EMPLOYING GEODATABASES FOR PLANETARY MAPPING CONDUCT – REQUIREMENTS, CONCEPTS AND SOLUTIONS. S. van Gasselt[1] and A. Nass[2], [1]Freie Universität Berlin, Institute of Geological Sciences, Malteserstrasse 74-100, D-12249 Berlin, Germany (Stephan.vanGasselt@fu-berlin.de); [2]German Aerospace Center (DLR), Institute of Planetary Research, Rutherfordstrasse 2, D-12489 Berlin, Germany (Andrea.Nass@dlr.de).

Introduction and Background: Planetary geologic mapping has become complex in terms of merging and co-registering a variety of different datasets for analysis and mapping. But it has also become more convenient when it comes to conducting actual (geoscientific) mapping with the help of desktop Geographic Information Systems (GIS). The complexity and variety of data, however, are major issues that need to be taken care of in order to provide mappers with a consistent and easy-to-use mapping basis. Furthermore, a high degree of functionality and interoperability of various commercial and open-source GIS and remote sensing applications allow mappers to organize map data, map components and attribute data in a more sophisticated and intuitional way when compared to workflows 15 years ago.

Integration of mapping results of different groups becomes an awkward task as each mapper follows his/her own style, especially if mapping conduct is not coordinated and organized programmatically. Problems of data homogenization start with various interpretations and implementations of planetary map projections and reference systems which form the core component of any mapping and analysis work. If the data basis is inconsistent, mapping results in terms of objects' georeference become hard to integrate.

Apart from data organization and referencing issues, which are important on the mapping as well as the data-processing side of every project, the organization of planetary geologic map units and attributes, as well as their representation within a common GIS environment, are key components that need to be taken care of in a consistent and persistent way.

Employing Geodatabases: Today, still very few organizations in the field of planetary mapping seem to employ object-relational geodatabase management systems (GDBMS) although such environments form the backbone of any GIS. ESRI's ArcGIS environment allows each user to create a local database stored directly as part of the computer's file system and managed by ArcGIS without having to set up a server-client-based database management sytem (DBMS). A file-based geodatabase (FGDB) is transportable (via Extensible Markup Language Metadata Interchange format; XMI) and can be easily migrated, and its layout can be modified and adapted to fit specific requirements. The FGDB layout (model schema) is easily transferable to a DBMS if there is a need to migrate and set up a larger-scale environment or switch to other GIS applications. The reasons to switch to database-organization (either file-based or based on a server management system) for planetary mapping conduct are twofold. The first reason is concerned with data homogenization and integration as outlined above. The database model provides boundary constraints in terms of reference systems and map projection issues which control and safeguard the proper use of data (e.g., raster or feature datasets form containers with associated reference and map projection definitions to control individual feature class objects).

The second reason is concerned with attribute values for specific feature class objects (a map unit, a contact), feature datasets and relations. Once attributes for feature classes and additional relations are defined they can be imported and utilized without having to set up feature objects manually, thus avoiding inconsistencies. Secondly, once feature classes and relations are defined, they can interact by relationship classes and subtype-driven domain assignments which consequently allow the user to (a) query data in a limited (when FGDB-based) or highly sophisticated (when DBMS-based) way and (b) select only attribute values that are within a given domain and controlled by subtypes. This not only prevents erroneous entries but it also allows working much more efficiently, even collaboratively if required. Furthermore, a rich set of topology classes improves the quality and consistency of mapping work by, e.g., controlling different feature classes covering geologic and/or geomorphologic mapping units.

Key DB-Model Components: We will present the current status and key components of DB-model developments and focus on tasks dealing with (a) organizational and (b) geoscientific mapping issues. The geoscientific parts are covered by relations dealing with stratigraphic issues and surface-material assignments and relationships in the context of chronostratigraphy and model ages (including concepts on selection processes), integration of geologic and geomorphologic mapping units on different object levels and the possible organization and representation of cartographic symbologies beyond proprietary solutions. Additionally, we will discuss the implementation (and benefit) of topologic constraints and the migratability to DBMS and other GIS environments