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SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and Development (3)

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HYDRODYNAMIC DESIGN OF A PNEUMATIC SAMPLE ACQUISITION SYSTEM FOR VENUS SURFACE

Abstract

Due to the very high surface temperature and corroding nature of Venus Surface, previous missions have failed to analyse surface regolith with the detail as has been done for Moon or Mars missions. Although, it is well understood, that the first set of Next Generation Missions to Venus would be Orbital or Atmospheric, the National Research Council (NRC) Decadal Survey 2013-20122 lays out Long term Venus exploration mission plans that require the investigation of surface probes, both mobile and stationary. Under a NASA SBIR Phase I project, our group is investigating the possibility of sending a High Temperature Drill and Sample Delivery System that shall work with Pneumatic Actuation. The drill would utilise an impeller pump to continue to pump in the drilled regolith through a hollow cavity within the drill and transport the samples to a X-ray Fluorescence Spectrometer or an X-ray Powder Diffraction Instrument. This work looks at the characterization of the impeller blades and studies its performance in Venus conditions. Several preliminary computational models shall help understand the design constraints to be faced and one can test a set of impeller blade configuration designs for their flow performance.