Age constraints for basin evolution and sedimentation in the "Northeastern Kibaran Belt"

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SHRIMP age determinations on detrital zircons were carried out on three quartzites and one volcanoclastic rock from the Northeastern Kibaran Belt (NKB). The NKB is interpreted as an intracratonic orogenic belt entirely underlain by the Archaean and Palaeoproterozoic Congo-Tanzania craton. The NKB can be sub-divided into (1) a Western Domain (WD), composed of deformed metasedimentary rocks, and intruded by c. 1.37 Ga S-type granitoids and associated mafic rocks, (2) an Eastern Domain (ED) of (pene)-contemporaneous, relatively undeformed to subhorizontal (meta)sedimentary sequences, and (3) a narrow Transition Zone (TZ) that separates the two domains (see Abstract Tahon et al., this volume). Synchronous emplacement of mafic-ultramafic layered intrusions and associated feeder dykes occurred along and close to the TZ and formed the "Kabanga–Musongati" (K-M) mineralized alignment (see abstr. Duchesne et al., this vol.).
Based on regional structural considerations and sedimentological indications in the turbidite sequences, it has been proposed that the WD in Rwanda contains a series of (sub)basins. Later it was discovered that some supposedly Neoproterozoic Bukoban series correspond to the easternmost NKB. A structural discontinuity running parallel to the TZ and between the former "Bukoban" and "Lower Burundian" units supports the presence of 2 subbasins within the ED as well. To test both the multiple basin ideas, and determine the detrital provenance of the WD and ED sequences, samples were selected for U-Pb SHRIMP dating from some lower units of the ED and the WD.
In the ED, sedimentation is tightly constrained through a volcanic tuff component (KI2) near the base of the sequence (in the Murore quartzite; lower unit of the basal Buyogoma Group), which overlies the Archaean basement with a marked unconformity. The tuff yielded a magmatic age of 1.78 Ga, constraining the onset of the sedimentation in the ED. The second sample (KI7, along–trend equivalent of the Murore quartzite, collected in the area of Nyanza-Lac), shows two age populations: 1.85-2.02 Ga (41%) and 2.40-2.67 Ga (51%). The youngest concordant zircon of 1846 ± 5 Ma yields a maximum age for sedimentation.
In the WD, one quartzite sample (KI8; Ruganza quartzite; upper unit of the basal Gikoro Group) has a very prominent 2.48-2.73 Ga peak (83%), and limited input from a 2.01-2.07 Ga population (10%). The youngest detrital zircon of 2.01 Ga gives its maximum age of deposition. Another quartzite sample (KI25; Muyinga quartzite, along-trend equivalent of KI8) has a 1.75-2.07 Ga population (60%), and a scatter of 2.58-2.79 Ga (23%) data. We believe that the relative abundances of the two main populations reflect the proximity to an Archaean and Palaeoproterozoic source respectively. Noteworthy there is a small (5%) component of ~1.41 Ga magmatic zircons in sample KI25, whose origin is unclear for the moment. These zircons constrain a maximum age of sedimentation for the uppermost part of the basal Gikoro Group.
The preliminary results confirm the presence of at least two different sedimentary sequences in the NKB. In the ED, basin formation accompanied by felsic volcanism started at 1.78 Ga. The absence of zircons younger than 1.85 Ga in the quartzite, indicates that there was no detrital input from post-1.78 Ga lithologies, including the rhyolitic tuff collected near Murore. This could either indicate that the quartzite in KI7 was deposited prior to the 1.78 Ga volcanism, or that it was distal to the volcanic centre. The latter is corroborated by field evidence, as no volcano sedimentary units are found in the Nyanza-Lac area. Detrital patterns of quartzites in the WD are very similar to that of the quartzite from the ED. However, the presence of a small, but significant concordant 1.41 Ga population in one of the two analysed quartzites from the WD may indicate one of the two following scenarios: (1) sedimentation in the WD is considerably younger than that in the ED, or (2) the sedimentary sequences of the ED and WD represent a long lasting sequence starting at ~1.8 Ga and, in the WD at least, (episodically) continuing until 1.41 Ga, and perhaps until intrusion of the S-type granitoids at 1.37 Ga. If the former scenario is correct, the TZ represents not only an important structural boundary as marked by the K-M alignment, but highlights distinct early histories for the ED and WD. If the latter scenario is held up, then the sedimentary basin(s) of the NKB record a complex and long-lasting history of late Palaeo- to Mesoproterozoic sedimentation, which may link up with tectonic and sedimentary processes described for the Muva Supergroup in Zambia. Complementary data are needed to better constrain the history and evolution of the NKB (sub)basin(s).

Keywords: basin evolution; SHRIMP sedimentation age from detrital zircons; Kibaran belt.