



Meso-Cenozoic thermal evolution of the western European plate: conclusions from the Variscan French Massif Central

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The exhumation history of basement areas is poorly constrained because of large gaps in the sedimentary record. Indirect methods including low temperature thermochronology may be used to estimate exhumation, but these require an inverse modeling procedure to interpret the data. Solutions from such modelling are not always satisfactory as they may be too broad or may conflict with independent geological data. In this study, apatite fission-track (AFT) data have been compiled and newly acquired on the French Massif Central. Homogeneous thermal inversion has been realized assuming that some samples were close to the surface during Triassic times. The results show a complex post-Variscan evolution of the French Massif Central. Inversion of the AFT data characterizes high temperatures event during the Jurassic. Temperature range of this event is compatible with the deposition of a significant sedimentary cover which has been later eroded during Late Jurassic or Early Cretaceous, interpreted as a probable larger extension of the surrounding sedimentary basins (Paris Basin, Aquitaine Basin and Tethys). Interpretation of the thermal models suggest the presence of the samples close to the surface during Cretaceous and Eocene times. Despite the presence of small outliers of Late Cretaceous, no evidence is recorded excepted for the northern domain by the fission-track data for the deposition of a significant chalk cover as attested in different parts of western Europe.

This study shows that the input of geological constraints is necessary to obtain a valuable and refined exhumation history and to reconstruct the presence of a former sedimentary cover presently completely eroded. The comparison between the different areas of the French Massif Central shows, in some case (e.g., Vendée, Morvan, Montagne Noire), a significant cooling during Paleocene related to the construction of the Pyrenean orogeny and illustrates that the Massif Central did not behave as a single unit during Mezo-Cenozoic times.

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