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The ESA Mars Planetary Mapping Pilot Project: advanced terrestrial mapping methodologies applied to the Nili Fossae Region.

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The British Geological Survey (BGS), in partnership with TNO Geological Survey of the Netherlands, the Mullard Space Science Laboratory (MSSL) of the University College London, and the International Institute for Geo-Information Science and Earth Observation (ITC) Netherlands, is now half-way through a one year "Mars Planetary Mapping Pilot Project" for the European Space Agency (ESA/ESAC). One of our main project goals is to demonstrate as part of a documented work-flow, how we can apply geological 3D visualisation and analysis tools developed for Earth Observation, for Mars datasets held by ESA. The project focuses on a part of the Nili Fossae region, which was one of the seven final candidate Mars Science Laboratory (MSL) sites discussed at the 3rd MSL Workshop in September 2008.

Since 1993, BGS geologists have been using digital stereoscopic computer workstations with airborne and satellite imagery to assist with their geological interpretations on Earth. In 2005 a floor-to-ceiling 3D stereo viewing system called GeoVisionary was developed in association with Virtalis Ltd. This allows large raster datasets such as aerial photos, geological and topographic maps, or remotely sensed images to be rapidly draped over a terrain model, and cross-sections, seismic sections and borehole information to be hung underneath and viewed from any angle in 3D. Our goal is to demonstrate the utility of this technology to planetary scientists.

A Digital Terrain Model mosaic with 50m resolution of the Nili Fossae area was produced by MSSL (ESA PANGU contract; Kim & Muller, 2009, PSS in press) from three HRSC orbits: H0988, H1347 & H3047, and used to orthorectify B&W nadir (12.5m) and colour (50m) images. The HRSC orthorectified images were then mosaiced by TNO. Six hyperspectral OMEGA scenes were processed using a variety of image processing software by ITC. 39 summary product images were produced for each scene. These were reprojected and converted into geotif format by TNO, and then brought into the 3D environments of SOCET SET and GeoVisionary by BGS.

In SOCET SET, new synthetic stereoscopic images were created from the terrain model and the orthoimages, before 3D viewing from a fixed vertical perspective. 3D shapefiles of geological features were then digitised using a terrain following cursor, by linking to ArcGIS. Several stereo-windows may be open at once containing different images of the same region. For example: a day IR image in one and a night IR image in the other; or different 3-band spectral combinations.

Once imported into GeoVisionary, any of the layers can be viewed stereoscopically from any direction in space, and the layer translucency interactively adjusted, to assess the relationship between two of them. Oblique perspective digitising with a terrain following cursor is possible. A particularly useful new tool is that topographic profiles in any direction can be constructed, and displayed at the bottom of the screen.

We demonstrate these advanced visualisation and interpretation techniques for data from the Nili Fossae region.