

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Solar System Exploration including Ocean Worlds (5)

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FEASIBILITY STUDY OF A SAMPLE RETRIEVAL MISSION TO VENUS

Abstract

The discovery of new planets in other solar systems and the prospect of stable human outposts in other celestial bodies, such as the Moon or Mars, have rekindled the scientific community's need to better understand the planetary evolution processes and the factors which influence their habitability. In this context, as reported by VEXAG (Venus EXploration Analysis Group) in their last report "Venus goals, objectives and investigations – 2019", the study of Venus could have a crucial relevance. Like the Earth, this planet has an atmosphere, and its dimension and density are very similar to the terrestrial ones. Despite these peculiar and promising characteristics, it is a harsh and inhospitable world, with a chemical-reactive atmosphere and high pressures and temperatures at the soil level. Due to its challenging environment, Venus has not been sufficiently explored, and further investigations and data are fundamental to deepen our knowledge of its evolutionary history. This information could give many benefits in different fields, from the study of exoplanets to the development of optimal strategies for Mars settlements. Moreover, Venus could also provide important clues to understand our planet and what its future could be. According to the previous considerations and the VEXAG roadmap, a feasibility study has been carried out to examine a Venus exploration mission, analysing the possibility of displacing an orbiter around the planet and of collecting samples both from the atmosphere and the surface. The chance of retrieving samples and bringing them to a future lunar scientific outpost has been investigated as well, in order to exploit lunar infrastructures and resources and to reduce the overall cost of the mission. This study has been carried out within the frame of the XIII edition of the international Specializing Master programme in SpacE Exploration and Development Systems (SEEDS), by a team of graduate students coming from Politecnico di Torino (Italy), ISAE-Supaero (France), and University of Leicester (UK), with the support and interest of ASI, CNES and ESA and the collaboration of prominent industrial companies such as Thales Alenia Space Italy and ALTEC.