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Beyond data collection in digital mapping: interpretation, sketching and thought process elements in geological map making

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Geological mapping techniques have advanced significantly in recent years from paper fieldslips to Toughbook, smartphone and tablet mapping; but how do the methods used to create a geological map affect the thought processes that result in the final map interpretation? Geological maps have many key roles in the field of geosciences including understanding geological processes and geometries in 3D, interpreting geological histories and understanding stratigraphic relationships in 2D and 3D. Here we consider the impact of the methods used to create a map on the thought processes that result in the final geological map interpretation.

As mapping technology has advanced in recent years, the way in which we produce geological maps has also changed. Traditional geological mapping is undertaken using paper fieldslips, pencils and compass clinometers. The map interpretation evolves through time as data is collected. This interpretive process that results in the final geological map is often supported by recording in a field notebook, observations, ideas and alternative geological models explored with the use of sketches and evolutionary diagrams. In combination the field map and notebook can be used to challenge the map interpretation and consider its uncertainties. These uncertainties and the balance of data to interpretation are often lost in the creation of published 'fair' copy geological maps.

The advent of Toughbooks, smartphones and tablets in the production of geological maps has changed the process of map creation. Digital data collection, particularly through the use of inbuilt gyrometers in phones and tablets, has changed smartphones into geological mapping tools that can be used to collect lots of geological data quickly. With GPS functionality this data is also geospatially located, assuming good GPS connectivity, and can be linked to georeferenced infield photography. In contrast line drawing, for example for lithological boundary interpretation and sketching, is yet to find the digital flow that is achieved with pencil on notebook page or map. Free-form integrated sketching and notebook functionality in geological mapping software packages is in its nascence. Hence, the result is a tendency for digital geological mapping to focus on the ease of data collection rather than on the thoughts and careful observations that come from notebook sketching and interpreting boundaries on a map in the field. The final digital geological map can be assessed for when and where data was recorded, but the thought processes of the mapper are less easily assessed, and the use of observations and sketching to generate ideas and interpretations maybe inhibited by reliance on digital mapping methods.

All mapping methods used have their own distinct advantages and disadvantages and with more recent technologies both hardware and software issues have arisen. We present field examples of using conventional fieldslip mapping, and compare these with more advanced technologies to highlight some of the main advantages and disadvantages of each method and discuss where geological mapping may be going in the future.