

Reactivation of Variscan Structures in Northern France

The results presented here are preliminary results of the geological referencial frame project carried out by the BRGM and the Lille and Budapest universities. This work concerns the validation of the borehole data and interpretation of industrial seismic profiles realized between 1960 and 1985, within the framework of the reinterpretation of the geometry of the Meso-Cenozoic cover and the roof of the Palaeozoic.

The northern France is marked by a characteristic topography: it is composed of uplifted chalky plateaus in the SW and Palaeozoic massifs in the SE, incised by deep valleys. Towards the north, the relief diminishes quickly to constitute the low flat land. The transition between these domains is localized in a narrow band of a few kilometers which displays a concave arc of circle towards the north with two principal branches. The Triassic and the Meso-Cenozoic sediments show thicknesses variations along this zone. These variations are associated with faults in the Western part (NE-SW branch) : the epi-cretaceous faults (Gosselet, 1908). Towards the east, near Valenciennes, such faults are not described but the lithological variations persist. The narrow band where we find the major variations is moulded upon the Variscan front. In a more precise way, the southern limit of the band coincides with the trace in map of the Midi Fault and the northern limit is generally at the level of the most septentrional part of the Parautochthonous Thrust Sheets Unit (Lacquement, 2001). The reprocessing of petroleum seismic profiles and their re-interpretation allowed to highlight the relationships between the cover and the Variscan substratum. In the western part, the epi-cretaceous faults are steeply dipping towards the South. These faults are relaying in a complex way suggesting a lateral shear component coeval with the vertical displacement of the southern fault blocks. Seismic sections show that these faults do not cut the substratum but are rather connected to the major Variscan thrust faults. To the Western part, in Artois, conglomerates

dated from Lower to Middle-Permian times (Mansy *et al.*, 2003) are observed on the southern block of the most septentrional faults. The geophysical studies show that the conglomerates are deposited in asymmetrical grabens (roll-over structure developed during a Late Variscan extensional event). During the Cretaceous, the presence of tilted blocks in Artois and sedimentary thicknesses variations localised above the Variscan thrust Front in the Valenciennes area suggest a weak extensional activity. During the Eocene times, a compressive phase induced the reactivation of the Variscan Front allowing the uplift of the southern part of more than 100 m, and inducing the formation of anticlinal structures South of the Midi Fault Zone. The Variscan Thrust Front thus corresponds to a major zone of crustal weakness which will be reactivated numerous times from Late Variscan to Cenozoic times controlling by the way the dynamics of the northern border of the Paris basin.

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