



Intraplate deformation of the southern French Massif Central: from karst sediments to numerical modeling of the regional geodynamic

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Although very subtle, the deformation of the Alps and the Pyrenees can be studied with seismology and geodesy. This is not the case for the southern margin of the French Massif Central located between these two mountain ranges. With an elevation up to 1700 m and a very scarce seismicity one could easily conclude that no deformation is occurring in this region. However using absolute dating of karst buried alluvium ($^{10}\text{Be}/^{26}\text{Al}$ on quartz cobbles) and paleomagnetic data from clay samples collected in caves we will show that the southern margin of the Massif Central is experiencing since 4 Myrs, a regional incision at a rate of 85 ± 11 m/Myr. Morphological evidences show at first order that the river profiles are at equilibrium, preventing a regressive erosional signal. Therefore, such regional incision is only possible if a regional uplift occurs at the same rate as the incision rate.

Based on these newly quantified rates, we used numerical modeling to identify, at first order, to the driving process leading to the current regional morphology. Our models show that the erosion of the Massif Central can explain two third of the expected regional uplift. Furthermore, our models suggest that morphological surfaces should dip radially to the Massif Central. We confirm these results by a study of geomorphological surfaces (e.g. strath terraces) and cave shelfstones.

Based on our multi-disciplinary approach, we propose new constrains on the morphogenesis of the southern Massif Central which was formed during the Plio-Quaternary mainly due to erosional driven isostatic adjustment. These results enlighten the importance of surface processes into intra-plate domain deformations.