

G-BASE

Internet Information



History of the G-BASE project

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In 1968 the Institute of Geological Sciences (IGS) (now the British Geological Survey, BGS) began a regional geochemical sampling programme in the northern Highlands of Scotland. This work was aimed at producing maps to show the distribution of trace elements in stream sediments. Prior to this, earlier geochemical studies were mainly involved with uranium reconnaissance work, a programme supported by the UK Atomic Energy Authority (1967–1972). The establishment of a Geochemistry Division on 1st August 1967 must be seen as a step that initiated the regional geochemical mapping programme. Funded by the Department for Trade and Industry the project in the early 1970's was known as the Regional Geochemical Reconnaissance Programme and was closely associated with the work of the DTI Mineral Reconnaissance Programme. The project was then based in the Radioactive and Metalliferous Minerals Unit. The earliest samples are from the Sutherland atlas area and collected in the summer of 1968 as part of the uranium reconnaissance work. The first systematic sampling for the regional geochemistry started in Orkney and Shetland in the summer of 1970. The work has progressed southwards from northern Scotland ever since. The first geochemical data from the regional survey of northern Scotland was placed on open file in 1972 for the Caithness ¼" Geological map sheet area.

A further reorganisation of the IGS saw the creation of a Special Surveys Division in 1977 and the Regional Geochemical Reconnaissance Programme became a major project within the Metalliferous Minerals and Applied Geochemistry Unit. Work on the Orkney and Shetland geochemical atlases commenced in 1974 and the Shetland atlas was the first to be published in 1978. Between 1975 and 1990 the work was funded by the UK Department for Trade and Industry (DTI). After 1990 funding for the work came from the Department of Education and Science and subsequently, the Office of Science and Technology. The project was renamed the Geochemical Survey Programme (GSP) in 1988 and again in 1994 to the Geochemical Baselines Survey of the Environment Project (G-BASE).

The activity of regional geochemical surveys, as described in the IGS Annual Report of 1978, has been maintained until the present but with a far greater emphasis on environmental rather than minerals related issues:

"While the principal application of the data is to the determination of variations in bedrock composition, the mapping is of direct value to organisations engaged in mineral investigations, including IGS in the Mineral Reconnaissance Programme, also funded by the DTI. The data also have potential applications, being increasingly realised, to a range of other disciplines and activities, particularly agriculture, medical geology, land-use planning and regional geological studies"

During the lifetime of this long project analytical, statistical and data processing techniques have evolved substantially. Initially stream sediments were analysed for 16 elements using optical emission spectroscopy, atomic absorption spectrophotometry and delayed neutron activation (U). A direct-reading emission spectrometer was used to determine some 25 elements for the Hebrides

and subsequent atlas areas. The current analytical method is XRF, which commenced on the Welsh stream sediments and now determines 48 elements (Ag, Al, As, Ba, Bi, Br, Ca, Cd, Ce, Co, Cr, Cs, Cu, Fe, Ga, Ge, Hf, I, K, La, Mg, Mn, Mo, Na, Nb, Nd, Ni, P, Pb, Rb, Sb, Sc, Se, Si, Sm, Sn, Sr, Ta, Te, Th, Ti, Tl, U, V, W, Y, Zn and Zr). Major changes in the analytical methodology have meant there has been a need to standardise results produced by different analytical methods over a long period of time. The strict analytical controls and use of standard, duplicate and replicate samples initiated at the start of the work has enabled a high quality seamless geochemical database to be created and maintained.

Improved analytical techniques for water analyses by ICP-OES and MS has enabled the project to complete a greater range of determinants on the water samples which were originally just collected for pH, conductivity, F and U analyses. The collection of soil samples has also increased as a consequence of moving into lowland areas dominated by intensive agriculture and more mature drainage systems. In particular, the demand for geochemical baseline data in urban areas has been significant enough to justify higher resolution baseline determinations using soils in major urban centres.

The geochemical mapping initially set out to produce maps corresponding to the quarter inch geological map sheets. These evolved into the atlas areas shown in the figure, and the geochemical atlas is the principal product of the survey work. Digital distribution of the data is increasingly important and the geochemistry is integrated into GIS with other layers of geoscience information.

G-BASE continues to be one of the BGS's principal science budget-funded projects. Its aim and objective fit well within the aims of the BGS

and the mission of the NERC. Few BGS projects have produced such a wealth of external peer reviewed publications, a fact that has established BGS regional geochemistry mapping in high esteem around the world. Geochemists who have worked on this project have established reputations in the field of geochemistry and have become key figures in the development of international geochemical projects and working groups. Many geological organisations around the world have adapted the G-BASE methodology for their own national geochemical surveys.

