Under the ice and over the sky

Aspects of building the International Quaternary Map of Europe and potentially useful parallels to planetary geological map projects

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Project of the International Quaternary Map of Europe (New IQUAME 2500) in a nutshell:

- Umbrella: CGMW* and INQUA**
- Coordination: BGR, Germany
- 2011: Start at INQUA congress, Bern
- Planned to be completed 2023

Aims:

- Summarize the actual status quo of mapping and research on Quaternary geology in Europe
- To help understanding the Quaternary history of Europe
- In cooperation and synergies with international colleagues
- Project As GIS, to be available on-line
- For science, university, planning authorities, exploration …

* Commission of the Geological Map of the World (CGMW)
** and International Union for Quaternary Research (INQUA)
International Quaternary Map of Europe and Adjacent Areas

- 40 countries involved
- Cooperation with EC EMODnet Geology project
- Subcommission Middle East of Commission of the Geological Map of the World etc.

Project Participation

Scientific advisors:

Coordinator: Kristine Asch, BGR
Cartography: Alexander Müller, BGR

National Geological Survey Organizations (contact points and contributing scientists)
Albania: Albanian Geological Survey (IGS), Marko, S.
Austria: Geological Survey of Austria (BGR), Burdich, J.
Belarus: The National Academy of Sciences of Belarus (NASB), Kulagin, P.
Bosnia and Herzegovina: Federal Geological Survey of Bosnia and Herzegovina, Hrvatin, H.
Croatia: Croatian Geological Survey (HIG), Galic, L.
Czech Republic: Czech Geological Survey (CGS), Novi, O.
Denmark: Danish Geological Survey and Greenland (DGG), Johansen, P.
Estonia: Geological Survey of Estonia (EGS), Kall, V., Põnlin, A.
Faroe Islands: The Faroese Earth and Energy Directorate (FED), Mortensen, L.
Finland: Geological Survey of Finland (FGF), Karlsson, A., Pajari, J.
Germany: Federal Geologic Institute and Natural Resources (BGR), Assm, A., Müller, A.
Germany: Free University of Berlin (FU), Böse, M.
Ireland: Geological Survey of Ireland, Palliser, K., Shrewsby, M.
Italy: Institute of Environmental Protection and Research (ISPRA), Frataccioli, M.
Istanbul: Istanbul Geological Survey (IEG), Piro, G.
Lithuania: Lithuanian Geological Survey (LIG), Cyselko, R., Bartkevičius, J.
Malta: Ministry for Transport and Infrastructure (MIT), Caruana, A.
Montenegro: Geologic Survey of Montenegro (GGM), Radić, V.
Netherlands: NIOO Geological Survey of the Netherlands, Heeres, P.
Netherlands: Utrecht University (UU), Cohen, K.
Norway: Geological Survey of Norway (NGU), Gislefoss, L., Lønning, V., Lysd, A.
Poland: Polish Geological Institute (PGZ), Malyń, L., Ryniec, P.
Portugal: National Laboratory of Energy and Geology (LNEG), Resende, R., Távora, P.
Portugal: Portuguese Sea and Atmospheric Institute (IPMA), Alves, J.
Romania: Geological Institute of Romania (IGR), Munteanu, M.
Russia: Russian Geological Survey (GSI), V. S., Petrovsky, D.
Serbia: Serbian Geological Institute (SNI), Srebuš, D.
Slovakia: Geological Survey of Slovakia (SNG), Javor, J.
Spain: Instituto Geológico y Minero de España (IGME), M.
Sweden: Swedish Geological Survey (SGU), Sjöberg, A., Alm, K.
United Nations: International Geographical Union (IGU), Östen, T.
Ukraine: Ukrainian Geological Survey Institute (UKSGU), Kyrylenko, V.
United Kingdom: Natural Environment Research Council (NERC), Jones, J.
United States: US Geological Survey (USGS), Bつけ, H.
Vietnam: Vietnam Institute of Geosciences and Geology (VIGEOM), Nguyen, D.

Participating Countries
On- and offshore Quaternary geology

- Lithology
- Age
- Genesis (environment, process)
- Glaciogenic features
- Last maxima of glaciation extent
- Last maximum of permafrost
- Postglacial rebound
- Direction of ice movement
- Limit of transgressions
- Limit of drift ice in summer time
- Active faults
- Key locations incl. Palaeolithic sites
40 countries involved: Discrepancies across political boundaries
differing:
– national mapping focus,
– mapping scales
– age of mapping campaign
– mapping methods

– classification systems/taxonomies *
– portrayal rules

and ... the individual fondness of the mapping geologists for a specific feature
Common standards: Use of the EC INSPIRE Directive Implementation Rules as base for the IQUAME data model and vocabularies

INSPIRE vocabularies\(^x\) very useful, but not sufficient for adequate portrayal of Quaternary geology in Europe

- geological event (age)
- genesis: $\ast$
- lithology
- faults
- set up of additional features and code lists

Based on the work of the CGI Geoscience Terminology Working group http://www.cgi-iugs.org/tech_collaboration/geoscience_terminology_working_group.html
IQUAME 2500 – Working material

Each national participant receives a “starter package”:

1. Topographic base data set (VMap0, optimized in parts by participants)

2. Guideline document incl. vocabulary (including INSPIRE and CGI-IUGS controlled vocabularies)

3. Technical Guidelines for data transformation Excel sheet with pop-up lists allowing to enter IQUAME standard terms

4. Dataset of 1st edition map units to review, digitized
**IQUAME Scheme of data acquisition and processing**

**preparation**
- standard vocabulary, guidelines, topographic base

**processing**
- compile, generalise, harmonize and portray

**Consultation & Review**

**Central Information system**
- ArcGIS/SQLserver

**IQUAME participants**
- national data production
- use vocabulary, provide map data
- review by participants, advisory board

**data release**
- publish

**production of final version**
- send material
- send data
- send processed data for review
- send amended data

**WWW**
- data release
Classic Quaternary mapping on Earth: surface forms (geomorphology), genetic interpretation, stratigraphy, lithology

Weichselian loess

Holocene fluvial deposits (sand, gravel)

local ice border

Weichselian ground moraine (clay, silt, sand, gravel, boulders)

end moraine

drumlin

glacier (recent)
Mapping on Mars and other planets

- surface forms (geomorphology),
- stratigraphy
- lithology.

Less genetic interpretation, more descriptive

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Geologic Features on Mars (Deuteronilus area) comparable to Quaternary features on Earth

- tongue shaped rock glacier
- inter-remnant moraine-like unit
- landslide
- Impact crater
- rock glaciers
- piedmont-type rock glaciers

Features from HRSC orbit 506

HRSC # 0506 Stephan van Gasselt

GEOZENTRUM HANNOVER
IQUAME lessons learned, potentially useful to planetary geological map projects: Common standards essential for crossboundary mapping

- Common data model
- Common topographic base map
- Common portrayalal rules
- Common vocabularies
Thank you very much to the IQUAME community, the participating organisations and individual scientists for your contributions! Thanks also for CGMW for the constant support and motivation and INQUA for your support and appreciation!
And thank you very much for your attention!

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References


• CGI Vocabularies http://www.cgi-iugs.org/tech_collaboration/geoscience_terminology_working_group.html


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