SUBSURFACE WATER DETECTION ON MARS BY ACTIVE SEISMOLOGY: SIMULATION AT THE MARS SOCIETY ARCTIC RESEARCH STATION

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The Mars Society has established a Mars Arctic Research Station (M.A.R.S.) on Devon Island, North of Canada, in the middle of the Haughton crater [1] formed by the impact of a large meteorite several hundred million years ago. The site was selected for its similarities with the surface of the Mars planet. During the Summer 2001, the MARS Flashline Research Station will support an extended international simulation campaign of human Mars exploration operations. Six rotations of a six person crew will spend ten days each at the MARS Flashline Research Station. International crews, of mixed gender and professional qualifications, will conduct various tasks as a Martian crew would do and perform scientific experiments in several fields (Geophysics, Biology, Psychology). One of the goals of this simulation campaign is to assess the operational and technical feasibility of sustaining a crew in an autonomous habitat, conducting a field scientific research program. Operations will be conducted as they would be during a Martian mission, including delays in radio communications with the Mission Control Center (located in Denver, Colorado) and Extra-Vehicular Activities (EVA) with specially designed suits.

One of the proposed experiments is to rehearse procedures and to conduct an active seismology experiment to detect the potential presence of subsurface water. A crewman wearing a Martian EVA suit will install a set of 30 seismometer sensors on the surface of the Haughton crater to record signals generated by a thumper, somehow similar to experiments conducted on the Moon [2]. The instrumentation will be provided by the Institute of Geophysics of Paris (IPGP), France. Recorded signals will be analyzed later on to extend the characterization of the Haughton crater structure by supporting scientists from the IPGP and the Royal Observatory of Belgium. This experiment can be seen as a possible extension of the future automatic Seismology and Gravimetry experiment (SEIS) aiming at characterizing the deep internal structure of Mars and of its direct subsurface to search for the presence of water. The SEIS experiment will be conducted during the NETLANDER mission, a cooperative program between France and the USA, to be launched in 2007.
The paper will present the first result of the experiment conducted during the simulation campaign at the Mars Flashline Research Station.