

Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System (B)
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LONG-TERM PLAN TO MONITOR VENUS USING EARTH-ORBITING CUBE-SATS: CHASING THE LONG-TERM VARIABILITY OF OUR NEAREST NEIGHBOR PLANET VENUS (CLOVE)

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Past Venus studies reported unexpected temporal variations on a global scale in terms of ultraviolet (UV) reflectivity, SO₂ and H₂O gas abundances, cloud top altitudes, and zonal wind speed. These variations are plausibly connected to each other and to global atmospheric circulation, atmospheric chemistry, volcanism, and solar activity cycles. The nature of these reported variations is unknown: are they periodic? What is the driving mechanism? What are the implications for the current climate? To answer these questions, we plan a long-term Venus monitoring campaign. Our plan has been selected by the Institute for Basic Science (IBS), South Korea, and funded for the first 5 years by a research grant (2022-2027).

Our international and ambitious project includes long-term monitoring with ground-based telescopes and space-based CubeSats. Ground-based telescopes will perform observations from 320 nm to the near-infrared (NIR). CubeSats in Earth orbit will provide a high temporal resolution and a unique UV wavelength coverage, as is only possible to achieve from space. We will simultaneously retrieve reflectivity, SO₂ abundance, cloud top altitude, and haze abundance above the clouds to elucidate the mechanism behind their correlations. Our effort will benefit from coordinated observations with the active space missions Akatsuki and BepiColombo.

We will perform a feasibility study to assess the use of CubeSats for Venus observations, with the goal of having the first CubeSat ready within 5 years, for a mission that can be extended with other CubeSats for a total of 15 years, covering the time of future Venus missions by NASA and ESA. Long-term monitoring will characterize the temporal variability of the variations, allowing us to reveal their origin and nature.