Global Warming of the Mantle at the Origin of Flood Basalts over Supercontinents

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At the Earth's surface, continents episodically cluster together as a supercontinent, ultimately breaking up with intense magmatic activity supposedly caused by mantle plumes[1]. The break-up of Pangea, the last supercontinent, was accompanied by the emplacement of the largest known continental flood basalt, the Central Atlantic Magmatic Province, causing massive extinctions at the Triassic/Jurassic boundary[2]. There is however little support for a plume origin for this catastrophic event[3]. On the basis of convection modelling in a internally heated mantle, this paper shows that continental aggregation leads to large-scale melting without the involvement of plumes.

With internal heat sources, the formation of a supercontinent causes the enlargement of the wavelength of the flow and the average temperature increase in the mantle can be close to 100°C. We suggest the existence of two distinct types of continental flood basalts, caused by plume or by mantle global warming.

References

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