

## **The geochemistry and genesis of calc-alkaline mafic dykes in the Dalradian Supergroup of County Donegal, Ireland**

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The Grampian terrane is located in the Caledonian orogenic belt of Ireland and includes the ca. 428–400 Ma Donegal Granite Complex (DGC), which intrudes the Late Precambrian Dalradian Supergroup. Three stages of deformation that pre-date granite emplacement are recognized in the Dalradian metasedimentary rock. Coeval with granite emplacement was thermal metamorphism and the pelitic members of the host rock around most of the aureoles consist of rather fine-grained chlorite-muscovite-quartz schist that locally contains biotite and garnet. Classic studies of the DGC have provided fundamental insights into some of the mechanisms of intrusion of granitoid rocks. However, the time and spatial relationships as well as the mantle processes between the large DGC plutons and smaller, more mafic bodies that are associated with the complex are unclear. The area around the Ardara Pluton of the DGC, widely interpreted as a classic diapir, provides an excellent, local opportunity to study its genetic linkage with suites of mafic dykes (widely reported as lamprophyres) that occur adjacent to the aureole of the pluton. Petrographic and electron microprobe analyses of the mafic samples collected from the field indicate that most of the dykes contain primary hornblende; however almost all of the samples have been altered and are dominated by secondary minerals such as chlorite and calcite. In addition, magmatic zircon has been recognized in several samples, and U-Pb dating of these zircons will test the widely assumed temporal relationship with the Ardara Pluton and the DGC. The geochemical data suggest that the classification of the mafic dykes as lamprophyres is in error. Given the often-cited genetic relationship between the presence of lamprophyres and mineral deposits, this conclusion has important implications for mineral exploration. The analytical results of the major elements indicate the mafic dykes in this region are potassic, calc-alkaline intrusions. Their rare earth elements are of the light rare earth element enrichment type. Moreover, they have high contents of Ti and P. Further understanding of the petrographical and geochemical characteristics of these mafic dykes can resolve the enigmatic relationship between the DGC and the associated mafic intrusions.