Constraints on element mobility associated with the conversion of granulite to eclogite along fractures in an anorthositic complex on Holsnøy, Norway

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ABSTRACT

On Holsnøy, an island along the coast of Western Norway, an anorthositic complex metamorphosed to granulite facies was partially overprinted by a later eclogite-facies metamorphism. Eclogite-facies rocks (containing omphacite, garnet, kyanite, and hydrous phases such as mica and zoisite) occur in shear zones of various scales and adjacent to veins. Previous studies of shear zones on Holsnøy reported evidence for substantial element mobility (Mattey *et al.*, 1994; Jamtveit *et al.*, 1990). In this work, we compare chemical compositions of granulite and its undeformed eclogitized equivalent adjacent to veins in locations where a single band of granulite can be traced and sampled as it approaches the vein. This tracing is crucial because the pre-granulite rocks cover a substantial compositional range, indicative of a petrologically variable protolith consisting of anorthosite, gabbro, and jotunite. We analyzed multiple core samples collected across nine separate granulite-eclogite transition zones located at veins in anorthositic, jotunitic, and gabbroic protoliths for major and trace elements. For each transition, no compositional difference between the average granulite and average eclogite composition was found at the 90% confidence level except for LOI (loss on ignition), which was consistently significantly higher in the eclogite samples. Although not significant at the 90% confidence level for any single traverse, the average eclogite concentrations of SiO_2, Na_2O, Cs, As, and Br exceed the average granulite concentrations for eight or all nine of the traverses. For most traverses, statistical analysis of the data limits any gain of SiO_2 in the eclogites to no more than a few relative percent. Other than the introduction of volatile substances, eclogitization associated with vein formation was essentially isochemical.