Venus Express Education and Public Outreach

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VEXAG Meeting in Madison, WI
2 September 2010
Venus Express Education and Public Outreach

Venus Express E/PO Program

• Sponsored by NASA, Coordinated with ESA
• First international E/PO Pilot program between NASA and ESA
• Joint efforts have:
  - Created new opportunities for E/PO
  - Expanded our perspective on Best Practices for effective programming and a more universal view of common needs and interests in STEM learning
  - Allowed your contributions as scientists to be recognized and relevant to the interests and concerns of the public!
Efforts to Date

• **Formal Education**
  - Teacher Professional Development Workshops
  - Curriculum Modules
    - Mysteries of Venus
    - Cloud Tracking Activity

• **Informal Education**
  - Interactive Computer Kiosks at Open Houses, Small Museums
  - Amateur Venus Imaging Project
  - Visiting Scientist Program

• **Public Outreach**
  - Lectures and Presentations to groups
  - Articles in magazines, newspapers

• **Web Presence**
  - venus.wisc.edu
Highlighted Efforts to Date: **Formal Education**

- Curriculum module development - modules being used in schools in Hawaii, Colorado, California and Washington State
- Venus Express outreach workshop for teachers - Belgium Institute for Research in Aeronomy (BIRA), September 2006
- Astronomy 101 - Venus lecture (David Grinspoon) at DPS 2006 - 13 October 2006, Pasadena, California
- Workshop for Teachers and Informal Education presenters - Planetarium of the Royal Observatory of Belgium - 26 April 2007
- Oneida Nation High School, Keshena, WI - 19 April 2010***
- New Testament Unified Schools of Milwaukee, WI - 21 May 2010***
- Monona Terrace Convention Center, Madison, WI - 31 August 2010***
- Ongoing Student Training Opportunities:
  - Graduate Student: Hsuan-Yun Pi (Curriculum, Web, Spring 2006 - Present)
  - Pre and In-service Teacher - Kate Abitz-Lewandowski
    *(Curriculum development and Classroom Implementation, 2008 - present)*
The Unsolved Mysteries of Venus

Curriculum Outline

Module 1: Understanding Remote Sensing (how are images created)
- Images comparison (IR, VIS, and UV)
- Radiation Spectrum (wavelength)
- How does a camera work (optional -- advanced)

Module 2: Atmosphere Structure Dynamics Observation (Image Data)
- Image Comparison – Earth’s hurricane vs. Venus’s double-vortex

Grade Level
Grade 8-12

Overview
The purpose of this unit is for students to apply their newfound knowledge in order to investigate the complex global atmospheric dynamics and cloud system of Venus, Earth’s sister planet, using actual Venus Express (VEX) data. The activities will employ imagery taken from the orbiter instruments on Venus Express spacecraft. Students will investigate and analyze images generated by several onboard cameras including: Venus Monitoring Camera (VMC); Visible Ultraviolet Near-infrared Mapping Spectrometer (VIRTIS); Ultraviolet and Infrared Atmospheric Spectrometer (SPICAV/SOIR). Students will also be introduced to the use of remote sensing in atmospheric and space science.

Guided by the science inquiry based instructional methods. The activities stimulate the process of how scientists perform research by 1) asking questions, 2) testing their ideas, 3) analyzing data about a planet and an atmosphere that cannot be measured directly.

Background Information

About Venus Express:
Venus Express is ESA’s first mission to Earth’s nearest planetary neighbor, Venus. The Venus Express spacecraft was launched from the Baikonur

- Clouds tracking – reading graphs (longitude & latitude) and calculating wind speed (velocity)
- Rotation rate (optional-- advanced)
Teacher Workshops

Please contact us if you would like to arrange a Venus Express presentation for your school, club, or community.

Past Events

Weather and Climate: Earth and Venus
3-5 August 2008, Livermore, CA, USA

Venus curriculum modules were used as part of the teacher professional development workshop for Lawrence Livermore Unified School District. Curriculum materials were adapted to meet the California State Science Standards for middle school in cooperation with the district curriculum specialist and science team members (Dr. Limaye and Dr. Cavey).

Astrobiology Laboratory Institute for Instructors (ALII Program)
13-18 July 2009, Hawaii, USA

Venus curriculum was first introduced as a special session in the ALII Program hosted by the University of Hawaii. Preliminary evaluation and feedback from participating teachers was used to make key revisions to the materials. Follow-up with participating teachers is planned in Spring 2009.
Teacher Comments: Curriculum Strengths

• The comparisons are interesting and specific, and showing the pictures without the labels is an interesting form of inquiry. (Module 2. activity 1: Hurricane on Venus?)

• This is real data! That is so exciting for students to do “real science” with real data. Let the students know they are doing science! Yay!

• Using actual current data and involving students in teams to make sense of data. Has applicability to other areas of science using key question #1: In what other areas of science do scientists study things they can’t touch/ directly observe, etc?

• Get students connected with what they already know, (earth science, weather comparisons)
Sample Curriculum Activity:
Winds on Venus......

Materials
A set of 7 time sequenced images of Venus’s cloud features. These images were taken on January 12, 2007 and are mapped into 20°x 20° latitude-longitude grid coordinates. Print these images in the correct time sequence on a letter size paper.

UT = Universal Time
Times given in UT are almost always given in terms of a 24-hour clock (hh:mm:ss). Thus, 14:42:03 (often written simply 144203) is 2:42 and 3 second p.m.
Real-Time Classroom Support: Animated On-line Data
College Readiness

College Readiness Benchmarks by Subject

Sixty-six percent of all ACT-tested high school graduates met the English College Readiness Benchmark in 2010. Just under 1 in 4 (24%) met all four College Readiness Benchmarks.

In 2010, 52% of graduates met the Reading Benchmark, while 43% met the Mathematics Benchmark. Over 1 in 4 (29%) met the College Readiness Benchmark in Science.

The Need is Real !!!
Efforts to Date: Public Outreach

- Launched Amateur observations of Venus in UV & IR through ALPO & BAA - April 2006
- Collecting amateur images since June 2006 and posting them on the web
- Web Page launched - April 2006. Updated ~ monthly
- EGU 2006 Venus Outreach Presentation - Vienna, Austria, April 2006
- Venus Express E/PO Paper at DPS 2006
- EGU Presentation on Education and Outreach effort, EGU 2007
- Native Sky Stories conference at Lac du Flambeau reservation - April 2007
- Presentation at the Royal Observatory of Belgium, April 2007 (Limaye)
- Presentation at the Annual Meeting of the Association of Lunar Planetary Observers (June, 2007, Limaye)
- Talk on Venus Express - Milwaukee Astronomical Society - October 2007 (Limaye)
- Talk by David Grinspoon at the Denver Planetarium
- Radio show - National Public Radio (D. Grinspoon)
- Article in Ciel et Terra - Sanjay Limaye
- College of the Menominee Nation - R. Pertzborn, April 2010
- Monona Terrace Convention Center - David Grinspoon, August 31, 2010
Efforts to Date: Website

- [venus.wisc.edu](http://venus.wisc.edu) launched in April 2006
- Amateur Venus Image Archive page organized by date
- MESSENGER Venus Fly-by link added in May 2007
- Venus Express E/PO Events page
- “Women of Venus Express” page launched to highlight science careers for young women
- Venus Bright Spot Highlighted in 2009 - Resulted in Significant Web Traffic Increase
- Akatsuki Mission Highlighted in May 2010
Website Updates

• New homepage
  - Upcoming Events and Highlights
  - Future exploration
  - Education Opportunities

About Venus Express Mission

On 11 April 2006, Venus Express was successfully launched from the Baikonur Cosmodrome in Kazakhstan. Successful insertion into Venus orbit took place on 11 April 2006 and data analysis is well underway. Venus Express achieved its desired orbit in May and has been sending routine data from its science instruments. Results are being announced as they become available. The mission is expected to provide data on the Venus atmosphere for several of the planet's days.

The Venus Express mission has many US participating and interdisciplinary scientists who are supported by NASA. We are pleased to present the Education and Public Outreach efforts for the Venus Express Mission in cooperation with the European Space Agency and support from NASA.

Future Exploration of Venus

VEDAG

The Venus Exploration Analysis Group (VEDAG) was established by NASA in July 2005 to identify scientific priorities and strategy for exploration of Venus. Open to all international scientists, VEDAG regularly evaluates Venus exploration goals, scientific objectives, investigations and critical measurements.

AKATSUKI

Japan’s mission to Venus to be launched in May 2010.

Recent News

- [21/4/2016] Launch countdown! Watch the launch of “AKATSUKI” live from the Tanegashima Space Center through JAXA’s internet broadcast.
Website Updates

- News & Events page
  - Featured articles & stories

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**News & Events**

**News & Features**

- "AKATSUKI" Message Campaign
  
  [November 2009] The Japanese Aerospace Exploration Agency (JAXA) would like to invite people around the world to send messages to Venus. The Venus Climate Orbiter, which will be launched next year from Japan, will deliver your names and messages on special aluminium plates aboard the spacecraft. [Full Story]

- Bright Spot on Venus: Weather?
  
  [August 2009] On July 19, 2009, Frank Melillo took a picture of Venus through an ultraviolet filter from his backyard in Holtsville, New York state and saw a bright spot near the limb, almost at the same time as the first picture of the recent impact on Jupiter taken by an amateur in Australia (Anthony Wesley). [Full Story]

- Venus at its 8-Year Best
  
  [March 2009] On March 27th, our sister planet will be at interior conjunction - as close as it will come this year to being directly between us and the Sun. At that date, approaches the crescent seems too thin to be real, and it

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**Featured Story**

[ August 2009]

**Weather on Venus?**

On July 19, 2009, Frank Melillo took a picture of Venus through an ultraviolet filter from his backyard in Holtsville, New York state and saw a bright spot near the limb, almost at the same time as the first picture of the recent impact on Jupiter taken by an amateur in Australia (Anthony Wesley). Frank was imaging Venus based on an alert to the amateur astronomers put out through ALPO (Association of Lunar and Planetary Observers) that some Venus volcanoes were going to be approaching the terminator.
Website Updates

- Videos & Animations page

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Videos & Animations

Videos
- PLANET-C: Venus Climate Orbiter Mission of Japan
  (Launched in May, 2010)
  Credits: JANNA
  Duration: 12:04

- Venus Transit in 6 June 2004
  Credits: ESA
  Duration: 3:32

- The Importance of Studying Venus
  Credits: ESA
  Duration: 2:36

Animations
- MESSENGER Venus Flyby
  Credits: NASA
  Duration: 00:24

- Vortex Circulation on Venus Revealed by VIRTIS
  Credits: Venus Express, ESA
  Duration: 3 looped animations

- Pioneer Venus View of Venus - 1974
  Credits: S.S. Limaye, U.W-Madison, L. Travis, NASA/GS
  Duration: 13:24

- Mariner 10 View of Venus - 1974
  Credits: S.S. Limaye, R.J. Krauss, V.E. Stuolf, U.W-Madison, NASA/JPL
  Duration: 17:30
Informal Education

- Amateur images page
Informal Education: Amateur Imaging of Venus

- Venus southern hemisphere brightening captured in amateur UV image!

Dr. Don Parker,
Coral Gables Florida,
13 January 2007
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Website Updates

- Publication page
  - Venus / VIRTIS / VEX publication
  - Dissertation and Venus Research

Publications

VMC / VIRTIS / VEX

   


3. Hashimoto, G., Roos-{
   


STEM Education Workshop at Monona Terrace Convention Center
Madison, WI on August 31, 2010

- Program cooperatively sponsored by:
  - NASA and SSEC
  - National Girls’ Collaborative (NSF)
  - WI Department of Public Instruction

- 114 Participants (typically 35 - 40)!!

- Focus on best practices to support STEM learning and careers for Young Women

- Participants included:
  - Teachers and Students
  - Technical College Representatives
  - Community Leaders representing STEM Careers
  - After School Programs such as 4-H and Girl Scouts
Monona Terrace STEM Workshop, August 31, 2010

- National Girls’ Collaborative Student Achievement Awards (Pollard)
- Venus Science & Future Mission Presentations (Limaye & Baines)
- “Meet with the Scientists”
- Venus Cloud Tracking Activity (Pi and Pertzborn)
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Students “Meet the Scientists”
Monona Terrace STEM Workshop, August 31, 2010
Authentic Inquiry Based Learning: Students use actual VEX Data to Track Venus Clouds—Just “like a scientist!”
Monona Terrace STEM Workshop, August 31, 2010

ONEIDA Nation High School meets “The Science Guy”
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Your Efforts?

Contact:

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