.

Dr. James Green and Dr. John Grunsfeld presented the NASA Planetary Science Division and Science Mission Directorate views on future Venus missions in the context of the current budget status. One of the key action items taken up was the development of a Venus Roadmap document. More than seventy five attended and many participated from near and far via WebEx. A presentation on Venus Game Changing Technology including the thermal protection system for entry probes was also made, with considerable discussion regarding Venus technology needs. Young scholars from the Planetary Science Summer School also presented their Venus mission concept. The presentations made at this meeting are available at the VEXAG at www.lpi.usra.edu/vexag/Nov2012/presentations. The VEXAG Executive Committee met during the AGU Fall to plan the next meetings.

Thanks for your support and participation in VEXAG - from the Outgoing Chair



Being put in a position to lead VEXAG was not something that I had anticipated, and certainly not the challenges serving as a conduit for the Venus community issues and opinions regarding Venus exploration opportunities and priorities. It has been a privilege to serve the community, first with Sue Smrekar and then alone. The last three years have been a lesson in learning and in adjusting to the new realities on several fronts; the disappointment of no NASA selections of Venus missions, the triumph of ESA's Venus Express and the trials of JAXA's Akatsuki mission as it waits for a second chance to orbit Venus in 2015 and the recommendation of the Venus Climate Mission by the Decadal Survey. I thank all of you have helped me with VEXAG and provided your input, the essence of which the VEXAG Chair has the privilege to communicate to the Planetary Science Subcommittee of the NASA Advisory Council. Specifically, thanks to the support of many, we have seen a few new initiatives that are promising – the Comparative Climatology Conference, the Planetary Observations from a Balloon Platform workshop in Cleveland and the recent Venus Upper Atmosphere Science and Technology Interchange Meeting at NASA/GRC. At least VEXAG has received some attention from the upper echelon at PSD and SMD, and in the current and near future restricted budgets scenario, we need to prepare to accomplish the most achievable science with limited budgets. Exploring Venus has been an international endeavor right from the beginning of space exploration half a century ago – first competitively, and now collaboratively and in the future, perhaps more coordinated as other nations may join the effort. I ask all of you to support the new VEXAG chair and wish success in making VEXAG more effective.

Sanjay Limaye

Note from the new VEXAG Chair – Lori Glaze



As the new VEXAG chair, I want to begin by taking a moment to thank Sanjay Limaye and the entire VEXAG Executive Committee for their leadership over the last year. I would also like to thank everyone who attended the VEXAG meeting at NASA Headquarters in November (in person and via WebEx). The meeting was full of discussion and interesting information. Highlights of the meeting included the attendance of Jim Green (NASA Planetary Science Division Director), John Grunsfeld (Director of the Science Mission Directorate), Waleed Abdalati (NASA Chief Scientist) and Charles Bolden (NASA Administrator).

I am looking forward to an exciting and productive year. VEXAG will be pursuing several major activities in the coming year as a direct result of the discussions during the November meeting. The two primary VEXAG activities this year are to (1) update and revise the Goals, Objectives, and Investigations for Venus Exploration (<http://www.lpi.usra.edu/vexag/reports/GoalsObjectivesFactSheets.pdf>), and (2) develop a Roadmap for Venus Exploration.



To kick off these activities, we are planning several VEXAG hosted events at the upcoming Lunar and Planetary Science Conference in March (more details are provided in this newsletter). These include a VEXAG Town Hall; The Venus Game Changing Technology Forum, and an Early Career Mixer.

In particular, I want to encourage all who are interested in the future of Venus exploration to attend the VEXAG Town Hall. The primary objective of this Town Hall is to provide a forum for community feedback regarding the “Goals, Objectives, and Investigations”, as well as the new “Roadmap for Venus Exploration”. I look forward to seeing you all there!

Finally, I would like to invite the Venus community to provide input for this Newsletter. We would like to increase the regularity of publication, and are always looking for interesting content! If you have an interesting “science tidbit” or other item of general interest, please send your ideas to me (Lori.S.Glaze@nasa.gov) or to Sanjay Limaye (SanjayL@ssec.wisc.edu), who has graciously agreed to stay on as our Newsletter editor.

On behalf of the VEXAG Executive Committee,
Lori S. Glaze, VEXAG Chair

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VEXAG Changes

Lori Glaze (NASA/GSFC) took over as the VEXAG Chair on January 1 after Sanjay Limaye’s term as VEXAG Chair ended December 31. VEXAG Committees and leadership for 2013-2014 are noted below.

The VEXAG Executive Committee for 2013 is Pat Beauchamp, Gordon Chin, Dave Crisp, Robert Grimm, Robert Herrick, Stephanie Johnston, Sanjay Limaye, Adriana Ocampo (Ex Officio), Sue Smrekar, Ellen Stofan, and Tommy Thompson (Executive Secretary).

Focus Groups

Venus Goals and Objectives (Document) and Venus Exploration Sites– [Robert Herrick](#), University of Alaska, Fairbanks, Lead

Technology Development and Laboratory Measurements– [Pat Beauchamp](#), JPL, Lead

Early-Career Scholars Outreach– [Stephanie Johnston](#), University of Maryland, Lead

Topical Analysis Groups

Venus Exploration Roadmap– [Ellen Stofan](#), Proxemy Research Inc., Lead

Competed Missions and ROSES– [Gordon Chin](#), Goddard Space Flight Center, Lead

International Collaborations– [Sanjay Limaye](#), University of Wisconsin, Madison, Wisconsin, Lead

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Venus Upper Atmosphere Science and Technology Interchange Meeting, NASA/GRC, Cleveland, 24 January 2013.

This one day meeting considered the science questions about the Venus atmosphere near the cloud tops, the measurements needed to answer those questions, platforms suitable for obtaining those measurements and instrument capabilities available to identify technology development areas. A summary of the meeting findings will be presented during the LPSC. A tour of the Venus Test Chamber was arranged prior to the meeting for the participants. Presentations will be posted at the VEXAG URL.

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Coordinated Venus Express and Ground Based Venus Observation Campaign

In 2013-2014, Venus Express will be undertaking targeted campaigns, each lasting up to 4 months, each with a particular science theme. These campaigns would benefit from co-ordinated ground-based observations:

** Mesospheric sulfur chemistry campaign – September-October 2013.*

- Dayside UV nadir observations (SPICAV) of SO₂, and solar occultation profiles of SO₂ and SO (SOIR), on 100% of orbits in September and 50% of orbits in October
- Co-ordinated ground-based observations of sulfur compounds, to include IRTF/TEXES, JCMT, HST, etc.

** South Polar dynamics campaign – Dec 2013 – Jan 2014*

- Cloud tracking observations on every orbit (VMC, VIRTIS-M-VIS)
- Radio occultation probing south polar latitudes on *every* orbit
- Co-ordinated ground-based observations could include Doppler velocimetry of high S. polar latitudes.

Further details of VEx and ground-based observations can be found at www.lesia.obspm.fr/venus-atm-wiki

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Future VEXAG Meetings

VENUS GAME-CHANGING TECHNOLOGY FORUM AT LPSC, The Woodlands, Texas, - Monday, 18 March 2013, 12:00 to 13:15 in the Panther Creek Room

Space technology is a vital tool for both scientists and engineers to reach some of the most extreme environments in our solar system. Exploring Venus with these technologies can answer key questions ranging from the history to the habitability of our universe. The forum is hosted by the VEXAG and will be run by Steve Gaddis, Director of the Game-Changing Development Program, NASA LaRC.

VEXAG TOWNHALL MEETING AT LPSC, The Woodlands, Texas, Wednesday, 20 March 2013

Waterway Ballroom 6-8, 12:00 - 1:15 pm

Revisions for the Goals, Objectives and Investigation document that are currently being discussed by the task group will be presented at this meeting. All are encouraged to participate in the discussion about the revisions leading to the adoption at the next VEXAG meeting.

**EARLY CAREER MIXER AT LPSC, The Woodlands, Texas, Wednesday, 20 March 2013**

The VEXAG Early Career Scholars Focus Group will be hosting a casual mixer for students, postdocs and young scientists interested in Venus. The mixer will take place following the Venus oral session on Wednesday. Please check the VEXAG – Early Career Scholars Facebook page for more information

(<https://www.facebook.com/groups/432478660134856/>).

Other Meetings of Interest**Venus Express [International Venus Conference](#), June 10–14, 2013, Catania, Sicily**

Topics – Surface and Interior; Atmosphere Dynamics; Atmosphere Structure; Atmosphere Chemistry and Clouds; Thermosphere, Ionosphere, and Escape Processes; Supporting Laboratory Measurements; Planetary Evolution. Abstract Deadline – 15 March 15, 2013. Meeting URL: www.iaps.inaf.it/Venus2013/Venus2013.php

10th International Planetary Probe Workshop, June 17-21, 2013, San Jose, California.

IPPW-10 will be held June 17-21, 2013, at San Jose State University, California, USA. Preceding the workshop, on June 15-16, a 2-day short course on Entry, Descent, and Landing Systems will be offered. For more information please email: peripapas@gmail.com Abstract deadline is 15 March. URL: <http://ippw10.com/>

International Symposium on Planetary Sciences (IAPS2013), July 1-4, 2013, Shanghai, China

IAPS 2013 brings together international scientists to present the latest results of research and development in planetary exploration and science. Meeting URL: 202.127.29.4/meetings/iaps2013

Davos Atmosphere and Cryosphere Assembly, 8-13 July 2013, Davos, Switzerland. Abstract deadline is past. Meeting URL: [www.daca-13.org/index EN](http://www.daca-13.org/index_EN)

European Planetary Science Congress, University College London, 08 – 13 September 2013, London, United Kingdom. Abstract deadline is 6 May 2013. Meeting URL: www.epsc2013.eu/

The Fourth Moscow Solar System Symposium, AMS3 Moscow, Russia, 14 - 18 October 2013.

The fourth Moscow international Solar System Symposium (3M-S3) covers many problems of the Solar system science with a central topic “Moon and Mars exploration”. There will be Venus presentations related to the Venus International Reference Atmosphere update, Venus Express as well as future missions to Venus.

45th Annual Meeting of the Division for Planetary Sciences, Denver, Colorado, 6-11 October 2013

Meeting URL: dps.aas.org/meetings

First COSPAR Symposium, “Planetary Systems of our Sun and other Stars, and the Future of Space Astronomy”, Bangkok, Thailand, 11-15 November 2013.

COSPAR Symposia are a bi-annual event dedicated to space and astronomical research, aiming at strengthening activities in this area not only at a regional level but also across the globe, through multidisciplinary and training sessions. Abstract deadline is May 31, 2013. <http://cospar2013.gistda.or.th/>

Fall Meeting of the American Geophysical Union, San Francisco, 9 - 13 December 2013

www.agu.org

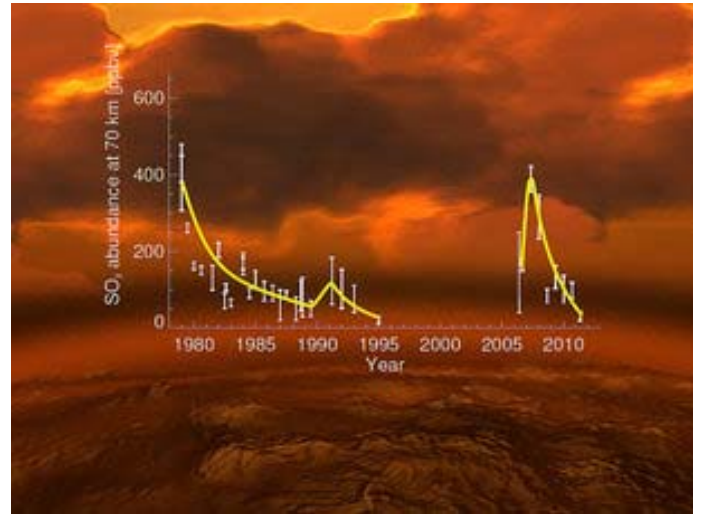
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Venus in the News

Sulfur Dioxide abundance above the cloud tops continues to decay after an increase after orbit insertion

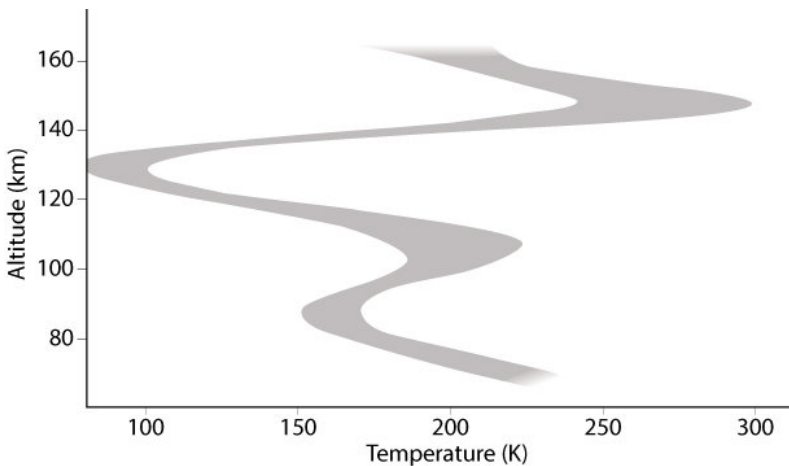
Emanuel Marcq and colleagues report on the rapid decrease in the amount of sulfur dioxide above the cloud tops of Venus since 2008. A similar decrease was seen from Pioneer Venus Orbiter and ground based telescopes earlier. Whether this is related to recent release from below as a result of volcanic activity or through some dynamical over turning is not known.

“Evidence for Secular Variations of SO₂ above Venus’ Clouds Top,” by E. Marcq et al., is published in *Nature Geoscience*, 2 December 2012.



Venus has a very cold layer at 125 km

From analysis of SOIR data on Venus Express, A. Mahieux et al. have discovered that the lowest temperatures in the Venus atmosphere occur in the polar terminator region at about 125 km, about 100K, cold enough to freeze carbon dioxide. No direct confirmation of frozen carbon dioxide however has been obtained yet. Densities and temperatures in the Venus mesosphere and lower thermosphere retrieved from A. Mahieux et al., SOIR on board Venus Express: Carbon dioxide measurements at the Venus terminator, *J. Geophysical Research*, **Volume 117, Issue E7**, July 2012, DOI: 10.1029/2012JE004058.



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Venus Mission News

ESA’s **Venus Express** mission has been formally funded through December 2014. Sufficient fuel may be left to continue operations into 2015 if approved. Data are available in the ESA Planetary Science Archive at www.rssd.esa.int/psa/. Radio Science data collected by the NASA DSNs have been submitted to PDS and are undergoing acceptance review. Dedicated campaigns for SO₂ and dynamics are planned during 2013.

JAXA’s **Akatsuki** is cursing in solar orbit towards a close approach in late 2015. Decision on how and when to insert in Venus orbit will be made in 2014. Some new results from Venus observations acquired after the first close approach and later have been obtained.