New U-Pb data for the Irumide Belt: LAM-ICP-MS results for Luangwa terrane

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We report new U/Pb data determined by laser ablation inductively coupled plasma mass spectrometry (LAM ICP-MS) for two granitoid samples from the Luangwa terrane of the Irumide belt in southeastern Zambia. Luangwa terrane is characterized by amphibolite-facies supracrustal rocks, including quartzite, muscovite-rich quartzite, garnet-sillimanite-staurolite schist, minor carbonate and amphibolite, and a variety of granitoid rocks. We have analysed zircon separates from a dioritic and a granitic body. All analysed grains were examined optically and by BSE imaging before isotopic analysis. Laser spot size was ~10 microns and the beam was rastered over 30 x 30 micron homogeneous segments of grains in order to reduce inter-element fractionation between U and Pb.

The dioritic sample comes from close to the Luangwa River, near the border with Mozambique. It is part of a strongly deformed granodiorite-diorite orthogneiss complex, with recumbent, isoclinally folded remnants of mafic dykes (now amphibolite). Three types of zircon are present in the dioritic orthogneiss. Type 1 zircons are large euhedral crystals with high-U and high-Th cores surrounded by zoned low-Th overgrowths. Type 2 zircons are smaller and typically display low U-cores and high-U tips. Type 3 zircons are similar to type 2, but have inherited cores and are the least common type.

The age of the cores from type 1 zircon and both tips and cores from type 2 zircon is 2608±14 Ma (2σ), MSWD = 0.63, probability of fit = 0.92 on 27 points. Pb-loss was probably episodic, but the best fit is derived from a Pan-Africa lower intercept of 590±50 Ma. However, the choice of lower intercept makes no difference to the upper intercept age. Thus, 2608±14 Ma is interpreted to be the protolith age of the dioritic gneiss.

The age of the low-Th overgrowths on type 1 zircons (model 1 solution on 20 points) is 1043±19 Ma, with a lower intercept age suggesting predominantly present day Pb-loss. Thus, the main metamorphic overprint occurred at ca. 1050 Ma.

The foliated granitoid sample comes from near Kamono village school close to the boundary with Nyimba terrane. It contains mafic to ultramafic inclusions and is associated with mylonitic amphibolitized metagabbro. Work on zircons from this sample is still in progress. The 28 analyses completed so far indicate an age of ~2050 Ma and metamorphic overgrowths are not abundant. All analysed grains are discordant, with only four being within 10% of concordia. Nonetheless, we can conclude that the age of emplacement of the granite protolith is approximately constrained by the available data.

In summary, we interpret the granitoid rocks to be part of the pre-Mesoproterozoic basement of the Irumide belt, with the data indicating that this basement has a range of ages from late Archean to Paleoproterozoic. The low Th rims on type 1 zircons from the dioritic orthogneiss indicate that Irumide metamorphism is dated at about 1050 Ma in Luangwa terrane. These represent the first results of an ongoing analytical program.