DIGITAL MAPPING TECHNIQUES 2024

The following was presented at DMT ‘24
May 13 - 16, 2024

The contents of this document are provisional

See Presentations and Proceedings from the DMT Meetings (1997-2024)
http://ngmdb.usgs.gov/info/dmt/
Creating, managing, and using ancillary data within the Alaska GeMS geologic mapping system

By Mike Hendricks, Ally Steinleitner, M.S. Seitz, Simone Montayne, W.C. Wyatt, A.E. Macpherson, and Wes Buchanan (Alaska Division of Geological & Geophysical Surveys)

The Alaska DGGS works with numerous ancillary datasets during the production of geologic maps. This presentation will address the various ways we manage and use these datasets in support of GeMS based geologic mapping. We store all our field stations, samples, interval data, and map extents in our Geologic and Earth Resource Information Library of Alaska (GERILA) database. We also maintain a geochemistry and a photo database, as well as have a geochronology database in development. Our Geologic Materials Center maintains a database of their cores and other samples. These databases all link to each other and with GeMS content through field stations and sample ids. In addition, we have recently developed a landslide inventory database that uses the AK GeMS Schema as its starting point with the intent to allow easy insertion of features in this database into geologic maps.
Creating, Managing, and Using Ancillary Data within the AK GeMS Geologic Mapping System

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Some Ancillary Data “Handling Options”

Ancillary Data: Data relevant to the map that does not have an obvious place within the GeMS schema.
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- Jam it into existing GeMS Schema (tables built with GeMS tool)
- Jam it into existing AK GeMS Schema
  - All type fields have domains. *We also have a category field*
  - Customization allowed with *Type field = other & describe in notes*
AK GeMS Data Dictionary

Key Aspects

• Increased focus on modeling geologic features
• Capable of exporting to National GeMS
• Capable of supporting both single-map geodatabases as well as the DGGS multi-map enterprise geodatabase (PostGreSQL)
• Support multiple geologic layers (i.e. bedrock, surficial, others)
• Formalized pick lists as attribute domains.
  • Over 75 domains
  • Over 400 controlled & defined values
• Well documented

Version 2.0 scheduled for June 2024

AK GeMS Data Dictionary: A description of the AK GeMS database schema, MP 170
https://dggs.alaska.gov/pubs/id/30669
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• Create new ancillary data tables (spatial or nonspatial) in GeMS/AKGeMS
  • One off map specific table (AK GeMS frowns upon new tables)
  • Add a table as a new organizational standard
Adding “new” modeled phenomena into the GeMS schema

1. A lot of specialized tables versus
2. A few tables with attributes to define specialization (type/category)

AK GeMS trends towards option 2, *but is sliding slowly towards 1*

Example – Geologic (Points, Lines, Polygons) category and type fields and domains

Note: AK GeMS frowns upon new custom tables within AK GeMS until new version published. One reason is custom tables make metadata generation, QC, and production in general less efficient.
### Geologic (Points, Lines, Polygons) Domains

<table>
<thead>
<tr>
<th>Category</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>key bed</td>
<td>key bed, generic</td>
</tr>
<tr>
<td></td>
<td>key bed, clay</td>
</tr>
<tr>
<td></td>
<td>key bed, clinkered coal</td>
</tr>
<tr>
<td></td>
<td>key bed, coal</td>
</tr>
<tr>
<td></td>
<td>key bed, economically important commodity</td>
</tr>
<tr>
<td></td>
<td>key bed, traceable bed</td>
</tr>
<tr>
<td></td>
<td>key bed, other</td>
</tr>
<tr>
<td>geomorphic feature</td>
<td>geomorphic feature, generic</td>
</tr>
<tr>
<td></td>
<td>geomorphic feature, lineament</td>
</tr>
<tr>
<td></td>
<td>geomorphic feature, form line</td>
</tr>
<tr>
<td></td>
<td>geomorphic feature, other</td>
</tr>
<tr>
<td>glacial and periglacial</td>
<td>glacial and periglacial, generic</td>
</tr>
<tr>
<td></td>
<td>glacial and periglacial, ice wedge polygon</td>
</tr>
<tr>
<td></td>
<td>glacial and periglacial, pingo</td>
</tr>
<tr>
<td></td>
<td>glacial and periglacial, other</td>
</tr>
<tr>
<td>lacustrine and marine</td>
<td>lacustrine and marine, generic</td>
</tr>
<tr>
<td></td>
<td>lacustrine and marine, other</td>
</tr>
<tr>
<td>landslide and mass wasting</td>
<td>landslide and mass wasting, generic</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, block-glide landslide</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, debris slide</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, displacement vector</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, earth flow</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, hummock</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, rock slide</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, rotational landslide</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, slump</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, soil creep or incipient sliding</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, spring, seep, or drainage</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, tilt direction</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, Toreva block</td>
</tr>
<tr>
<td></td>
<td>landslide and mass wasting, other</td>
</tr>
<tr>
<td>volcanic</td>
<td>volcanic, generic</td>
</tr>
<tr>
<td></td>
<td>volcanic, fumarole or steam vent</td>
</tr>
<tr>
<td></td>
<td>volcanic, hornito</td>
</tr>
<tr>
<td></td>
<td>volcanic, thermal spring</td>
</tr>
<tr>
<td></td>
<td>volcanic, geyser</td>
</tr>
<tr>
<td></td>
<td>volcanic, cone, vent, cinder cone, or spatter cone</td>
</tr>
<tr>
<td></td>
<td>volcanic, volcano</td>
</tr>
<tr>
<td></td>
<td>volcanic, diatreme, breccia pipe, or collapse structure</td>
</tr>
<tr>
<td></td>
<td>volcanic, other</td>
</tr>
<tr>
<td>natural resources</td>
<td>natural resources, generic</td>
</tr>
<tr>
<td></td>
<td>natural resources, occurrence</td>
</tr>
<tr>
<td></td>
<td>natural resources, prospect</td>
</tr>
<tr>
<td></td>
<td>natural resources, mine</td>
</tr>
<tr>
<td></td>
<td>natural resources, other</td>
</tr>
<tr>
<td>tectonic</td>
<td>tectonic, generic</td>
</tr>
<tr>
<td></td>
<td>tectonic, other</td>
</tr>
<tr>
<td>unprovided</td>
<td>unprovided</td>
</tr>
<tr>
<td>unknown</td>
<td>unknown</td>
</tr>
<tr>
<td>other</td>
<td>other</td>
</tr>
</tbody>
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- Build other Databases/Datasets with GeMS in mind for future linkages

Join custom non-spatial related data to existing GeMS/AK GeMS features with key fields if possible
Some Ancillary Data in the process

Organizational Databases and Datasets

GERILA
Data Sources
Map Citations
Stations
Samples

GeoChem

Photos

Map Images

Services

Still concerns about long term availability
Some Ancillary Data in the process

Organizational Databases and Datasets

GERILA
- Data Sources
- Map Citations
- Stations
- Samples

GeoChem

Photos

Map Images

Services

Single Map AK GeMS
PRODUCTION
Geodatabase

Ancillary

primary.mapx

.layout

Still concerns about long term availability

Production
Some Ancillary Data in the process

- **GERILA**
  - Data Sources
  - Map Citations
  - Stations
  - Samples

- **GeoChem**

- **Photos**

- **Map Images**

- **Services**

- **Ancillary Data Sources**
  - Map Citations
  - Stations
  - Samples

- **Organizational Databases and Datasets**

- **Production**
  - Single Map AK GeMS PRODUCTION Geodatabase
  - Ancillary

- **Delivery**
  - Report
  - Geologic Cartographic Map (pdf)
  - Delivery .mapx

- **Ancillary**

- **Still concerns about long term availability**
Some Ancillary Data in the process

Organizational Databases and Datasets

GERILA
Data Sources
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GeoChem

Photos

Map Images

Multimap AK GeMS Geodatabase

Single Map AK GeMS Production Geodatabase

Ancillary

primary.mapx

.Layout

Production

Still concerns about long term availability

Services

Single Map AK GeMS Delivery Geodatabase

Ancillary

report

Geologic Cartographic Map (pdf)
delivery.mapx

Multimap AK GeMS Geodatabase

Single Map AK GeMS Delivery Geodatabase

Ancillary

Ancillary

Overtime, the Multimap AK GeMS database will become a datasource
Some Ancillary Data in the process

Organizational Databases and Datasets

GERILA
Data Sources
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Stations
Samples

GeoChem

Photos

Landslide Inventory
Map Images

Multimap AK GeMS Geodatabase

Services

Still concerns about long term availability

Production

Single Map AK GeMS PRODUCTION Geodatabase

Ancillary

primary .mapx

.mapx

.Layout

Delivery

report

Geologic Cartographic Map (pdf)

delivery .mapx

Single Map AK GeMS DELIVERY Geodatabase

Ancillary

Ancillary

Ancillary
AK GeMS Key Relationships with Geo Analytic Data, Stations, Samples & GERILA

**GERILA**

Field Stations (GERILA)
- field_station_id [Long]
- field station number [TEXT]
- project_id_dggs [LONG]

Samples (GERILA)
- Sample_id [LONG]
- assigned_sample_label [TEXT]
- field station number [TEXT]
- field_station_id [Long]
- project_id_dggs [LONG]

**AK GeMS**

stations
- stations_id [TEXT] w/GUID [LONG] pub prep
- field_station_id [LONG] pub prep
- field_id [TEXT] fieldwork

geochron_points
- geochron_points_id [TEXT] w/GUID pub prep
- stations_id [TEXT] w/GUID Pub prep
- field_id [TEXT] fieldwork
- field_sample_id [TEXT] interpretation

fossil_points
- fossil_points_id [TEXT] w/GUID Pub prep
- stations_id [TEXT] w/GUID Pub prep
- field_id [TEXT] fieldwork
- field_sample_id [TEXT] interpretation

samples
- samples_id [TEXT] w/GUID Pub prep
- stations_id [TEXT] w/GUID Pub prep
- field_id [TEXT] fieldwork
- field_sample_id [TEXT] interpretation

orientation_points
- orientation_points_id [TEXT] w/GUID Pub prep
- stations_id [TEXT] w/GUID Pub prep
- field_id [TEXT] fieldwork
- field_sample_id [TEXT] interpretation

map_unit_points
- map_unit_points_id [TEXT] w/GUID Pub prep
- stations_id [TEXT] Pub prep
- field_id [TEXT] fieldwork

In general, AK GeMS Point Feature can relate to stations and sample records in GERILA without necessarily having a station or sample record in AK GeMS.

Station records in AK GeMS are optional. Typically used for inset map. All stations features must exist in GERILA and be collocated.

Records that relate to GERILA samples (field_sample_id) and/or field stations (field_id) must be collocated with GERILA’s sample and station location.

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Version 2 only
Holds sample records that cannot be represented in geochron or fossils. Samples must exist in GERILA and be collocated.

Orientation points can optionally relate to a station in the AK GeMS Database. Note: They DO NOT necessarily have to be collocated with the station. Checked with 500m.

Map_unit_points can optionally relate to a station in the AK GeMS Database. Station must exist in GERILA and be collocated.

**QC Checks:**

For geochron, fossils, and samples
- If point field_id is not NULL: field_id is found in GERILA point is collated with GERILA field stations point
- If point field_sample_id is not NULL: field_sample_id is found in GERILA point is collated with GERILA field stations point
- If field_id is found in AK_GeMS stations stations_id matches point is collated with AK GeMS stations point

For orientation_points
- If point field_id is not NULL: field_id is found in GERILA point is within 500m with GERILA field stations point

For stations
- for all points field_id is found in GERILA point is collated with GERILA field stations point

field_station_id matched GERILA field_station_id

AK GeMS Table Primary Key
GERILA Table Primary Key
Relates to DGGS GERILA DB

30 Apr 2024

Collocation defined as <10m new mapping <100m for older map conversions