

Input to the Decadal Survey Inner Planets Panel

Input from VEXAG

*for consideration by the Decadal Survey Inner
Planets Panel*

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<http://www.lpi.usra.edu/vexag/>

Missions to Venus

Status

- No missions to Venus have been selected so far for implementation in NASA's Discovery or New Frontiers Program, despite proposals deemed selectable.
- The rich science questions about Venus, spanning **the** surface, interior, atmosphere, and ionosphere, will require many **focused** missions for answers.
- Technology development, including precursor missions, is needed to enable many key missions for Venus to explore lower atmosphere and surface.

Additional Input to the Inner Planets Panel

- Venus Climate Flagship Mission Concept – Bullock et al.
 - Goal is to provide an intermediate class option
- Concept for an orbiting communications asset at Venus

VEXAG Proposal:

Long-term communications capability with an orbiter



- ❖ A long term communications capability in orbit at Venus would enable more robust balloon and lander missions which will occur in the future by enabling better communication of the data to Earth.
- ❖ The same capability will also enable mutual radio occultations with other orbiters to arrive at Venus to provide data on the Venus atmosphere.
- ❖ Options exist to create such an asset:
 - Collaborate with other space agencies to create an orbiting communications capability by contributing a transceiver
 - Provide credit and/or equipment to Venus Discovery or New Frontiers orbiter missions for providing long-term communications capability, as well possible funds to increase lifetime and robustness
 - Decadal Survey endorsement of this concept is desired

Atmospheric Occultation Opportunity

Orbiter Communications Relay Capability

- Determine the atmospheric contribution to the Doppler shift from the signal of another occulting orbiter.
- The mutual occultations can provide useful atmospheric temperature profiles each day without impacting the DSN as the crucial data reduction is done on-board.
- Occultation locations not controlled by celestial geometry
 - This opportunity has not been utilized at Mars with multiple orbiters operating at the same time but unable to perform mutual occultations due to orbit and incompatible radio frequencies.*
- Occultations can be achieved with omni XMTR/RCVR with a stable frequency reference (USO), the same as required for the balloons/lander communication for data relay (e.g. Electra Transceivers being flown on Mars orbiters as facility instruments).
- No demands on spacecraft/HGA pointing