Short-period (_˜400 kyr) pulsation of the Réunion hotspot

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Résumé

Many hotspots worldwide display evidence of fluctuating magmatic emplacement rates in their history, at periods of 1-20 Myr, indicative of changing melt production within underlying mantle plumes. Hotspot fluctuations provide information about the nature and dynamics of plumes and the rheology of the mantle, such as the "solitary waves" of Iceland controlled by viscosity contrasts between the plume and the ambient mantle. However, techniques seeking variations of magma production rates rely on the estimated age distribution of eruptive centres along the hotspot trail, with uncertainties typically over 1 Myr corresponding to the estimated lifetime of individual volcanoes. Here we report _˜10 times shorter fluctuations of magmatic activity in the Réunion hotspot. Using geomorphology, fieldwork, and K-Ar geochronology, we reconstructed the volcanic history of Réunion and Mauritius islands, the latest manifestations of the Réunion hotspot. Our reconstructions reveal coeval phases of

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volcanism and repose on the two islands over the past 3 Ma, with a periodicity of 370 ± 202 kyr. Given the distance between Réunion and Mauritius (_˜230 km) and the heterogeneity of the lithosphere underneath, this large-scale volcanic synchronization must stem from partial melting fluctuations in the mantle. The periodicity being comparable to the magmatic pulses that formed the Deccan traps, we conclude that the Réunion plume regularly delivers melting pulses with a periodicity of _˜400 kyr, possibly since the Cretaceous-Paleogene transition. The discovery of fast rhythmic fluctuations in hotspots opens promising implications for our understanding of mantle plumes, and a new challenge for geodynamic models to couple plume ascent with partial melting genesis and migration.

Mots-Clés: Point Chaud, Réunion, pulsation, panache mantellique, géochronologie, volcanisme, érosion