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Simulated Water Well Performance on Mars

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Abstract

The surface of Mars once had abundant water flowing on its surface, but now there is a general perception that this surface is completely dry. Several lines of research have shown that there are sources of potentially large quantities of water at many locations on the surface, including regions considered as candidates for future human missions. Recent discovery of exposed water ice scarps in Martian mid-latitudes has bolstered the evidence for massive amounts of almost pure water in these regions.

These favorable indications of massive quantities of water have initiated studies of changes that could be made to human Mars missions if a means could be devised that would make this water available to these crews. The proposed paper will describe progress towards developing one approach for accessing and extracting water from these mid-latitude sources. This approach relies on mechanical drills to access the water ice through overlying debris. Once the ice has been accessed, a technique known as a Rodriguez Well is used to melt the ice, store the resulting water until it is needed, and then pump the water to the surface for use.

Previous work in this area has utilized a computer simulation to predict the performance of the Rodriguez Well. This simulation was developed originally to predict performance in terrestrial polar regions. While the basic approach used in this model is appropriate for a similar well on Mars, several parameters were known to require a change to correctly model the Martian environment. Some of these parameters are empirical and require experiments simulating the Martian environment to determine their value. The proposed paper will describe the experiments set up to determine the value of these parameters and compare their numerical value to the terrestrial equivalent.

Finally, the proposed paper will show results from the updated computer simulation and compare results with those determined from the original version of the simulation.

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