

### A 3D INVESTIGATION OF VALLES MARINERIS

B. E. Elliott and J. G. Spray. University of New Brunswick.  
E-mail: [bev.elliott@unb.ca](mailto:bev.elliott@unb.ca). University of New Brunswick.

**Introduction:** Exploration in three dimensions can assist in the identification and characterization of important features in the Valles Marineris canyon system. The Fledermaus software package [1] permits the use of large data sets of high-resolution, such as data from the Mars Global Surveyor and Odyssey missions. The result is an analysis that is comprehensive and beneficial to Martian studies. Fledermaus can construct Digital Terrain Models (DTMs), drape imagery, perform data analysis and produce 3D flights (movies). We want to demonstrate how this 3D investigation can improve our understanding of the characteristics of features in Valles Marineris.

**Method:** Fledermaus is a visualization software capable of processing large data sets and providing interactive three-dimensional data exploration and analysis. DMAGIC [1] is an application of the software that can process and prepare data files for Fledermaus. The first step is to create a DTM in DMAGIC using MEGDR global topographic maps [2]. Georeferencing and surface shading are then applied to the DTM. The color map can be altered at any time to better represent the data set. Images can be draped over the DTM resulting in a more detailed analysis of the area. Images that can be draped include MOC [3] and THEMIS [4] data. The second step is to assemble the DTM, shading, georeferenced and draped image files as Fledermaus objects. The final result is a three-dimensional object that can be analyzed in Fledermaus (the main application of the software). Fledermaus is also capable of producing three-dimensional flights through various terrains. The third step is to produce various flight paths that can best reveal important aspects in areas of interest within Valles Marineris. These flights can be recorded and played back as movies, which allow the viewer to see the canyon system in detail and up-close.

**Discussion:** The purpose of this study is to investigate features of Valles Marineris using 3D exploration techniques. Various canyons in Valles Marineris contain layers (e.g. Hebes, Candor and Ophir Chasmata). By using 3D exploration, we can investigate these layers in detail without distortion of the high-resolution data used. The draping of MOC data will reveal the locations of significant features and the draping of THEMIS data will help identify mineral and rock types. This allows us to identify the composition of the various layered sequences within the canyons.

**References:** [1] Fledermaus Reference Manual, version 6.0. 1999-2004. Interactive Visualization Systems Inc. Unpublished, Fredericton, New Brunswick. [2] Smith, D., Neumann, G., Arvidson, R.E., Guinness, E.A. and Slavney, S. 2003. "Mars Global Surveyor Laser Altimeter Mission Experiment Gridded Data Record", NASA Planetary Data System, MGS-M-MOLA-5-MEGDR-L3-V1.0. [3] Malin, M.C. 2003. "MOC Standard Data Product Archive", NASA Planetary Data Systems, MGS-M-MOC-2-NA/WA-SDP-L0-V1.0. [4] Christensen, P.R., Gorelick, N., Mehall, G., Murray, K., Bender, K. and Cherednik, L. 2002. "Mars Odyssey Thermal Emission Imaging System Standard Data Record", NASA Planetary Data System, ODY-M\_THM-2-IREDR-v1.0; ODY-M\_THM-2-VISEDV-v1.0; ODY-M\_THM-3-IRRDR-v1.0; ODY-M\_THM-3-VISRDR-v1.0. [5] Smith, D., Neumann, G., Ford, P., Arvidson, R.E., Guinness, E.A. and Slavney, S. 1999. "Mars Global Surveyor Laser Altimeter Precision Experiment Data Record", NASA Planetary Data System, MGS-M-MOLA-3-PEDR-L1A-V1.0.