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The latest Triassic Rochechouart impact (France) – $^{40}Ar/^{39}Ar$ dating and potential relation to catastrophic paleoenvironmental effects in the western Tethys domain

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$^{40}Ar/^{39}Ar$ step-heating analysis of primary spherulitic-blocky and secondary idiomorphic (adularia-type) potassium feldspar separated from impact-metamorphosed gneiss found near Videix in the western central part of the $\geq$23 km Rochechouart impact structure (NW Massif Central, France) [1-3] yielded a Rhaetian combined age of 201 $\pm$ 2 Ma (2σ) (using the K decay constant of [4]), indistinguishable within uncertainty from the age of the Triassic/Jurassic boundary [5;6]. Ballen quartz intergrown with the primary K-feldspar indicates post-shock temperatures exceeding $\sim$1000°C that affected the precursor gneiss. Geochemically, both feldspar types represent essentially pure potassium end-members [2].

Apart from the Rochechouart impactites distributed within the $\sim$15 km diameter impact deposit area, the youngest crystallization age known for basement rocks in this part of the Massif Central is $\sim$300 Ma. No endogenic magmatic-thermal events are known to have occurred later in this region. The K-feldspar recrystallized from local monomineralic feldspar melts and superimposed post-shock hydrothermal crystallization, probably within some thousands of years after the impact. It is, therefore, suggested that the $^{40}Ar/^{39}Ar$ age for the Videix gneiss – as a potassic 'impact metasomatite' – dates the Rochechouart impact event within error, in consistence with evidence for pronounced K-metasomatism in other types of the Rochechouart impactites [1;2].

The new age value is distinctly younger than the previously obtained 214 $\pm$ 8 Ma Karnian–Norian age for Rochechouart [3] and, thus, contradicts the Late Triassic multiple impact theory (i.e., the suspected $\sim$4,500 km long Rochechouart – Manicouagan – Lake St. Martin – Obolon – Red Wing Creek 'crater chain') postulated some years ago [7] (see also [8]). In agreement with the paleogeographic conditions in the western Tethys domain around the Triassic/Jurassic boundary [9], the near-coastal to shallow marine Rochechouart impact is compatible with the formation of exotic and hitherto enigmatic seismites and tsunami deposits of large extent in the Rhaetian 'Cotham Member' (Latest Triassic Penarth Group) of the British Isles [10;11] and possibly related deposits in other parts of Europe [12;13]. We propose that the Rochechouart impact might have been a potential trigger mechanism for a catastrophic high-magnitude (probably Richter scale magnitude $\sim$11) earthquake coupled with a large, high-energy tsunami along western Tethyan sea straits in end-Triassic time [2]. A search for possible distal Rochechouart impact ejecta on the British Isles is projected.

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