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ANALYSIS OF POTENTIAL SETTLEMENT LOCATIONS ON THE MARTIAN SURFACE

**Abstract**

Human missions to Mars is the next phase of planned solar system exploration by NASA after the Moon. These missions can be a stepping stone to eventual settlement of the Red Planet. However, the harsh climate and other factors present many technical constraints in any future technical mission design. From a long transit where weight limitations are a key driver to planned payloads, on arrival, Mars' hostile climate will present extreme challenges in terms of surviving conditions to the crew. In recent studies, evidence of presence of water ice has been detected in the polar regions of Mars. Moreover the presence of lava tubes beneath the Martian surface further strengthens the feasibility of building effective settlement areas for the crew members using a high proportion of in-situ materials.

This work includes the identification of areas which could be potential sites of settlement location for crewed missions and explores a classification system to quantify suitability of settlement sites on a regional basis, depending on a selection of parameterised geographic and physical factors. Site suitability identifiers include attributes such as close proximity to water ice, in-situ resources, shielding from cosmic radiation, availability of lava tubes and others. This work will carry out data analysis from Hyperspectral and Ground Penetrating Radar to identify the presence of water ice and lava tubes, which could be substantiated by camera images. A map-based system can then be derived to recommend the most suitable landing and settlement site candidates. It is envisaged that the site candidate selection criteria is configurable to enable a bespoke site map to be output depending on the settlement needs and usage. Please note that the present abstract is submitted under the auspices of SGAC's Space Exploration Project Group.