Geophysical Research Abstracts
Vol. 15, EGU2013-5846, 2013
EGU General Assembly 2013

Collision of elements of peri-Gondwanan Ganderia with the composite Laurentian margin: detrital zircon U/Pb and Hf isotope evidence from Newfoundland

Arne Willner (1), Axel Gerdes (2), Hans-Joachim Massonne (1), Cees R. Van Staal (3), and Alexandre Zagorevski (4)

(1) Universität Stuttgart, Institut für Mineralogie und Kristallchemie, Mineralogie, Stuttgart, Germany (arne.willner@rub.de, +4968581222), (2) J.W. Goethe-Universität, Institut für Geowissenschaften, Frankfurt, Germany, (3) Geological Survey of Canada, Vancouver, Canada, (4) Geological Survey of Canada, Ottawa, Canada

Detrital zircon populations in precollisional sediments from the Laurentian margin and the accreted Ganderia microplate have been studied on both sides of the main Iapetus suture (Red Indian Line) in central Newfoundland. Characteristic detrital zircon Hf isotopic signatures (εHf(t)) reflect the large-scale crustal evolution of the source continents. These can be interpreted by different combinations of two contrasting trends. (1) Crustal evolution trends defined by εHf(t) values varying with age reflect times of initial juvenile magma production in the source continent evolving towards more recycled crust without further addition of juvenile magmas. (2) Time-restricted strong variation in εHf(t) values is interpreted as mixing of juvenile and recycled crust in continental magmatic arcs. Results for detrital zircon derived from Laurentia show the entire crustal history of northeastern Laurentia, whereas detrital zircon deposited on Ganderia reflects the crustal evolution in the northern part of Amazonia (present Columbia), its likely source craton.

The long-term evolution of magmatic arcs at the margins of both continents can be studied using detrital zircon in a similar way. In contrast to the Laurentian margin, Ganderia is characterized by development of Neoproterozoic-Cambrian continental arcs (ca. 500-670 Ma) that were built on the margin of Gondwana. During and following accretion of the various elements of Ganderia to Laurentia between 455 to 425 Ma, the syn-tectonic Late Ordovician to Silurian sediments deposited on the upper plate (composite Laurentia) continued showing only detritus derived from Laurentia, confirming that the trailing edge of Ganderia (Gander margin) remained isolated by a seaway from composite Laurentia until the Late Silurian. These sediments contain detrital zircon from Iapetan juvenile, continental and successor arcs that were active between ca 440 and 550 Ma, and from continuing magmatic activity until 423 Ma. A very different evolution was detected in the magmatic arcs along the former Laurentian margin in Newfoundland. In the northwestern part strongly negative εHf(t) values (-5 to -20) point to recycling of Mesoproterozoic crust and also of Palaeoproterozoic crust, which is not exposed in Newfoundland. In the southwest positive εHf(t) values (+7 to +12) indicate addition of juvenile crust, whereas time-equivalent negative εHf(t) values (0 to -10) suggest recycling of Mesoproterozoic crust and mixing with juvenile magma.