Silurian large scale uplifting in South China: An aborted plume?

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Silurian sedimentation is absent in a large area of the South China Block, covering ~500,000 km^2. Consistently, lithofacies paleogeographic results indicate a rapid doming in the South China Block between ~435 to 425 Ma [1].

There are two types of major processes that can result in large scale rapid uplifting of continental crust. One is plate interaction along convergent margins. For examples, the interaction between the overriding continental crust and subducting oceanic plate along the eastern margin of the Pacific Ocean has led to large scale thickening and uplifting of the American continental crust, whereas the collision between Indian and Eurasian continents has resulted in the uplifting of the Tibetan Plateau. The other process is interaction between plume head and continental lithosphere mantle. Modelings have suggested that the rising of mantle plume usually leads to large-scale rapidly doming of the overlaying crust [2-4]. This is supported by sedimentary evidence, which indicates a rapid, kilometer-scale crustal doming associated to the Emeishan large igneous province in southwestern China [5]. These processes have significantly different characteristics. Uplifting related to plate interactions is usually allied with convergent margin magmas and linear structures. By contrast, plume heads usually result in bulky magmatic activities and mafic dyke swarms.

Interestingly, there are no typical convergent margin magmas, no linear structures, nor large igneous province reported so far in South China between ~435 to 425 Ma. Given both plate subduction and continent-continent collision at convergent margins usually result in abundant magmatisms and characteristic tectonic evolutions, whereas mantle plume does not always end up with large igneous provinces, the uplifting in the South China Block occurred ~435-425 Ma was likely related to a mantle plume. The lacking of mantle plume related magmatic activities in South China during that period is probably because that the mantle plume was not large enough, and/or the crust was too thick, such that the mantle plume ran out of energy before it reached the surface.

References

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