INTEGRATION OF ORBITAL AND GROUND DATA FOR MARS TOPOGRAPHIC MAPPING AND ROVER LOCALIZATION. R. Li, Y. Chen, Juwon Hwangbo, Wei Wang, and Min Tang, Mapping and GIS Laboratory, The Ohio State University Dept. of Civil & Env. Eng. & Geodetic Science, 470 Hitchcock Hall, 2070 Neil Avenue, Columbus, OH 43210-1275 [li.282@osu.edu].

The High Resolution Imaging Science Experiment (HiRISE) camera onboard the Mars Reconnaissance Orbiter (LRO) acquires 0.3 meter-resolution images from its orbit 300 km above the Martian surface. The availability of this new, higher resolution imagery provides the opportunity to observe and model the Martian surface in unprecedented detail. In addition, it is possible to integrate these HiRISE images with ground-based imagery acquired by the twin MER rovers.

We will present a methodology to process HiRISE stereo imagery for mapping Martian surface features. High-accuracy Digital Terrain Models (DTMs) have been generated for the Spirit and Opportunity landing sites (Husband Hill and Victoria Crater, respectively) to support rover mission operations. The accuracy of these DTMs is about 0.6 meter. The generated products and the integrated information from both orbit and ground images were used to support mission operations. For example, before the third Martian winter, the Spirit rover faced a decision on where to park over the winter in order to ensure sufficient solar energy to survive. HiRISE stereo images were acquired along with wide-baseline Pancam rover images in the Home Plate area. Because of the obstacle angles of the rover cameras and the vertical view of the orbital camera, it was the combination of long-baseline stereo Pancam imagery and HiRISE stereo imagery that made it possible to have a complete set of topographic data sets needed for this task

Furthermore, with the use of the HiRISE orthophoto, we also have developed a new and more efficient method for rover localization. In this method, ground orthophotos are registered to the HiRISE orthophoto by comparing the same local features appearing in both. The same features are matched from orbit and ground, the center of the registered ground orthophoto is used as the rover position. Using this method, we have performed localization for the Opportunity rover traverse. A discussion on a comparison with the ground-imagery based bundle adjustment method will be given.