



# BGS•SIGMAMOBILE FOR GEOLOGICAL FIELD DATA

A NEW ERA FOR DIGITAL GEOLOGICAL MAPPING WITH A 2<sup>ND</sup> RELEASE OF THE BGS DIGITAL MAPPING SYSTEM.

The British Geological Survey (BGS) has been developing innovative systems to collect digital field observations data for geological mapping for over 20 years. The culmination of our labours is a Tablet PC system (**BGS•SIGMAmobile**) which is currently used to collect and utilise digital field data across the globe. BGS geoscientists use BGS•SIGMAmobile in some of the harshest environments in the world from the sweltering heat of the Emirates to subzero temperatures in the Antarctic, encompassing all possible terrains in between from the tropical rainforests of Madagascar to the Cairngorm Mountains in Scotland (see Figure 1).

Following an evaluation of existing technologies in 2001, it was evident that none provided the functionality to collect the full range of data required by BGS geoscientists. We began by developing a PDA (Personal Digital Assistant) system for point data capture, however the advent of rugged Tablet PCs with their larger screens and increased processing power meant that full digital survey and mapping tools could be placed into the geologists' hands.

The Tablet PC platform enabled us to heavily customise and link ESRI ArcGIS and MS Access systems and utilise handwriting recognition tools such as Inkwriter. The result is an integrated field mapping system based on those software packages that has been successfully implemented in many geoscience applications from traditional geological mapping to landslide monitoring and earthquake damage assessment. Having designed the system with geologists testing every step of the way, it provides a considered balance of structured input using drop-down menus along with free text and sketches where appropriate.



A built-in GPS aids location while comments, symbolised points, lines and polygons can be drawn on the map face with ease. The information traditionally recorded in the field notebook is collected in a relational database accessed by modular forms. Ancillary data such as digital photos can be added in the field and sketched over, or added on return to the office where they are automatically renamed, linked in the database and copied into the correct folder.

The concept was to develop a system that replicates where possible to the flexibility of pencil and paper, while providing additional tools never before available at the outcrop.

Extending beyond the capabilities supplied by pencil and paper, we also developed functions like a Structure Contour Tool that plots contours from dip and strike data. Similarly, points are automatically symbolised and rotated on screen using the values recorded in the modular forms. Moreover, the capacity to bring vast amounts and types of raster and vector data to the field (such as DTMs, historic and recent maps, aerial and satellite imagery) helps the geologist to make better-informed interpretations.

The integrated digital mapping workflow (SIGMA ~ System for Integrated Geoscience Mapping) won the ESRI GIS Excellence Award for Innovation in 2007 and BGS•SIGMAmobile was 'Highly Commended' in the same category by the AGI in the same year. In July 2009 we made BGS•SIGMAmobile freely available from our website (see link at end of article) and 650 licenses were downloaded in 12 months by academic and commercial users across the globe (see Figure 2).

Whilst users need to have their own licenses of ArcGIS and MSAccess, the concept behind releasing our extensive customisations free-of-charge is that future development will be shared by the growing global digital geoscience community. To ensure shared development, before downloading the free release of our customisations and dictionaries,

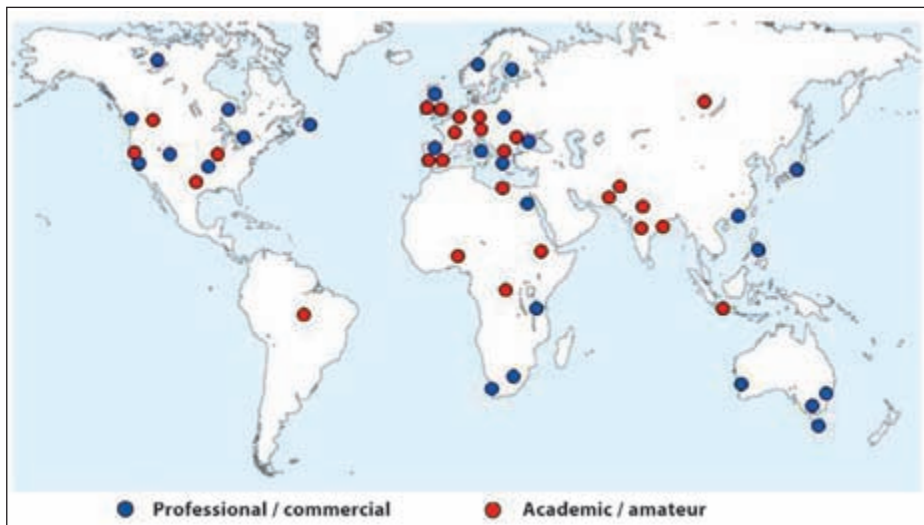


Figure 2 Geographical distribution of 650 downloads of BGS digital mapping software

users agree to send any upgrades or modifications to us to add to future releases.

In the year that marks the 175th anniversary of BGS we are proud to release the 2nd free version of BGS•SIGMAmobile. This release sees improvements including making the system easier to install, the upgrade to ArcGIS 9.3.1, the addition of a new fully-attributed line-drawing tool and the function to produce MSWord reports from the data collected.

It is undoubtedly a culture change to move from pencil and paper to digital techniques, and it is part of human nature that some people are more comfortable with change than others. Nevertheless, feedback from users such as "I will not return to pencil and paper" serve to highlight that the system is fit-for-purpose and has been embraced by our geologists.

Beyond BGS, a range of commercial companies, national geological surveys and amateurs are using the system free-of-charge. The academic community have taken to the software, for example SPLINT, a joint teaching initiative between Universities of Leicester,

Nottingham and UCL has been using BGS•SIGMAmobile to develop pedagogies for teaching digital mapping to Earth Science students. Dr England (Senior Lecturer and Course Director in Geology at Leicester) states that the "tablet is easier to handle than map and notebook" and is "simple and quick to use once the software is mastered" enabling the "rapid production of high quality maps" by the students.

Prof Giulio Viola, Senior structural geologist at the Geological Survey of Norway stated that, "I feel confident that BGS•SIGMAmobile is indeed a reliable and strong software that we will continue using in the framework of the mapping program I am responsible for. Day by day we all become more used to the software and we discover progressively its great advantages."

It is envisaged that the future for digital geological mapping will include novel ways to collect and interact with data. Based on better connectivity in the field and rapidly improving hardware systems, technologies such as augmented and virtual reality are being investigated while active and dynamic links to sensor webs are being developed. If more information is required on BGS•SIGMAmobile or the field hardware that BGS has experience with, please visit our web site at the URL in the article, from which the new version of the system can be downloaded.

#### Links

[www.bgs.ac.uk/research/technologies\\_epo.html](http://www.bgs.ac.uk/research/technologies_epo.html)

#### Article by Colm Jordan, BGS

*This paper is published with the permission of the Executive Director of the British Geological Survey (NERC). BGS•SIGMAmobile owes much to the dedication and perseverance of a motivated team of developers, mappers and support staff in BGS whose enthusiasm for digital mapping have helped make the system an award-winning success.*



Figure 1 BGS•SIGMAmobile in use in the United Arab Emirates and Lancashire