

A MULTIMETHOD APPROACH TO CORRELATING BENTONITES FROM THE SILURIAN OF THE WELSH BASIN. J. Thorogood¹, N. J. G. Pearce¹, C. A. Bendall¹, D. K. Loydell², R. Cave¹, and J. A. Evans³, ¹I.G.E.S., University of Wales Aberystwyth, Ceredigion, Wales, UK, SY23 3DB, ²University of Portsmouth, Burnaby Building, Burnaby Rd., Portsmouth. UK, PO1 3QL, ³NERC Isotope Geosciences Laboratory, Keyworth, Nottingham, UK, NG12 5GG.

Bentonites are common in the Silurian of Wales and the Welsh Borderlands and can be used to correlate diverse facies (deep water graptolitic and shallow water shelly) which occur in the Welsh Basin. Bentonites occur in both facies, and are essentially isochronous as they were deposited in a matter of days or weeks (Bergström *et al.* 1998). Their

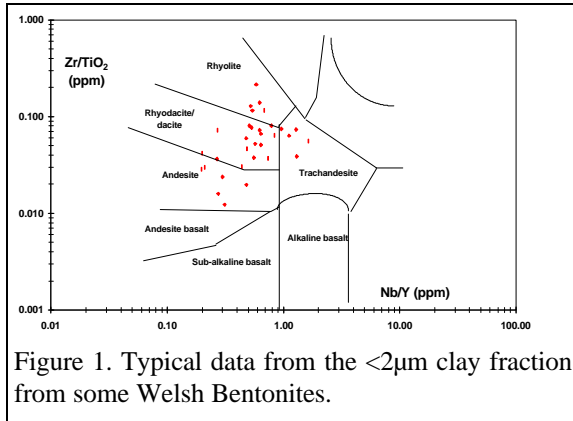


Figure 1. Typical data from the $<2\mu\text{m}$ clay fraction from some Welsh Bentonites.

The discrimination diagram of Winchester & Floyd (1977) indicates the $<2\mu\text{m}$ clay fraction derived from a silicic, mostly subalkaline source(s) ranging from andesite to rhyolite (Fig. 1). Results suggest changing/evolving source(s) from volcanic arc in the early Silurian to within plate in the Wenlock (Pearce *et al.* 1984). The clay fraction shows light REE enrichment and negative Eu anomalies.

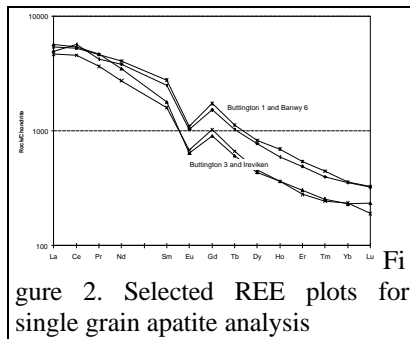


Figure 2. Selected REE plots for single grain apatite analysis

correlation may also identify the potential diachroneity of graptolite biozones across the basin (Loydell 1993). Volcanic arc sources have been postulated for these deposits although no direct proximal or distal source has been identified (Fortey *et al.* 1996). Isotope and geochemical analysis have been used here to provide a signature for bentonites from the Llandovery and Wenlock to enable correlations across the Welsh Basin (and possibly beyond) and place constraints on their source(s).

The clay fraction shows light REE enrichment and negative Eu anomalies.

Apatites were separated from the bentonites and analysed by LA-ICP-MS. Applying the discrimination diagram of Fleischer & Altschuler (1986) to the single grain data revealed several magma sources in operation at any time, mostly from intermediate to alkaline sources. Comparing trace and rare earth element data obtained from single apatite grains has provided a series of tentative correlations (e.g. Fig. 2). Continuing factor analysis on both clay and grain analyses is being

applied to further substantiate these correlations.

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