Paper Number: 4820

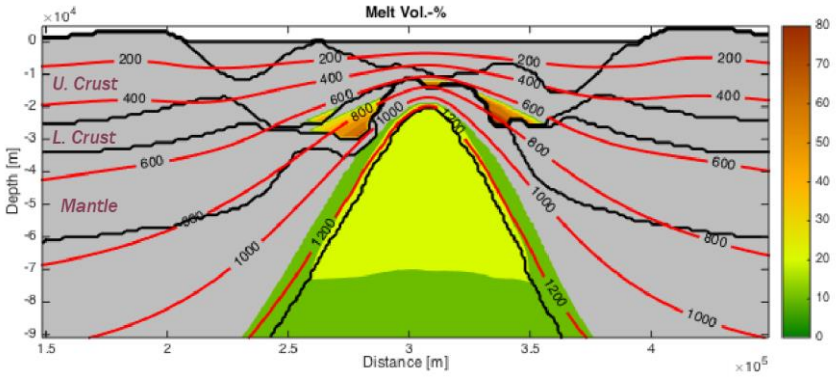
Thermal evolution of early passive margins formation and consequences on their geophysical signature

Bousquet, R.[1], Nalpas, T.[2], Schlüter, F.[1] and Lompa, R.[1]

[1]Christian-Albrecht-University, Ludewig-Meyn-Str. 10 24118 Kiel Germany.
[2]Université de Rennes 1, Campus de Beaulieu, 35042 Rennes, France

---

Many large-scale dynamic processes, from continental rifting to plate subduction, are intimately linked to metamorphic reactions. This close relation between geodynamic processes and metamorphic reactions is, in spite of appearances, yet poorly understood. For example, during extension processes, rocks will be exposed to important temperature, pressures and stress changes. Meanwhile less attention has been paid to other important aspects of the metamorphic processes. When reacting rocks expand and contract, density and volume changes will set up in the surrounding material.
While several tectonic models are proposed to explain the formation of extensive basins and passive margins (simple shear detachment mantle exhumation ....) a single thermal model (McKenzie, 1978), as a kind of dogma, is used to understanding and modeling the formation and evolution of sedimentary basins. The study of the thermal evolution, coupled with other tectonic models, and its consequences have never been studied in detail, although the differences may be significant. nd it is clear that the petrological changes associated with changes in temperature conditions, influence changes reliefs. Constrained by the new field data of north Pyrenean basins on thermal evolution of pre-rift and syn-rift sediments, we explore the petrological changes associated to different thermal evolution and the consequences on the subsidence of the basins. We will also present numerical models quantifying mineralogical and physical changes inside the whole lithosphere during rifting processes. In the light of these models, we discuss the consequences of different thermal evolution on the subsidence processes as well as on gravimetry and seismic velocities signature of passive margins.



We are able to distinguish two types of margins according to their thermal evolution:
- An Alpine-type basin in which the temperature rise is 50 to 100 Ma older than the tectonic extension, leading to the "cold" opening of the ocean.

- A Pyrenean type basin in which temperature changes are synchronous with basin formation, leading to a crustal boudignage and to the formation of a “anomalous” geophysical layer at the OCT