

Repeated, synchronous magmatism within Africa: Timing, magnetic reversals, and global tectonics

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ABSTRACT

A general feature of alkaline and related magmatism is repetition of eruption at the same site over long time intervals. Alkaline activity is widespread across Africa, where there are more than one thousand complexes. Eruption is typically localized by older lithosphere structures. As more igneous age dates have become available, examples of repetition have been found for all areas. Histograms showing numbers of dates against age show distinct spikes highlighting a pattern of episodic, synchronous repetition at many different sites across the continent. Most of the spikes match the times of major global events, such as orogenic periods, while the most exceptional igneous age peaks (in the Cretaceous and Tertiary) correlate with the main collision episodes between Africa and Europe. Cretaceous activity spans the period of the Cretaceous normal (CN) superchron, starting shortly after completion of the breakup of Gondwanaland. Major peaks of kimberlite activity also mark the start and end of the CN superchron, emphasizing the singular conditions that prevailed during this period. The igneous age spikes reveal that the Africa plate contains a sensitive record of global events from the period between 180 and 0 Ma, such as major changes in oceanic magmatism and tectonics. All these global episodes are also registered in the geomagnetic record. These correlations indicate coupling between plate tectonics and the core, raising questions that need to be addressed by models of whole-Earth dynamics. The current information on Africa is given in a synoptic review, with new maps and diagrams showing all presently available data, with unpublished material to be made available on the Web. More data from all the continents should help sharpen the details of global dynamics and extend the picture into the pre-Mesozoic.