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Clarifying the stratigraphic boundary between Member 4 and member 5 of the Sterkfontein Caves, South Africa: a three-dimensional spatial analysis of hominin fossils and stone tools

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Abstract

The caves of the Cradle of Humankind, South Africa, have yielded some of the most important palaeoanthropological evidence in the world. Over the last eighty years, Sterkfontein has produced remarkable fossils of both hominins and the diverse range of fauna that lived on the landscape over the last 3.67 million years. The Sterkfontein evolutionary record is not limited to fossils but also documents a rich development of stone tool technology from the Oldowan to Middle Stone Age. Sterkfontein is one of the only sites in the world that documents such a long sequence of overlapping biological and technological evolution. The recent development of a three-dimensional GIS-based geospatial framework at Sterkfontein has provided a new tool with which to interrogate spatial data from the extensive palaeoanthropological assemblages yielded from Members 4 and 5 at the Sterkfontein Caves. To explore long-standing debates regarding the stratigraphic association and formation of Member 4 and Member 5, this research conducted a GIS-enabled spatial analysis of *Australopithecus* fossils and fossil wood from Member 4 and stone tools from Member 5. Clarifying the location of the boundary between Member 4 and Member 5 may improve our stratigraphic control of the hominin and non-hominin fauna. Greater spatial and stratigraphic confidence in the attribution of specimens to major units, or even sub-divisions within major units, may assist in differentiating chronologically and stratigraphically distinct assemblages, thereby providing more surety to taxonomic and palaeoenvironmental associations between these deposits. In clarifying the location of the cave entrance, from which the Member 4 sediment accumulated, this research also addresses long-standing debates about the morphology of the Member 4 deposit and has implications on the stratigraphy of the unit and taphonomy of the interred fossil assemblages.