MID-CRUSTAL RECRYSTALLIZATION OF ZIRCON IN GRENVILLIAN ECLOGITES - EVIDENCE FROM A CL AND SHRIMP STUDY

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Zircons in eclogites from two areas of the Grenvillian High Pressure (HP) belt with different uplift histories were examined with a cathodoluminescence (CL) detector prior to SHRIMP analysis. In the central HP belt, eclogites were rapidly exhumed following burial, whereas in the western part of the belt they underwent a period of mid-crustal, granulite-facies metamorphism prior to exhumation. Most zircons from both areas have rounded terminations and length:width ratios of 2:1 or less, compatible with growth in a metamorphic environment. CL imaging of the zircons revealed a range of zoning features that were qualitatively classified into primary (i.e., igneous), modified primary, and secondary (i.e., etamorphic) types, with the overwhelming majority of grains from both areas showing evidence for various types of secondary zoning. Some zircons, typically those with low U and Th contents, display diffuse metamorphic growth zoning, especially radial sector and 'fir-tree' types that are generally associated with growth under high temperature metamorphic conditions. Others, which are commonly partially resorbed, display irregular, strongly contrasting CL-dark and -light zoning unrelated to the crystal margins and are inferred to have undergone within-grain recrystallization after growth. SHRIMP analyses of such grains show that U, Th and Pb concentrations vary significantly between adjacent dark and light zones, implying these elements were redistributed during the recrystallization process.
Interpretation of SHRIMP U/Pb results for zircons from the central HP belt, which display metamorphic growth zoning, is relatively straightforward and in accord with previous TIMS analyses that the eclogite-facies metamorphism took place at ca. 1050 Ma. Interpretation of the SHRIMP U/Pb data from the western HP belt is more complicated. Most grains exhibiting metamorphic growth zoning yield ages in the range 1150 to 1050 Ma, with the mode at 1100 Ma, whereas those with evidence of recrystallization commonly yield two ages. CL-dark zones, enriched in U and Th, typically retain memory of the crystallization age (~1500-1400 Ma in different samples), and CL-bright zones, depleted in U and Th, yield ~1100-1060 Ma ages with large errors due to their low U contents. As with previous TIMS results, we tentatively associate the ~1100 Ma age with the eclogite-facies metamorphism and the younger ages with the granulite-facies overprint. These results imply that eclogite-facies metamorphism was diachronous along the HP belt, and that uplift through the mid crust imparted distinctive U-Pb signatures to zircon in eclogite in different parts of the belt.