Detrital zircons from Variscan Sardinia, Italy: source rocks and early paleozoic paleogeography

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A chemical and radiometric study has been carried out on detrital zircons from paragneisses cropping out in the Axial Zone of Variscan NE Sardinia, near to the Lula village, not far from the contact with granodioritic orthogneiss and augen gneiss (Lodé orthogneiss). The paragneiss belongs to the upper part of the garnet zone; it consists of quartz, albite, K-white mica, biotite, garnet, late chlorite and accessory apatite, zircon, and Fe-oxides, and is characterized by quartz-feldspathic layers alternating with mica-rich layers. Garnet composition is Alm_{65-68} Prp_{1-2} Sps_{9-12} Grs_{20-21}. Zircon crystals show rounded or broken corners and irregular edges; the variable development of the two prisms suggests a wide range of crystallization temperatures. Cathodoluminescence images reveal multiple magmatic growth stages, sometimes with inherited cores. Their chemical composition varies over a relatively wide range and the obtained ages cover a very large time span (3151 + 97 My to 465 + 8 My). The oldest ages were obtained on relic cores and/or magmatic stages, mostly enriched in Hf and devoid of Y (Zr / Hf ratios: 45-24). The sedimentation age of the protolith is constrained by the youngest ages. The younger crystals are characterized by low or absent Y_2O_3, with HfO_2 below 1.35 (Zr / Hf ratios: 72-43). The studied zircons reveal a complex history of inheritance and recycling. The oldest ages correspond to the most enriched zircon compositions, as can be found in granitoid rocks of mainly crustal origin. With decreasing ages, the composition is progressively poorer in both Hf and Y and becomes more characteristic of zircons from calcalkaline and K-calcalkaline rocks with increasing mantle contribution in their genesis. The Lula paragneiss likely represents a record of an early-Paleozoic sedimentary basin which collected sediments from nearby emerged lands consisting of pre-Paleozoic sequences and Early Paleozoic volcanic arc.