

Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System (B)  
Venus Science and Exploration (B4.2)

## **LONG-TERM MONITORING PLAN OF VENUS USING EARTH-ORBITING CUBESATS**

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Venus's atmosphere shows considerable temporal variations regarding the SO<sub>2</sub> gas abundance, zonal wind speeds, and the UV brightness near the cloud's tops. The main drivers of the reported variations are unclear but may be associated with volcanic activities, impacts of the Solar Cycle, or large-scale atmospheric dynamics. To understand possible mechanisms, a long period of monitoring is necessary, and reliable data calibration is mandatory. We propose a continuous monitoring project, CLOVE (Chasing the Long-term Variability of Our Nearest Neighbor Planet Venus), utilizing a combination of ground- and space-based facilities to overcome the limitations of using a single dataset. Firstly, we plan a low-Earth orbit CubeSat that will monitor Venus at four selected wavelengths to investigate the cloud top vertical structure, the unknown absorber(s), and the SO<sub>2</sub> gaseous abundance. We plan our first CLOVE CubeSat to be launched in 2026. With its successful operation, we aim to proceed with the subsequent CubeSats that will continue Venus monitoring, replacing the old Sat with a new one to cover at least 15 years of time to complete one Solar Cycle. Secondly, our ground-based observations have been conducted as a coordinated Venus dayside observation in 2020 and 2023 with the Akatsuki Venus orbiter and the BepiColombo mission during its cruise phase. Future ground-based observations will be coordinated with the CLOVE CubeSat, providing cross-check validation and supplementary data to interpret our analysis.