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Late Cretaceous-Cenozoic intraplate basin inversion and paleo-stress fields in the North Atlantic-western Alpine-Tethys realm

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Intraplate basin/structural inversion (indicating tectonic shortening) is a good marker of ("far-field") tectonic stress regime changes that are linked to plate geometries and interactions, a premise that is qualitatively well-established in the literature. There is some also quantitative evidence that Late Cretaceous-Palaeocene inversion of sedimentary basins in north-central Europe was explicitly driven by an intraplate, short-lived relaxational response to forces developed during rapid reconfigurations of the Alpine-Tethys (Europe-Africa) convergent plate boundary. Three main periods of intraplate tectonics (marked primarily by structural inversion in initially extensional sedimentary basins) can be documented in the North Atlantic-western Alpine-Tethys realm. These are in the Late Cretaceous-Palaeocene, the Eocene and the Miocene though there may be some temporal overlap between these events. Examples documenting them are from published literature and these are primarily interpreted seismic reflection profiles (of varying quality and resolution). A limited number of examples where no seismic data exist but intraplate deformation is demonstrated from other kinds of observations, and where timing constraints are robust, have also been considered. The distribution and orientation of the map-compiled intraplate inversion structures are here compared to the model paleo-stress fields derived from Late Cretaceous-Palaeocene, Eocene and Miocene tectonic reconstructions of the North Atlantic-western Alpine-Tethys realm. The modelled paleo-stress fields include geopotential effects from paleo-bathymetry and -topography of the Earth surface as well as laterally variable lithosphere and crustal paleo-thicknesses but no component of the stress field produced by processes occurring at contiguous convergent plate margins. The former satisfactorily provides the background stress field of most of the Earth's plate interiors whereas the latter seems to be paramount in producing the short-lived "stress trauma" resulting in intraplate deformation such as basin inversion in the study realm.