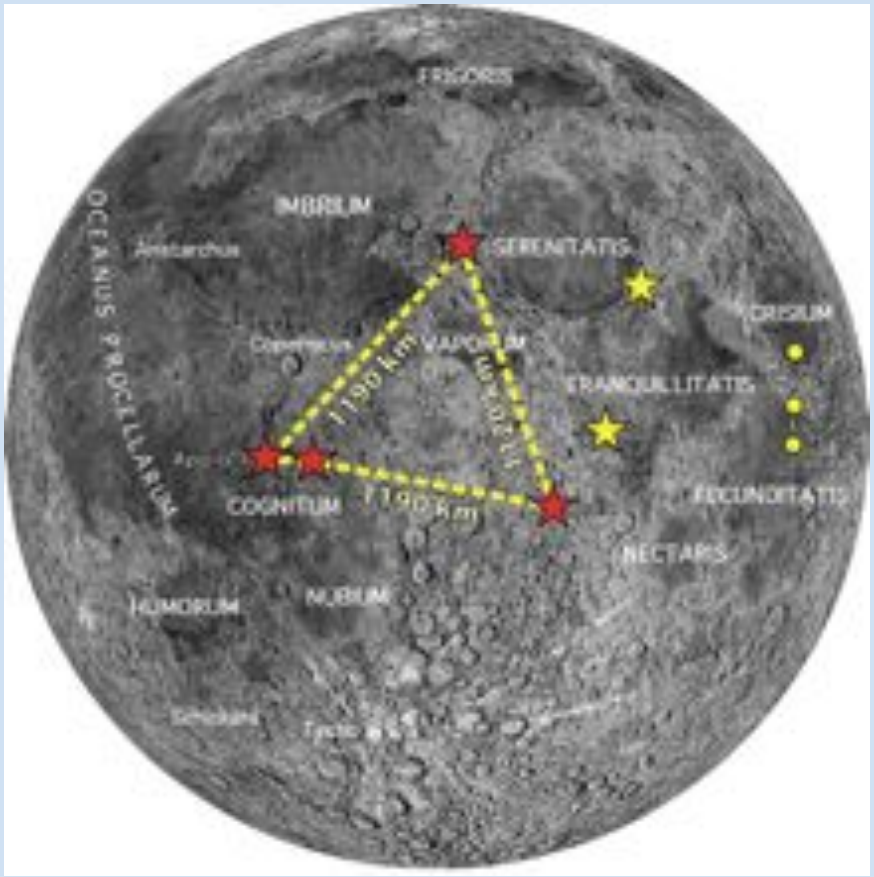
Inner planets

Categorizing the white papers

- 35 Moon-focused
- 9 Venus - focused
- 0 Mercury-focused (why)
- 2 relevant to all three inner planets
- 32 general topic papers submitted to multiple
- panels
- Total of 78 papers

Lunar geophysical network

- Cost: $879,000,000 million
- New Frontiers mission
- Geophysical equipment would be placed on the moon to research geophysical activity.
- Deploy a global, long-lived network of geophysical instruments on the surface of the Moon to understand the nature and evolution of the lunar interior from the crust to the core.

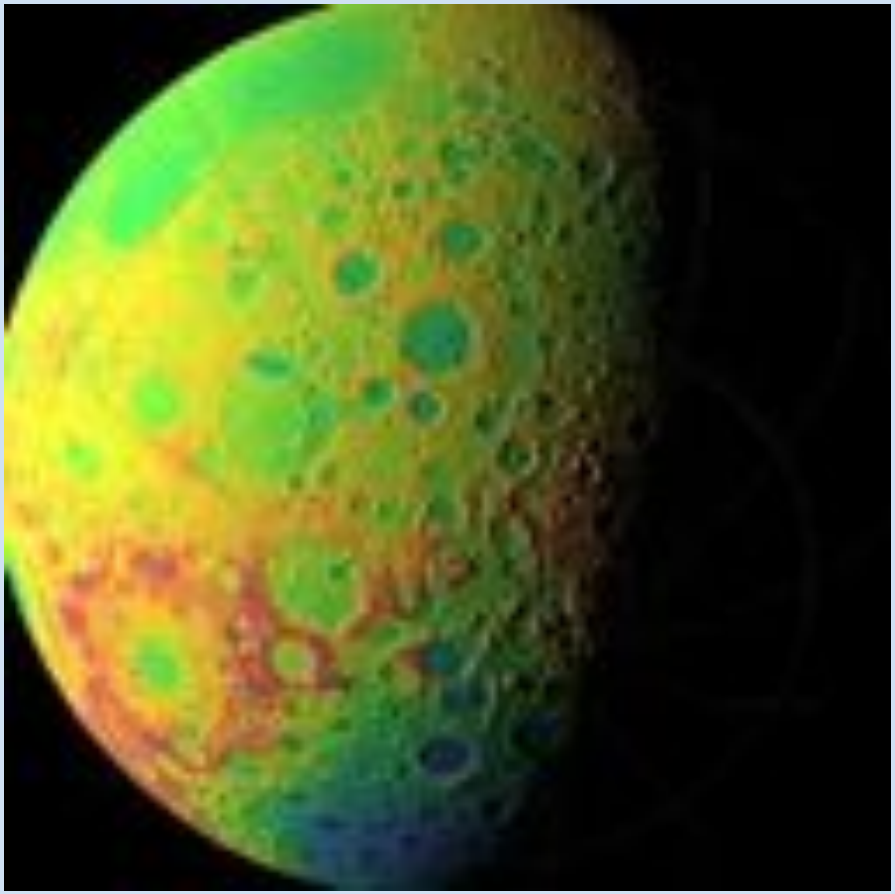


Lunar geophysical network

Science Objective	Measurement	Instrument(s)
A) Determine the internal structure of the Moon	Thickness, composition, temperature, and lateral variability of major internal layers (Crust, mantle, core)	Seismometer, Heat Flow probe, Electromagnetic Sounding, Laser Retroreflector
B) Determine the distribution and origin of lunar seismic activity	Seismic detection of deep and shallow moonquakes	Seismometer
C) Determine the global heat flow budget for the Moon	Value and variability of heat flow measurements in major lunar terrains	Heat Flow Probe, Electromagnetic Sounding
D) Determine the bulk composition of the Moon	Thickness and composition of major internal layers (Crust, mantle, core)	Seismometer, Heat Flow probe, Electromagnetic Sounding, Laser Retroreflector
E) Determine the nature and the origin of the lunar crustal magnetic field	3-component electric and magnetic field determination	Electromagnetic Sounding

Aitken Basin

- New frontier mission
- Sample return from the south pole Aitken basin.
- Estimated cost: $1.046 bil
- Want to know the form and species of the volatiles.



Aitken Basin

	Science Objective
A	Determine the form and species of the volatile compounds at the lunar poles.
B	Determine the vertical distribution/ concentration of volatile compounds in the lunar polar regolith
C	Determine the lateral distribution/ concentration of volatile compounds in the lunar polar regolith
D	Determine the secondary alteration mineralogy of regolith
E	Determine the composition and variation in the lunar exosphere adjacent to cold traps

Venus flagship mission

- The climate mission
- Planned launch date: 11/2021
- Planned end of mission: 05/06/2022
- Cost:$1.15 billion
- The mission would study the climate of Venus, including its strong greenhouse effect, which would help us to understand the climate evolution of Earth and Earth-like planets.
- The Venus Climate Mission (VCM) concept is

designed to answer remaining science questions such as uncertainties in atmospheric motions, radiation balance, cloud composition and chemistry,

- The mission would also make elemental and isotopic measurements that would reveal the origin and evolution of the atmosphere and the evolution of the extreme greenhouse climate.

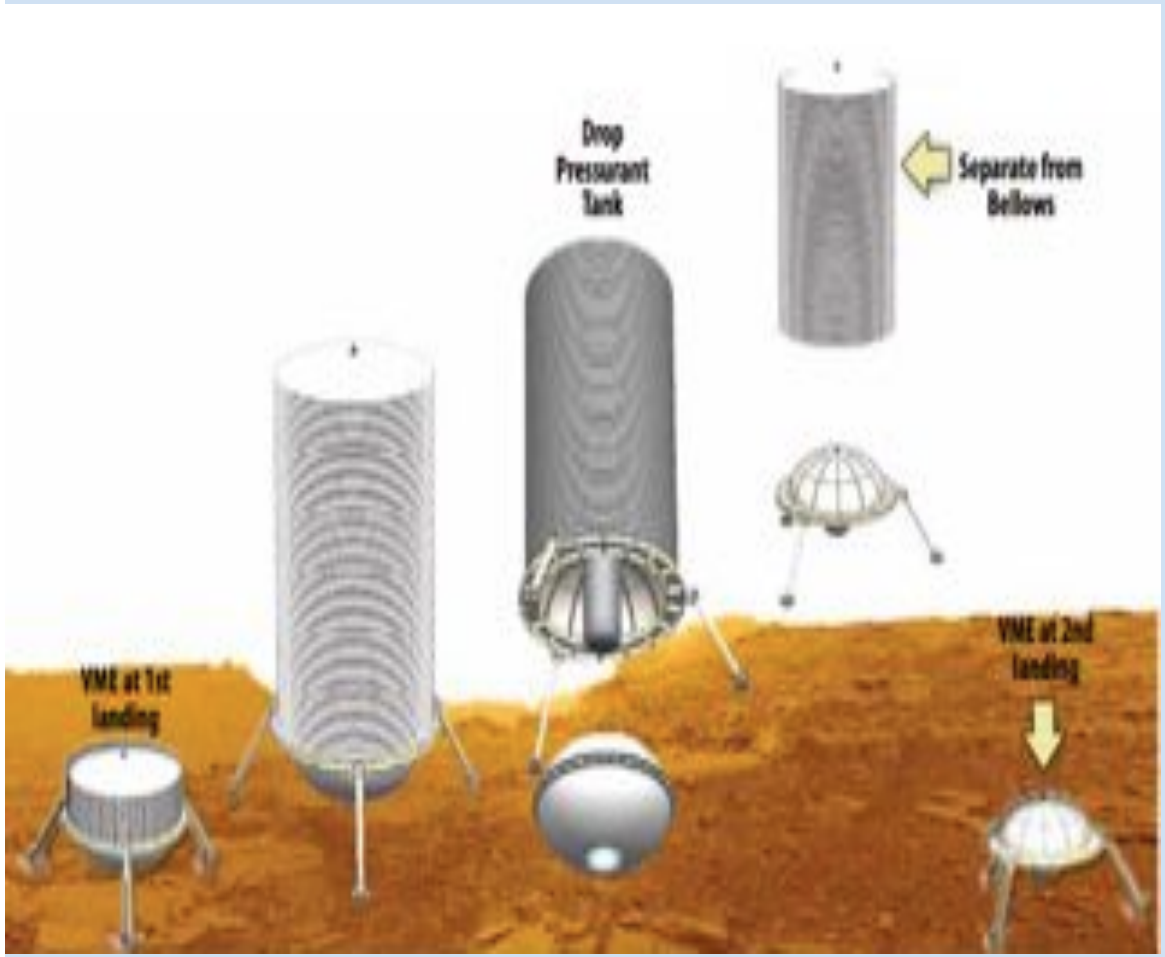
In-situ explorer

- 1.1 - 1.7billion(without launch vehicle), 1.9 billion with launch vehicle.

- The Venus Mobile Explorer concept developed in this study is a mission to explore the surface and near surface environments of Venus to determine surface mineralogy and associated compositional variations.
- Another goal of the VME is to understand chemical exchange mechanisms between the surface and atmosphere, to discern whether a widespread ocean existed and was subsequently lost.
- Also whether Venus could have ever maintained surface conditions capable of supporting life.

In-situ explorer

Science Objective	Measurement	Instrument
Determine whether Venus has a secondary atmosphere resulting from late bombardment and the introduction of significant outer-solar system materials, including volatiles	Measure atmospheric Noble gas isotopes in situ	Neutral Mass Spectrometer
Characterize major geologic units in terms of major elements, rock forming minerals in which those elements are sited, and isotopes	Identify mineralogy (SiO_2, FeO, MgO, sulfur bearing, OH bearing) and elemental chemistry of surface rocks in ≥ 2 surface locations (separated by > 8 km)	Raman/LIBS
Characterize the morphology and relative stratigraphy of surface units	Near IR imaging along an airborne traverse > 8 km in length, at < 5 m spatial resolution	Near-infrared (~1.1 micron) imager with field of view TBD and SNR > 100
Determine the rates of exchange of key chemical species (S, C, O) between the surface and atmosphere	Measure trace gases in the near surface atmosphere (within one scale height)	Neutral Mass Spectrometer, Tunable Laser Spectrometer
Place constraints on the size and temporal extent of a possible ocean in Venus's past	Measure D/H ratio in atmospheric water, at least twice	Neutral Mass Spectrometer, Tunable Laser Spectrometer
Characterize variability in physical parameters of the near surface atmosphere (pressure, temperature, winds)	Atmospheric temperature, pressure, winds	Temperature, pressure, accelerometers, LIDAR
Measure ambient magnetic field from low- and near-surface elevations	Detection of existence or absence of surface magnetic signal	Flux-gate magnetometer



- Drops down onto the surface, the bellows is separated. Basically turned into a balloon so that it can go to several different parts of the planet. This is accomplished by filling the spacecraft with helium so that it may be buoyant.

Technologies

- A dedicated space observatory for time-domain solar system science: Machine run observatory conducting repeated imaging and observations over a period of 10 years or more.
- SOFIA (Stratospheric Observatory for Infrared Astronomy) and Planetary Science: Designed to make sensitive measurements of a wide range of astronomical objects at wavelengths from 0.3 μm to 1.6 mm.

technologies

- Balloon-Borne Telescopes for Planetary Science: Advocates the use of balloon-borne telescopes for imaging in visible wavelengths.
- Global Imaging of Solar Wind-Planetary Body Interactions using Soft X-ray Cameras: X-ray emission can map out the solar wind distribution around planets.