

Geodatabase model for global geologic mapping: concept and implementation in planetary sciences

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One aim of the NASA Dawn mission is to generate global geologic maps of the asteroid Vesta and the dwarf planet Ceres. To accomplish this, the Dawn Science Team followed the technical recommendations for cartographic basemap production. The geological mapping campaign of Vesta was completed and published, but mapping of the dwarf planet Ceres is still ongoing. The tiling schema for the geological mapping is the same for both planetary bodies and for Ceres it is divided into two parts: four overview quadrangles (Survey Orbit, 415 m/pixel) and 15 more detailed quadrangles (High Altitude Mapping HAMO, 140 m/pixel). The first global geologic map was based on survey images (415 m/pixel). The combine 4 Survey quadrangles completed by HAMO data served as basis for generating a more detailed view of the geologic history and also for defining the chronostratigraphy and time scale of the dwarf planet. The most detailed view can be expected within the 15 mapping quadrangles based on HAMO resolution and completed by the Low Altitude Mapping (LAMO) data with 35 m/pixel. For the interpretative mapping process of each quadrangle one responsible mapper was assigned.

Unifying the geological mapping of each quadrangle and bringing this together to regional and global valid statements is already a very time intensive task. However, another challenge that has to be accomplished is to consider how the 15 individual mappers can generate one homogenous GIS-based project (w.r.t. geometrical and visual character) thus produce a geologically-consistent final map. Our approach this challenge was already discussed for mapping of Vesta. To accommodate the map requirements regarding rules for data storage and database management, the computer-based GIS environment used for the interpretative mapping process must be designed in a way that it can be adjusted to the unique features of the individual investigation areas. Within this contribution the template will be presented that uses standards for digitizing, visualization, data merging and synchronization in the processes of interpretative mapping project. Following the new technological innovations within GIS software and the individual requirements for mapping Ceres, a template was developed based on the symbology and framework.

The template for (GIS-base) mapping presented here directly links the generically descriptive attributes of planetary objects to the predefined and standardized symbology in one data structure. Using this template the map results are more comparable and better controllable. Furthermore, merging and synchronization of the individual maps, map projects and sheets will be far more efficient. The template can be adapted to any other planetary body and or within future discovery missions (e.g., Lucy and Psyche which was selected to explore the early solar system by NASA) for generating reusable map results.