Detrital zircon ages of the Cambrian sandstone of NW Scotland: implication for multistage of evolution of the Lewisian Gneiss Terrene

YAN SONG[1]*, LU XIONG [2], DI FENG [2], HONGYU ZHANG [2], JUNJIE HAI [2]

[1] School of Earth Sciences, University of Bristol, UK, BS8 1RL
[2]Institute of Earth Sciences China University of Geosciences, Beijing, 100083, CHINA
(*conrrespindence:yansong@pku.edu.cn)

Paleozoic sedimentary rocks that accumulated along Laurentia passive margin are ideal for revealing the history of continental growth and tectonic evolution. Here we report ages of detrital zircons from a Cambrian sandstone sample of the external zone of NW Scotland. The results show that the zircon ages range four groups, > 3000 Ma, 2930-2680 Ma, 2610-2480 Ma, and 2230-1758 Ma. Of the total 260 analysed zircon grains, only one zircon gives the youngest age of 538 Ma. No zircon has ages in the span of 1758 Ma to 539 Ma. Four broad implications can be summarized based on the age data.

1. The Provenance of the Cambrian sediments mainly come from the Lewisian Gneiss. The Grenville orogenic belt did not extent to the NW Scotland.
2. The Laurentia has multistage of growth that started in the Paleoarchean (3400 Ma) and ended with the assembly of Columbia supercontinent.
3. Four zircons yield ages of 3392-3021 Ma, which represent the oldest remnants of Paleoarchean crust. The 2930-2680 Ma is the major period of crustal growth with a relatively large population of zircon, whereas the late Neoarchean is minor stage of crustal growth.
4. Of all the 260 analysed zircons, 190 (~ 73 %) grains have ages in time period of 2230-1758 Ma, which recorded strong orogenesis during assembly of the Columbia supercontinent. The orogenesis started at ~ 2230 Ma, with a peak stage at 1869±6 Ma, and ended at ~ 1760 Ma. The timing of the orogenic cycle of the Columbia assembly extends ~470 million years.