A CONCEPTUAL GEODATABASE-MODEL FOR GEOSCIENTIFIC PLANETARY MAPPING APPROACHES. S. van Gasselt, G. Neukum**,** Institute of Geosciences, Freie Universitaet Berlin, Germany.

Background and Mapping Approaches. GIS-based geologic mapping of planetary surfaces is often conducted as a combined approach of digitizing and interpreting geological as well as geomorphological surface units in a way that a set of pre-processed image and topography data products (raster and vector) are stacked individually ontop of each other within a stand-alone mapping project and a set of user-defined mapping files are generated that form individual feature classes. The connection between mapping files is usually established through a common spatial reference. A mapping project is considered finished when the final map output has been generated and the results have been stored in a map file.

In the context of semi-systematic mapping approaches with the help of high-resolution image- as well as topographic terrain-model data, mapping projects grow considerably larger and usually end up with gigabytes of cluttered image data, pyramid files, auxiliaries with low-performance file access or even stalled applications. In mapping projects where multi-user access is required, projects and project management often deal with versioning problems and redundancy problems. Individual mapping projects can not be easily transferred and efficiently homogenized, mostly because of lack of project interoperability and inaccessible configurations and defaults on the GIS software levels. Though multi-user access as well as reliable and efficient data management is especially needed for commercial applications, geoscientific planetary mapping projects performed in the context of, e.g., scientific projects or student education could be significantly improved by establishing a configurable data platform. Apart from data management issues, multi-user mapping projects require a certain level of standardization. Unfortunately, such standards do usually not exist and are defined on agency or institutional level even for terrestrial geologic mapping projects.

In this work we focus on GIS-based data-management issues and present a conceptual geodatabase model for generic planetary mapping tasks. Main aim of our geodatabase model is to allow a high level of user customization and easy integration for a given mapping project in order to maintain data consistency and provide 'recyclable' definitions. At the FUB planetary sciences and remote sensing group a number of currently 21 mapping projects by students are currently conducted (3 projects were finished recently). Most of the mapping targets are located on Mars and are carried out at various scales and on the basis of several global maps and additional high-resolution data that have been processed and incorporated on demand for a specific project. Global data, such as the MOLA topographic basemaps (shaded relief, terrain model and derivatives) and medium-resolution image-data maps (THEMIS, Viking, Mars Global Surveyor Wide-Angle) are utilized by all workers in the same way so that concurrent file access is required. Concurrent access leads to latencies but also to a considerable degree of redundancy, especially when data analysis is performed repeatedly by all users and when comparable derivatives are produced (e.g., image-based spectral classification maps, terrain model data). Such data products are usually not fed back into a central repository so that other workers have the chance to benefit from previous work within their own mapping project.

A well-known and established method to avoid such problems are database-managed systems on which - in principle - every GIS is based. GIS environments are capable to work with an efficient geospatial database backend which can be exploited to not only enable people to work with that common basis in a concurrent way but also to transfer projects easily and to store work within a common system. Currently, work at FUB is carried out to define, layout and implement a large-scale geodatabase model and to transfer finished and ongoing mapping projects into such a system. On the current conceptual level, a database model is presented which is as unspecific as necessary to allow integration of mapping projects of other solar-system bodies but which is highly specific with respect to issues such as properties of, e.g., certain feature classes and (entity) relationship classes that are common to all such projects. Moreover, the datamodel holds an significant amount of freely configurable entries that allow mapping of geologic units as well as focussing on geomorphology within a mixed approach. Implementation of the database-model allows any mapper to import XML-based specification for data-model defintions and to work with predefined but customizable style files and layers that fit individual needs. Due to size, storage and access limitations, personal and file-based geodatabases (FGDB) will not work and appropriate enterprise solutions are necessary. Though the conceptual and logical design is carried out using a FGDB, a migration to a commercial system is envisaged for massive data storage which needs to hold >1TByte of data. The conceptual model comprises of a definition of layer sets and information requirements at defined scales and arrangements in dataset groups. Instead of working with individual filesystem-based shapefiles, mapping is performed using standard tools in classes connected by sets and through a entity-relationship design.

A mapper using such a model-based system does not necessarily need to be involved in the implementation and geodatabase design as work is conducted on the toolset level.

Output, i.e., map presentation, is left to the user although definitions of certain map elements and dataframes are provided and are based on appropriate (and customizable) styles and templates.

Current implementation tests and prototyping lead to refinements of the geodatabase model for which the results are presented at the conference. The presented model focuses on Mars-based mapping projects but is easily transferable to any other (terrestrial) planetary body. The model subset is connected to a much larger system allowing characterization and complex query of planetary data in general to aid data search and access through data repositories.