Summary of Goals, Objectives and Investigations from Tuesday
Lori Glaze

- Great discussion on purpose and intended audience for the GOI document
- We should propose a resolution from this meeting that the VEXAG supports multiple Discovery class missions that address high priority since objectives?

GOI: overall

- Suggestion to restructure the goals stimulated lots of great discussion
- There is still very strong support (across all disciplines) to keep the direct link of Goals to the Decadal – document should show mapping to decadal
- My take is that the surface/interior folks feel that there is insufficient emphasis of these objectives and that key investigations lack priority.
- Based on the discussion, there is likely a way to accommodate these concerns while retaining the link to the decadal

Technology Group

- There is a definite need to incorporate technology in some way.
- The technology group is considering options for how to integrate technology, or possibly add a separate goal.
- Overnight thoughts from this group?

Atmospheres Group

- In general were satisfied with the current structure and individual investigations
- Unsure about need to prioritize the investigations – my personal opinion is that we need to prioritize because the non-Venus community has no other way to assess what is important.
- Has this group assessed the current priority listing?

Surface/Interiors Group

- Propose five new objectives:
  - What are tessera?
  - Was there an ocean in the past?
  - What is the current level of volcanic and tectonic activity?
  - What is the nature of past tectonic transitions?
  - What is the structure of the interior
- Compare to current priority of these objectives?
- Does resurfacing have enough visibility?

Goal 2: Venus as a Terrestrial Planet

What are the tessera and how do they differ from other crustal units?

Venus as a Terrestrial Planet	Understand what the chemistry and mineralogy of the crust tell us about processes that shaped the surface of Venus over time	Characterize geologic units in terms of major, minor, and selected trace elements (including those that are important for understanding bulk volatile composition, conditions of core formation, heat production, and surface emissivity variations), minerals in which those elements are sited, & isotopes.
		Characterize the chemical compositions of materials near the Venus surface as a function of depth (beyond weathering rind) to search for evidence of paleochemical disequilibria and characterize features of surface rocks that may indicate past climate or biogenic processes.
		Assess the petrography (shapes, sizes, & mineral grain relationships) & petrology (formation characteristics) of surface rocks to aid in interpretation of chemical and mineralogical characterization.
		Determine the physical properties and mineralogy of rocks located in a variety of geologic settings, including meteoritic and crater ejecta, volcanic flows, aeolian deposits, and trace metals in the high radar reflectivity highlands.
		Characterize surface exposure ages through measurements of weathering rinds.
	Assess the current structure and dynamics of the interior	Characterize the current structure and evolutionary history of the core. 1st???
		Place constraints on the mechanisms and rates of recent resurfacing and volatile release from the interior. 1st???
		Determine the structure of the crust, as it varies both spatially and with depth, through measurements of topography and gravity to high resolution. 1st???
		Measure heat flow and surface temperature to constrain the thermal structure of the interior.
		Measure the magnetic field below the ionosphere and characterize magnetic signature of rocks in multiple locations.
		Characterize subsurface layering and geologic contacts to depths up to several km.
		Determine the moment of inertia and characterize spin-axis variations over time.

Sue

Walter

Goal 2: cont.

Venus as a Terrestrial Planet	Characterize the current rates and styles of volcanism and tectonism, and how have they varied over time	Characterize active-volcanic processes such as ground deformation, flow emplacement, or thermal signatures to constrain sources and sinks of gases affecting atmospheric evolution.
		Characterize active-tectonic processes through seismic, ground motion, or detailed image analysis.
		Characterize the materials emitted from volcanoes, including lava and gases, in terms of chemical compositions, chemical species, and mass flux over time.
		Characterize stratigraphy of surface units through detailed topography and images.
		Assess geomorphological, geochemical, and geophysical evidence of evolution in volcanic styles.
	Characterize current processes in the atmosphere	Characterize the sulfur cycle through measurements of abundances within the Venus clouds of relevant gaseous and liquid/solid aerosol components such as SO_2, H_2O, OCS, CO, and sulfuric acid aerosols (H_2SO_4).
		Determine the mechanisms behind atmospheric loss to space, the current rate, and its variability with solar activity.
		Characterize local vertical winds and turbulence associated with convection and cloud-formation processes in the middle cloud region, at multiple locations.
		Characterize superrotation through measurements of global-horizontal winds over several Venus days at multiple-vertical levels (day and night) from surface to thermosphere.
		Investigate the chemical mechanisms for stability of the atmosphere against photochemical destruction of CO_2.
		Characterize local and planetary-scale waves, especially gravity waves generated by underlying topography.
		Measure the frequencies and strengths of lightning and determine role of lightning in generating chemically-active species (e.g., NO_x).
		Search for and characterize biogenic elements, especially in the clouds.

Bruce

Goal 1: Origin and Evolution

Table 1-1. Venus and Implications for the Formation of Habitable Worlds

Goal	Objective	Investigation
Origin and Evolution	Understand atmospheric evolution	Characterize elemental composition and isotopic ratios of noble gases in the Venus atmosphere, especially Xe, Kr, ^{40}Ar, ^{36}Ar, Ne, ^{4}He, ^{3}He, to constrain origin and sources and sinks driving evolution of the atmosphere.
		Determine isotopic ratios of H/D, $^{15}N/^{14}N$, $^{17}O/^{16}O$, $^{18}O/^{16}O$, $^{34}S/^{32}S$ and $^{13}C/^{12}C$ in the atmosphere to constrain paleochemical disequilibria, atmospheric loss rates, the history of water, and paleobiosignatures.
	Seek evidence for past changes in interior dynamics	Characterize the structure, dynamics, and history of the interior of Venus, including possible evolution from plate tectonics to stagnant-lid tectonics.
		Characterize the nature of surface deformation over the planet's history, particularly evidence for significant horizontal surface movement.
		Characterize radiogenic ^{4}He, ^{40}Ar and Xe isotopic mixing ratios generated through radioactive decay to determine the mean rate of interior outgassing over Venus history.
	Determine if Venus was ever habitable	At the surface, identify major and minor elemental compositions (including H), petrology, and minerals in which those elements are sited (for example, hydrous minerals to place constraints on past habitable environments).
		Characterize gases trapped in rocks for evidence of past atmospheric conditions.

Robby

Goal 3: Climate Change and the Future of Earth

Climate Change and the Future of Earth	Characterize the Venus Greenhouse	Determine radiative balance as a function of altitude, latitude, and longitude.
		Measure deposition of solar energy in the atmosphere globally.
		Determine the size, distribution, shapes, composition, and UV, visible, and IR spectra, of aerosols through vertical profiles at several locations.
		Determine vertical-atmospheric temperature profiles and characterize variability.
	Determine if there was ever liquid water on the surface of Venus	Determine isotopic ratios of H/D, 15N/14N, 17O/16O, 18O/16O, 34S/32S 13C/12C in solid samples to place constraints on past habitable environments (including oceans). Identify and characterize any areas that reflect formation in a geological or climatological environment significantly different from present day.
	Characterize how the interior, surface, and atmosphere interact	Determine abundances and height profiles of reactive atmospheric species (OCS, H2S, SO2, SO3, H2SO4, Sn, HCl, HF, SO3, ClO2 and Cl2), greenhouse gases, H2O, and other condensibles, in order to characterize sources of chemical disequilibrium in the atmosphere.
		Determine rates of gas exchange between the interior, surface and atmosphere.

Bob

Path Forward

- We have a GOI focus group (led by Buck Sharpton)
- Propose a short term task group specifically to work the suggested changes to the table
- Task group can then submit a new draft table to the GOI focus group (by end of January?)
- Focus group can work table and the prose companion, then circulate to wider VEXAG community (before LPSC)