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Patricia Wood Dickerson¹, James F. Reilly², William R. Muehlberger³ (1) Lockheed Martin, National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX 77058, Houston, TX (2) National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, TX (3) University of Texas at Austin, Austin, TX

Field and Remote Sensing Training for Human Exploration of the Planets

In addition to geologic sampling, stereophoto interpretation, and descriptive techniques, in 1999 astronauts began to be trained in geophysical exploration methods. Thirty-one astronauts conducted gravity traverses - a technique employed by Apollo explorers on the Moon; the group acquired ~10 miles of data and profiled a buried fault with displacement of thousands of feet. Gravity traverses are about to be conducted by a second corps; those results will also be reported.

Other geophysical techniques for eventual instruction include seismic profiling to reveal buried stratigraphy/structures, and possibly water and/or CO₂ ice. Magnetic surveys could help to distinguish among lava flows and lithic boundaries expressed in thermal emission spectrometric (TES) data. Geological and geochemical methods for distinguishing spring deposits, hydrate/clathrate accumulations, and macro/microbiological remains should be emphasized as well.

Lunar and Martian impact craters, volcanoes, and dunes exhibit analogous morphologies to terrestrial features and likely formed by processes similar to those that have operated on Earth. Forms of others, such as vast canyons and channels, fluid springs, and layered strata are similar, but modes of formation are vigorously debated. New data for both Moon and Mars enable comparison with astronaut photographs of Earth and investigation of planetary processes in advance of field exploration.