Geophysical Research Abstracts
Vol. 18, EGU2016-13178, 2016
EGU General Assembly 2016

Digital bedrock mapping at the Geological Survey of Norway: BGS SIGMA tool and in-house database structure

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Since 2010, the Geological Survey of Norway has been implementing and continuously developing a digital workflow for geological bedrock mapping in Norway, from fieldwork to final product. Our workflow is based on the ESRI ArcGIS platform, and we use rugged Windows computers in the field. Three different hardware solutions have been tested over the past 5 years (2010-2015). (1) Panasonic Toughbook CE-19 (2.3 kg), (2) Panasonic Toughbook CF H2 Field (1.6 kg) and (3) Motion MC F5t tablet (1.5 kg). For collection of point observations in the field we mainly use the SIGMA Mobile application in ESRI ArcGIS developed by the British Geological Survey, which allows the mappers to store georeferenced comments, structural measurements, sample information, photographs, sketches, log information etc. in a Microsoft Access database. The application is freely downloadable from the BGS websites. For line- and polygon work we use our in-house database, which is currently under revision. Our line database consists of three feature classes: (1) bedrock boundaries, (2) bedrock lineaments, and (3) bedrock lines, with each feature class having up to 24 different attribute fields. Our polygon database consists of one feature class with 38 attribute fields enabling to store various information concerning lithology, stratigraphic order, age, metamorphic grade and tectonic subdivision. The polygon and line databases are coupled via topology in ESRI ArcGIS, which allows us to edit them simultaneously.

This approach has been applied in two large-scale 1:50 000 bedrock mapping projects, one in the Kongsberg domain of the Sveconorwegian orogen, and the other in the greater Trondheim area (Orkanger) in the Caledonian belt. The mapping projects combined collection of high-resolution geophysical data, digital acquisition of field data, and collection of geochronological, geochemical and petrological data. During the Kongsberg project, some 25000 field observation points were collected by eight geologists. For the Orkanger project, some 2100 field observation points were collected by three geologists. Several advantages of the applied digital approach became clear during these projects: (1) The systematic collection of geological field data in a common format allows easy access and exchange of data among different geologists, (2) Easier access to background information such as geophysics and DEMS in the field, (3) Faster workflow from field data collection to final map product. Obvious disadvantages include: (1) Heavy(ish) and expensive hardware, (2) Battery life and other technical issues in the field, (3) Need for a central field observation point storage inhouse (large amounts of data!), and (4) Acceptance of- and training in a common workflow from all involved geologists.