VEXAG Steering Committee

Darby Dyar (PSI, Mount Holyoke College), Chair
Noam Izenberg (Applied Physics Laboratory), Deputy
Giada Arney (NASA GSFC)
Lynn Carter (University of Arizona)
Natasha Johnson (NASA GSFC)
Candace Gray (NM State University)
Jeff Balcerski (Ohio Aerospace Institute)
Gary Hunter (NASA GRC)
Kevin McGouldrick (University of Colorado)
Pat McGovern (Lunar & Planetary Institute)
Joseph O’Rourke (ASU)
Emilie Royer (University of Colorado)
Jennifer Whitten (Tulane)
Colin Wilson (University of Oxford)
Tommy Thompson (JPL), Scribe

Megan Ansdell (NASA HQ) ex officio
New 6-month rotation established, with 30% early career investigators required at all times.

Question for PAC: Formalities/consistency of succession plans for AG leadership?
Ongoing Reorganization to Streamline VEXAG Management

<table>
<thead>
<tr>
<th>Month</th>
<th>Activities*</th>
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<tbody>
<tr>
<td>January</td>
<td>Review and approve Findings, submit to HQ. Two new members begin.</td>
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<tr>
<td>February</td>
<td>Plans for annual interAG meeting</td>
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<tr>
<td>March</td>
<td>Prepare for LPSC</td>
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<tr>
<td>April</td>
<td>Committee updates</td>
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<tr>
<td>May</td>
<td>Committee updates</td>
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<tr>
<td>June</td>
<td>Committee updates</td>
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<tr>
<td>July</td>
<td>Two new members begin.</td>
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<tr>
<td>August</td>
<td>Committee updates</td>
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<tr>
<td>September</td>
<td>Plan for annual meeting(s)</td>
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<td>October</td>
<td>Review of CAPS and PAC presentations from Fall meetings; finaliize planning for annual meeting; assign tasks for SC members at meeting</td>
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<tr>
<td>November</td>
<td>Annual meeting in person (Virtual 2020)</td>
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<tr>
<td>December</td>
<td>Review and vote on new Steering Committee members and committee assignment for the coming year. Plan for AGU Town Hall, if any.</td>
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*Each month will begin with reports HQ Liaison (if any) and from the standing Study Analysis Workgroups and other current Venus-related bodies.
VEXAG Subcommittees (current as of August 2020)

1. Nugget Officers: Pat and Jenny

2. Committee Organization Document Committee: Darby, Noam, Colin

3. Working Group for Next Off-season VEXAG meeting (2021):
   AGU special session from Exoplanets in our Backyard
   Noam, Giada, Stephen

4. Working Group for next VEXAG meeting (Nov 2020): Darby, Noam, Natasha

5. VeGASO committee: Joe, Paul, Emilie, Candace

6. Venus Surface Platform Study: Tibor, Darby, Noam

7. Venus Technology group: Jeff and others

8. Monthly/quarterly virtual seminar: Jeff and others – joint with other AGs?
Other VEXAG Commitments:

• **NExSS, Nexus for Exoplanet System Science**, is a NASA research coordination network dedicated to the study of planetary habitability. The goals of NExSS are to investigate the diversity of exoplanets and to learn how their history, geology, and climate interact to create the conditions for life.

• **ExoPAG Science Interest Group #3**: Exoplanet / Solar System, coordinates joint activities and an ongoing discussion on how Exoplanet and Solar System science and missions can benefit from each other. This SIG will endeavor to identify multiple initiatives that could be mutually beneficial for both communities and will encourage cross-disciplinary interaction between ExoPAGs and the Planetary AGs.

• **Equity, Diversity, and Inclusion Working Group**
DAVINCI+ will explore past and present Venus

Deep Atmosphere Venus Investigation of Noble Gases, Chemistry, and Imaging Plus

Dr. James B. Garvin
NASA GSFC, Principal Investigator

Drs. Stephanie Getty and Giada Arney
NASA GSFC, Deputy Principal Investigators

Ancient Oceans on Venus?
Establishing Venus’ place in our Solar System

Evolution of Habitability

Venus-like Exoplanets
Enabling exploration of Venus-like exoplanets and Earths

ORBITER

DAVINCI+ Operations 2026-2029

Way et al. (2016) GRL

Major partners: Lockheed-Martin, JPL, MSSS, LaRC, ARC, APL, KinetX, University of Michigan

Kepler-69c
What makes a rocky planet habitable?
Like Earth, Venus started with all the building blocks of a habitable world. How was habitability lost?

Science Goals

1 Rocky planet evolution
   1a igneous rock type, surface-atmosphere interaction
   1b ancient geologic processes
   1c volcanic history
   1d subduction, origins of plate tectonics

2 Active processes
   Active and recent volcanism, tectonics?

3 Past and present water
   3a continents from a wetter past?
   3b current water outgassing?

Mission Overview

Launch Date: May 2025
Venus Orbit Insertion: Dec 2025
3 years of science operations from orbit
>40 Tb of science data returned

High-Resolution Global Reconnaissance

1. VISAR (Venus Interferometric Synthetic Aperture Radar)
   - Highest resolution global topography for terrestrial planets
   - 1st planetary active deformation map
     • Global data sets:
       - Topography: 250 m horiz, 5 m vertical
       - SAR imaging: 30 m
     • Targeted data sets:
       - SAR imaging: 15 m
       - Surface deformation: 1.5 cm vertical

2. VEM (Venus Emissivity Mapper)
   1st near-global map of igneous rock type, weathering
   - 6 NIR surface bands with robust SNR
   - 8 atmospheric bands for calibration / water vapor

3. Gravity Science Investigation
   1st global maps of derived elastic thickness & core size

PI: Sue Smrekar, JPL; Managed by JPL
Venus Flagship – A Mission to Assess the Habitability of Venus
Martha Gilmore, Wesleyan Univ., Pat Beauchamp, JPL, VFM Science Team, GSFC

Science Goals
1. History of volatiles and liquid water on Venus and determine if Venus was habitable.
2. Composition and climatological history of the surface of Venus and the present-day couplings between the surface and atmosphere.
3. The geologic history of Venus and whether Venus is active today.

Key Elements of Current Design
Launch ~2031, Cost target $2B
Synergistic measurements between multiple assets
- **Orbiter and Small Sats** -- support *in situ* assets prior to science campaign
- **Probe/Lander** – 4-8 hour lifetime on tessera terrain
- **Balloon** – 30 days
- **Long-lived lander (LLISSE)** – 60 days

Status: DONE
Feb 28, 2020
Venus Surface Platform Study Status

• Implemented to understand state of capability for Venus surface exploration, explore what additional science can be achieved with increasing lander capability

• Two face-to-face meetings, telecons with experts from various Centers and Institutions

• 4 subgroups have produced a draft report and draft white paper. Both are in review / editing

• Identified 3 leading capabilities that drive science: lifetime, mobility, and “smarts”. Different degrees enable unique and compelling new science. Examples:
  • Increased lifetime enables temporal measurements, helps understand surface weather / climate. Lifetime also critical to seismology needed to gain insight into interior structure
  • Situational awareness and ability to make autonomous data based decisions (attributes of increasing “smarts”) can enable more productive targeting and/or sample acquisition and thus enable better knowledge of Venus geology, weathering, and history.

• Capabilities created, enhanced with specific technology investments (e.g., high temperature systems (sensors and electronics, memory, power); Mechanisms (actuators, drills, tools); introduction of autonomy: etc…)

LLISSE-TD

SAEVe

Flagship

Cooled/mobile lander

balloon
Session 1: 3 hours:
40 minutes of HQ presentation by Megan and/or Lori followed by 15 minutes of questions and a short break.
40 minutes of VEXAG Year in Review presentation by Darby followed by 15 minutes of questions and a short break.
15-minute presentations by VERITAS, DaVinci+, Envision

Session 2: 3 hours
15-minute presentations Akatsuki, Venera-D, Indian Space Agency, Heat-driven aircraft (Eldar)
30-minute presentation Flagship PCMS
1st round of lightning presentations

Session 3: 3 hours
Group A: 4-6 talks back to back on a similar theme, followed by questions, discussion, and a break
Group B: 4-6 talks back to back on a similar theme, followed by questions, discussion, and a break
Group C: 4-6 talks back to back on a similar theme, followed by questions, discussion, and a break

Session 4: 3 hours
2nd round of lightning presentations followed by a break
Group D: 4-6 talks back to back on a similar theme, followed by questions, discussion, and a break

Summary: Planning for VEAXG 2021, solicitation for new SC members, draft findings
VEXAG White Papers

35 and counting…
Venus Science Today
A Mini-Zoom conference 31 August - 3 September 2020

All are invited to consider attending and/or contributing a talk to Venus Science Today, a mini-Zoom conference.

Venus Science Today will showcase talks about Venus research published in the past 12 months, or work in progress. The conference will take place over four days, but only for two hours per day to allow simultaneous participation from Europe, the USA and East Asia.

Conference detail can be found here: https://www.giss.nasa.gov/meetings/venus2020/

• Register/contribute a talk here: https://docs.google.com/forms/d/e/1FAIpQLSe_sLS5O55px7DiJbBjk6ihhS4VCnz8UJqEzHsyB0R6FPk5Aw/viewform?usp=sf_link

• This virtual conference is co-hosted remotely by the NASA Goddard Institute for Space Studies and the Akatsuki Science Team.