Geophysical Research Abstracts
Vol. 15, EGU2013-13403-1, 2013
EGU General Assembly 2013

U-Pb ages and trace-element geochemistry of zircon from migmatite, Western Gneiss Region, Norway: significance for partial melting in continental subduction

Donna L Whitney (1), Stacia M Gordon (2), Christian Teyssier (1), and Haakon Fossen (3)

(1) University of Minnesota, Earth Sciences, Minneapolis, United States (dwhitney@umn.edu, teyssier@umn.edu), (2) University of Nevada, Reno, United States (staciag@unr.edu), (3) University of Bergen, Bergen, Norway (haakon.fossen@geo.uib.no)

The major rock type of the Western Gneiss Region (WGR), Norway, is migmatitic gneiss. This migmatite is the host rock to the well-studied ultrahigh-pressure (UHP) and high-pressure eclogites that were severely deformed during exhumation in an oblique divergent setting. To evaluate geochemical and age relationships between eclogite and host migmatite from peak to lower pressures, we obtained LA-ICP-MS U-Pb dates and trace-element analyses for zircon from a variety of textural types of leucosome, from layer-parallel to crosscutting. Leucosome zircons are commonly euhedral, and many display oscillatory and sector zoning. Caledonian U-Pb zircon spot dates from zircon rim and near-rim regions are as old as 410–406 Ma, coeval with previously determined ages of UHP metamorphism of eclogite. Trace-element analyses obtained simultaneously with U-Pb ages document zircon crystallization under garnet-stable conditions in the majority of leucosomes. Other zircons, including those from crosscutting pegmatite, yield younger ages (as young as 385 Ma), coinciding with ages determined for amphibolite-facies retrogression of eclogite; trace-element analyses suggest that these zircons grew under plagioclase-stable (garnet-unstable) conditions. Combined age and trace-element data for leucosome zircons track the transition from high-pressure (garnet-stable, plagioclase-unstable) crystallization to lower-pressure (plagioclase-stable) crystallization. If the euhedral zircons that yield ages coeval with peak or near-peak UHP metamorphism represent crystallization in anatectic leucosomes, these results, combined with field and petrographic observations, are consistent with the presence of partially molten crust in at least part of the WGR during continental subduction. The decreased viscosity and increased buoyancy and strain weakening associated with partial melting may have assisted the rapid ascent of rocks from mantle to crustal depths. Alternatively, exhumation of the UHP terrain in oblique divergence at plate tectonic rates may have triggered decompression melting from UHP to low- pressure conditions during ascent.