

## Spatiotemporal evolution of magmatic pulses and regional metamorphism during a Cretaceous flare-up event: constraints from the Ryoke belt (Mikawa area, central Japan)

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The spatiotemporal relationship between granitoid intrusions and low- $P/T$  type regional metamorphism in the Ryoke belt (Mikawa area, central Japan) is investigated to understand the evolution of the upper- to middle-crust during the Cretaceous flare-up event at the active Eurasian continental margin. Following three stages are recognized; (1) 99–84 Ma: the gneissose granitoid intrusions of the 99 Ma pulse (ca. 99–95 Ma) into the shallow crust and high- $T$  regional metamorphism of the sillimanite-grade ( $97.0 \pm 4.4$  Ma to  $88.5 \pm 2.5$  Ma) at the middle crust, (2) 81–75 Ma: the gneissose granitoid intrusions of the 80 Ma pulse into the middle crust, and (3) the voluminous massive to weakly-foliated granitoid intrusions of the 70 Ma pulse into ~9–12 km depths accompanied by contact metamorphic aureoles. Cooling of the metamorphic belt started at the final stage of (1). Between (2) and (3), entire regional metamorphic belt should be inclined to the north and exhumed to the depths of ~9–12 km. In spite of the temporal association, lack of spatial association between the highest-grade metamorphic zone and pre- to syn-metamorphic felsic plutons support transient thermal anomaly in the mantle and resulting heat conduction in the crust as a possible mechanism for the regional metamorphism. The successive emplacement of granitoids to shallow, deep and shallow levels of the crust is probably controlled by the thermal structure of the crust at each stage. The voluminous granitic continental crust formation and intrusion into the shallow levels of the crust at ca. 99–70 Ma in the Mikawa area probably reflects drastic and significant thermal/material input from the mantle at the active continental margin.

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