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# Model meets reality: contrasting TTG source rock models with anatectic metabasites from the Kapuskasing Uplift, Ontario

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Phase equilibrium modelling is a powerful tool for investigating petrological processes—especially those that operated on early Earth with limited preserved evidence in the geological record. Models of tonalite-trondhjemite-granodiorite (TTG) generation have explored conditions and processes in the source metabasites extensively, and the results of these models are validated by comparison with a plethora of TTG datasets. However, such models require key assumptions about Archean deep crustal metabasites, which are rarely exposed at Earth's surface. For instance, bulk compositions of these rocks are typically based on average compositions of Archean greenstones and the behaviour of partial melt is simplified as either open or closed system. Examining exposures of Archean anatectic metabasites is therefore crucial to validating these assumptions and evaluating the capability of the model to reproduce natural residual metabasites. The Kapuskasing Uplift in the Superior Province provides a rare opportunity to study an Archean crustal cross section, with deep crustal metabasites representing amphibolite- to suprasolidus granulite-facies conditions. These rocks are ideal for comparison with models, as variable degrees of partial melting are represented. Preliminary results indicate that modelled metabasite residue has more pronounced geochemical trends than variably melted natural metabasites, with the latter showing considerable scatter in composition. In addition, leucosome associated with metabasite in the Kapuskasing Uplift shows geochemical evidence for plagioclase accumulation, suggesting that melt underwent fractionation prior to extraction. Both observations highlight the complexity of the natural system relative to the model system, with consequences for phase equilibrium modelling approaches to understanding early Earth crustal differentiation.