Burial Diagenesis Comparison Between Agadir and Essaouira Jurassic Series (Western High Atlas – Morocco)

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In the Agadir basin, the effects of burial diagenesis on clay assemblages expressed, clearly with depth, by: 1) The illite and chlorite abundance downward to the detriment of smectite and kaolinite; 2) Improvement, with depth, of illite cristallinity witch evolve from 7 to 3 °2q. The major modifications on clay assemblages of Agadir series, take place from 2000m of depth. Moreover, the comparison with data of contemporaneous atlantic (D.S.D.P. sites), permits to emphasize the conjugated effects of tectonic instability of the margin and burial depth. Thus, the clay transformation resulting from diagenesis is superposed to initial variations resulting from detrital process.

In the Essaouira basin, clay assemblages identified on Jurassic sedimentary series is mainly composed by smectites and smectite mixed-layers (chlorite-smectite or C-S, illitesmectite or I-S and vermiculite-smectite or V-S). Kaolinite is also present in these series with small quantities. Among the minerals associated with clays, the quartz seems to be ubiquistic, whereas the feldspaths and oxides appear in some levels of the series. Illite cristallinity shows variable values comprised between 4 and 9 °2q. Generally, the vertical variation of illite contents and its cristallinity doesn't show a significant evolution in depth. This suggests that the effects of the depth of burial on clay assemblages of these series are negligible. Thus, variations in clay assemblages express palaeogegraphic evolution rather than variations on post sedimentary processes.

Furthermore, contrary to Agadir basin, where burial of upper Jurassic series is more than 3000m, the one of Essaouira basin doesn't exceeds 2000 m. However, the difference in thickness of these two series can not be the only reason of the mineralogical differentiation between the two localities. Several studies show that the temperature and the environment of sedimentary series are the most important factors than pressure and time. Indeed, in the Essaouira basin, geothermal gradient is moderated, identical to the one of passive margin with slow overstretching (2,7 °C/100m). This takes along a banal effect of sedimentary burial on clay composition, with temperatures of about 75°C from 2000 m of depth. However, in the Agadir region, several studies show that the temperature conditions are most important than those of Essaouira. This explains by the proximity of south atlasic zone faults.

The comparison of clay sedimentation between two sectors submitted to the same geological history, permits to precise the modality of clay diagenesis, and its obliterate of the palaeonvironmental message, acquired before burial. The mineralogical differences observed between the Agadir and Essaouira Jurassic series, show that the clay diagenesis, during burial, depends more than temperature than age or lithostatic pressure.