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ICELAND CAMPAIGNS FOR EXPLORATION OF LAVA CAVES AND EXTRAPOLATION TO A
SEMI-PERMANENT LUNAR HABITAT**Abstract**

Finding terrestrial locations comparable to the moon is not an easy feat, but very important for the planning and testing of future lunar missions. Current moon-analogue bases, like LunAres (Poland) and HiSeas (Hawaii), focus on survival on the moon, based on vast, man made structures. This however, might not be feasible as the first semi-permanent settlement. A possible alternative is therefore using already existing structures on and in the lunar (sub)surface. Examples of these structures include ice habitats and, what we will elaborate on here, lave tube habitats. Lava tubes form when hot lava comes in contact with colder surroundings and a layer of rock crystalizes around the lava flow, creating a tube like channel. Lava caves are usually long stretched (several meters to kilometres) cave systems with sporadic openings to the surface. What makes the lava tubes so convenient is that the temperature inside the caves is the approximate average surface temperature. For the moon this means temperatures of around -20 degrees centigrade. This is less extreme and more stable than the possible temperature variations on the lunar surface. This means that less temperature adjustments are needed to create a comfortable living environment. Lastly, being underground is also a protection against radiation and micrometeorites. The reason that Iceland is a well fitting moon-analogue site, is that the Icelandic basalts are geochemically similar to lunar lava tubes and the low temperatures and low weathering rates make the geomorphology of the tubes similar to what is expected of the lunar tubes. Furthermore, the same low temperatures cause conditions comparable to those on a possible future lunar base, where one should not go outside without special suiting. A psychological simulation is the remoteness of certain lava tubes in central-Iceland. In September 2018 a team of researchers visited three different lava tube systems in Iceland. The Stefanshellir lava tube was selected as the best choice for a lunar analogue base, based on its long lava tubes and remote location. Future expeditions in May and July 2019 will cover exploration of the cave system with drones and first simulations of analogue lunar missions. This will include equipment testing, geological and glaciological research as well as evaluation of psychological and protocol factors. A moon-analogue habitat in Iceland can be a real addition to already existing habitat simulations because of its similar geological and climatic conditions to the moon, and perhaps in the future, even Mars.