

Regional mantle replacement during Pangea amalgamation documented by comparing Sm-Nd isotopic signatures of pre-, syn-, and post-collisional mafic rocks

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Important insights into the coupling between the crust and the sub-continental lithospheric mantle (SCLM) during continent collision can be gained by focusing on comparing the Sm-Nd isotopic composition of mafic igneous rocks that occur before, during and after collisional events. The late Palaeozoic Variscan orogenic belt of continental Europe is the result of the demise of the Rheic Ocean, a key event in the amalgamation of Pangea. Sm-Nd isotopic analyses of Early Paleozoic basaltic rocks that pre-date the collision provide juvenile compositions close to the depleted mantle reservoir that are typical of Rheic ocean ophiolites, suggesting they represent vestiges of that ocean. On the other hand, Carboniferous-Permian syn-collisional mafic rocks from the same region yield more negative values typical of SCLM, implying that this mantle underthrust the Variscan orogenic belt during collision. Post-collisional (Mesozoic-Cenozoic) mafic magmas in the same region show a return to positive juvenile values implying that the SCLM had been replaced, possibly by delamination in the aftermath of the collision.