A Two billion years-long history recorded in the 2.45 - 2.2 Ga old sedimentary sucession of Turee Creek Group, Western Australia

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The 2.45–2.21 Ga Turee Creek Group, Western Australia, consists of a ca. 4 km thick siliciclastic-dominated sedimentary sequence, which recorded at least two glacio-eustatic cycles (diamictites of the Meteorite Bore Member) and was deposited during the rise of atmospheric oxygen (Great Oxidation Event, GOE) in an intracratonic basin.

We performed a systematic *in situ* U-Pb dating of detrital zircons from drill cores and surface samples collected throughout the Turee Creek sedimentary units, the conformably underlying Boolgeeda Iron Formation of the Hammersley Group, and the unconformably overlying Beasley River Quartzite of the Wyloo Group. Over 1,500 detrital zircons analyzed by Laser Ablation coupled to ICP-MS yielded age peaks at ca. 2.45, 2.54, 2.68, 2.81, 2.96 and 3.14 Ga. A single zircon grain yielded a Hadean age of 4.0 Ga, thus pointing to the existence in the Pilbara Craton of a proto-crust much older than previously thought. A younger age of 2.34 Ga was obtained at the base of the Meteorite Bore Member main glaciogenic horizon. This age represents a maximum age for the two glacial cycles, which is consistent with a pyrite Re-Os age of 2,310 ± 7 Ma recently reported on the same samples. In contrast, a meter-scale level of glacial diamictite identified at the top of the Boolgeeda Iron Formation in two different localities yielded a significantly older age of ca. 2.45 Ga. This implies that at least three glacial cycles were recorded during deposition of the Hamersley Basin.

The age distribution between 2.45 and 3.14 Ga was found in all samples analyzed independently of their stratigraphic positions. This indicates that the sediments delivered to the basin during its ca. 200 Ma of depositional history were sourced from erosion of strongly heterogeneous continental masses spanning the Archean and Paleoproterozoic eons. These results allow establishing a correlation with the other glaciogenic deposits recorded in the North America and southern Africa basins, and from then on reconstructing the sequence of redox and climate changes during the early Paleoproterozoic.