

A Novel Portable Simulated Rover Platform (SimRP) for Astrobiology Exploration Rover Development

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A novel simulated rover platform (SimRP) has been developed as part of an effort to provide a portable stable instrument testing platform for space flight instrument development and remote sensing of extreme environments. Sample acquisition, handling, extraction and contamination control issues are all addressed by this platform. This will allow the laboratory methods of biology and biotechnology to be applied to terrestrial environments as well as aiding instrument development for solar system exploration. The SimRP platform consists of an aluminum frame that breaks down for travel, with a standard threaded hole pattern to mount a wide variety of instruments and systems. Commercially available products are used to provide power, control and data handling, and imagery. A single interface is used to control and monitor all devices and instruments. The software is written in a modular fashion which simplifies the process of changing devices in the instrument suite. A robotic arm collects samples and is operated through the common software interface. Robot arm operator training can be performed in field conditions using this system. An ultrasonic drill that both cores and meters sample to a sample handling chamber is attached to this robotic arm. Aseptic conditions for microbiological experiments can be maintained through the use of sterile-air-inflatable glove bags, which enclose the instrument suite while allowing user access.

Future work on upgrading the SimRP platform includes changes allowing remote operation of the platform through a web page interface, as well as completely automated sample handling. The web page format allows remote operation of the platform by any associated researcher from any location. This method allows near-real-time operation of the platform in a field environment by researchers from any location with Internet access. In addition, the web page interface allows outreach participation by students or other observers during actual operation of the platform in field locations around the world.

Information presented will include description of the SimRP and its systems, the instrument suite, and relevant collected data, including initial results of field-based DNA extraction, amplification and visualization of target microbial genes coupled with ATP luminometry.