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Circulation of Fluids during Compressive Deformation: the Linking Zone Fold and Thrust Belt (NE Spain)

The Linking Zone is a fold and thrust belt that constitutes part of the southern flank of the Ebro basin. Compressive deformation occurred during the late Eocene-early Miocene affecting a Hercynian basement, a Mesozoic cover and syntectonic Tertiary conglomerates. The integration of the structural, petrologic and geochemical studies reveals two episodes of fluid circulation during compressive deformation. The first episode occurred during the early stages of belt development and includes two fluids responsible for precipitation of two types of calcite cement. The fluids precipitating the first group of cements were meteoric fluids derived directly from the surface and circulating through the undeformed and highly porous Tertiary conglomerates within an open palaeohydrogeological system. The fluid precipitating the second group of calcite cements was originally a meteoric fluid evolved to a formation water composition due to a high interaction with the Mesozoic rocks. The Triassic shales and evaporites of the detachment levels were conduits for these fluids. The second episode of fluid circulation occurred during the last stages of belt development, after the major uplift of the interior belt and formation of the relief. Two different fluids are recognised during this episode as responsible for precipitation of two types of calcite cements. These two groups of cements precipitated from meteoric waters evolved to a formation water composition due to interaction with Mesozoic and Paleozoic rocks. The main factors controlling the fluid flow dynamics are the existence of a high relief and the presence of impermeable levels, whereas the host rocks and structure type do not play an important role.