

Ordovician volcanism, Wales

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The extensive Ordovician volcanic activity in the Welsh Basin is consistent with the general model of Ordovician plate tectonics that places the basin in a back-arc setting. The initiation of volcanic activity, in late Tremadoc times, was an island-arc volcanic episode. Subsequently, this subduction-related episode was succeeded by mainly tholeiitic volcanism related to back-arc extension. The volcanism was essentially bimodal, with considerable volumes of tholeiitic basalts of ocean-floor affinity and rhyolites. The relatively minor volume of intermediate, andesite to rhyodacite magma, resulted from low pressure fractional crystallisation of the tholeiitic basalts. The small volume of intermediate magma and the lack of geophysical evidence for the existence of large bodies of mafic residua have been used to suggest that the large volume of acidic magma was the result of partial melting of the crust. However, extensive and concerted studies in central and northern Snowdonia concluded that the whole suite was derived by crystal fractionation from three distinct basalt parents. The parental basaltic magmas resided at subcrustal levels and periodically ascended, together with their rhyolitic derivatives, through a system of deep crustal fractures to upper crustal levels. It is argued that most of the denser intermediate derivatives did not reach upper crustal levels. Batches of rhyolitic magma, derived from basaltic magmas with minor amounts of crustal contamination, temporarily occupied small high-level magma chambers beneath the Snowdon Centre. The model does not envisage the existence of a single large, basic to acid zoned magma chamber or, contrary to earlier interpretations, that wholesale crustal melting was the dominant factor in the production of the rhyolite magmas.

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