

Evidence of Paleoproterozoic plate tectonics: eclogitic subduction and record of a Wilson cycle in the DR Congo

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ABSTRACT

The question of how and when plate tectonics and subduction processes initiated on Earth is still a subject of debate. Subduction requires the oceanic lithosphere to sustain differential stress without creep. Today, mid- to high-pressure mineral assemblages are commonly interpreted in terms of plate tectonic processes including subduction. While in the Early Earth, mid- to high pressure assemblages could have been also produced by sagduction (or stagnant-lid tectonics) of dense mafic lithology into their light silicic crustal basement, the first evidence of high pressure rocks (i.e. eclogites) seems to appear only at the Neoproterozoic-Paleoproterozoic boundary. In fact, this limit seems to be a crucial period and a time of major change in tectonic style regime. Here, we characterize and date the oldest compelling eclogites discovered so far, dated at 2089 ± 13 Ma from the Northern margin of the Kasai block (Democratic Republic of the Congo). We also identify the protolith of these eclogites as being originally a gabbro formed at 2216 ± 26 Ma in an intra-cratonic rift-type basin, which was buried at high pressure and low temperature (20-25 kbar and 550-600°C) in a subduction zone and then exhumed during a Wilson cycle of ca. 130 Ma, testifying a modern style plate tectonics at 2.2-2.1 Ga.

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