
Chronostratigraphical constraints in the intramountain late-Paleozoic basins of the northern Massif Central (France) and synthesis of their implication on geodynamics, paleogeography and paleoclimate at the Carboniferous-Permian transition

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Résumé

Intracontinental late Carboniferous–Permian basins of Autun, Decize–La Machine and Aumance, located in the northern French Massif Central, developed in eastern equatorial Pangea during the late extensional stage of the Variscan Orogeny. Recently, their sedimentary successions have been investigated to reevaluate the time-space evolution of depositional environments, and explore the contemporaneous climate dynamics. Simultaneously, radiometric age constraints have been acquired, and the environmental and climate interpretations now benefit from an updated precise chronological framework.

These siliciclastic late-Paleozoic sedimentary successions were mainly deposited in lacustrine environments with sediment supply coming from delta systems (alluvial-fan or Gilbert-type deltas). The more landward deposits are represented by coal beds and microbial deposits, and strictly fluvial deposits are rare.

Paired organic and elemental geochemistry and clay mineralogy analyses indicate that local intrinsic environmental parameters (e.g., anoxic/dysoxic conditions, or organic matter sources), and climate-driven modifications (e.g., runoff and continental alteration variations), are closely intricated in the sedimentary record, and that these signals cannot be accurately disentangled without a multiproxy approach.

Recent geochronological results obtained in these basins (U–Pb dating of zircon grains collected in interbedded volcanic ash-fall levels – tonsteins) indicate that the deposition of their

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whole successions occurred around the Carboniferous–Permian boundary (ca. 300 to 297 Ma). In addition, these dating shed a new light on the basin dynamics: (i) their filling was more rapid than previously estimated, involving substantial sedimentation rates (ca. 450 ± 150 m/Myr) and indicating very active sedimentary systems (subsidence vs climate), (ii) the environmental and climate changes happened over short time periods (ca. 10 kyr), and (iii) these basins developed simultaneously and shared connections, therefore only representing preserved paleodepocenters at present-day.

Mots-Clés: Carboniferous/Permian transition, intramountain basin, chronostratigraphy, continental paleoenvironment