

**Title :** Petrological, Geochemical, and Temporal Diversity of the Paleozoic Basement of the Morvan (NE French Massif Central) : Implications for the Variscan Geodynamics

**Keywords :** Geochronology, Geochemistry, Petrography, Orogenesis, Granitoid, Volcanic rocks

**Abstract :** The Morvan region, located to the NE of the French Massif Central (FMC), represents a segment of the Variscan basement that has been little studied in recent decades, yet holds significant potential for constraining the evolution of this orogeny. The basement is only weakly metamorphosed, hosts a large volume of Carboniferous plutonic rocks emplaced at different stages of orogenic evolution, combines both plutonic and silicic volcanic lithologies, and is located, from a geodynamic perspective, close to the suture zone between Gondwana and Laurussia. This study focuses primarily on the northern Morvan, in particular the Settons batholith, and integrates a petrographic approach, zircon and apatite U-Pb geochronology and geochemical investigations based on major and trace elements and isotopic systems (whole-rock Sr-Nd and zircon Hf).

Three magmatic groups have been investigated : (1) granitoids (350-309 Ma), reflecting partial melting of a mixed crustal-mantle source; (2) Carboniferous silicic volcanic rocks (355-348 Ma and 330-321 Ma), recording two distinct episodes of crustal partial melting in a locally extensional setting; and (3) vaugnerites (336-325 Ma), witnesses of an asthenospheric upwelling and partial melting during the Visean-Serpukhovian transition. Collectively, these data allow the distinction of five successive magmatic episodes linked to the three major geodynamic events:

1. A late Devonian roll-back, initiating Variscan collisional magmatism and responsible for the first volcanic and plutonic episode (355-348 Ma), associated with the disappearance of the Mid-Variscan Ocean;
2. A second episode (342-338 Ma), which may correspond either to the last remaining effects of the Devonian roll-back or to the onset of the Visean tectonic regime;
3. A Visean lithospheric dripping event, during which the formation of a lithospheric drop (336-330 Ma) triggered mantle-derived magmatism (vaugnerites, lamprophyres);
4. The subsequent detachment of this lithospheric drop (330-320 Ma), which generated voluminous, dominantly crustal plutonism and volcanism, closely linked to the Tufts Anthracifères. This dripping process also accounts for the persistence of high-temperature conditions at the base of the crust;
5. Finally, the collapse of the Variscan orogen during the Late Carboniferous, recorded in the Morvan by the youngest intrusions (312-309 Ma).