SAMPLING PLUME DEPOSITS ON ENCELADUS' SURFACE TO EXPLORE OCEAN MATERIALS AND SEARCH FOR TRACES OF LIFE OR BIOSIGNATURES. M. Choukroun[1], P. Backes[1], M.L. Cable[1], E.C. Fayolle[1], R. Hodyss[1], A. Murdza[2], E.M. Schulson[2], M. Badescu[1], M.J. Malaska[1], E. Marteau[1], J.L. Molaro[1,3], S.J. Moreland[1], A.C. Noell[1], T.A. Nordheim[1], T. Okamoto[1], D. Riccobono[1,4], K. Zacny[5]. [1]Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., MS 183-601, Pasadena, CA 91109, E-mail: mathieu.choukroun@jpl.nasa.gov, [2]Thayer School of Engineering, Dartmouth College, Hanover, NH, [3]Planetary Science Institute, Tucson, AZ, [4]Politecnico di Torino, Torino, Italy, [5]Honeybee Robotics, Pasadena, CA.

Enceladus is unique as an astrobiology target in that it hosts an active plume sourced directly from its habitable subsurface ocean. Ice particles from the plume contain geochemical constituents that are diagnostic of the ocean conditions, and may hold traces of life and/or biosignatures, if they exist.

A large fraction of the plume particles falls back onto the surface of Enceladus [e.g., 1]. The low radiation environment and present-day activity are favorable to the preservation of any complex organics and putative biosignatures contained within these particles [2]. Laboratory experiments and modeling suggest that plume deposits would likely be weakly consolidated and relatively easy to sample [2, 3].

Sampling systems like a dual rasp [4, 5], under development to achieve TRL 5 in 2021, would enable a landed mission on Enceladus' surface to acquire large amounts of surface materials, a requirement for analysis of trace constituents. A landed mission on Enceladus could greatly enhance our understanding of the chemical make-up of plume particles and the subsurface ocean, and seek traces of life and/or biosignatures.

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