A $^{40}Ar/^{39}Ar$ study of whole rock slate samples from Meguma gold deposits, Nova Scotia: implications for the timing and duration of auriferous quartz vein formation

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Previous field and laboratory work ($^{40}Ar/^{39}Ar$ dating) on select Meguma Supergroup gold deposits (Beaver Dam, Moose River, Upper Seal Harbour, Fifteen Mile Stream, West Gore, Caribou) indicate vein formation occurred at ca. 370 ± 5 Ma, thus post dating peak regional metamorphism and deformation, based on: (1) retrogression and deformation of contact metamorphic minerals transected by veins in aureoles of 370 Ma granites (e.g., Musquodoboit, River Lake); (2) discordant veins cutting regional (S_1) fabrics (e.g., West Gore); (3) presence of saddle reef veins *sensu stricto* (e.g., Dufferin, The Ovens); (4) late emplacement of bedding concordant and discordant veins during flexural slip folding which overprints regional (S_1) fabrics (e.g., The Ovens, Mooseland); and (5) concordance of $^{40}Ar/^{39}Ar$ ages for hydrothermal vein minerals (biotite, muscovite, hornblende). In order to better constrain the absolute timing of vein formation in deposits not containing hydrothermal minerals amenable to $^{40}Ar/^{39}Ar$ dating (i.e., K-bearing), a reconnaissance program using whole rock slate samples was undertaken. Material from eight gold districts wholly within the greenschist facies of the Meguma Zone was collected, including areas where hydrothermal vein minerals have been previously dated using the $^{40}Ar/^{39}Ar$ method (i.e., Beaver Dam, Moose River, Caribou). Material for analysis was collected from within ribbon-textured veins, adjacent veins and away from deposit areas (i.e., 1-2 km). All material was irradiated together and subjected to the same step-wise heating schedule. The experimental results for all samples are similar, with internally concordant age spectra produced such that for any deposit the same ages are obtained using plateau, correlation plots and integrated dates. Collectively the data indicate a total spread in ages from 403 to 380 Ma, but similar results (i.e., ≤1-2 Ma difference) are indicated for samples from the same deposit, whether hosted by veins, adjacent veins or collected regionally. Where $^{40}Ar/^{39}Ar$ data are available for hydrothermal minerals, the whole rock samples give older ages by ≤10 Ma. The results are interpreted to indicate the following: (1) regional metamorphic ages are retained by vein-hosted slate samples, despite having been bathed in hydrothermal solutions (i.e., 400-450°C); (2) the whole rock ages reflect diachronous metamorphism or cooling throughout the central Meguma Terrane, as also suggested by previous workers; (3) vein emplacement and attendant deformation post-dated peak regional metamorphism and deformation in the areas studied; (4) vein emplacement was rapid enough to prevent diffusive loss of Ar in the slates, even for the least retentive, low-temperature sites; and (5) the vein-forming fluids must have originated at a deeper structural level since the fluids were in obvious thermal disequilibrium with the wall rocks.