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The Sarro-Lorraine Basin (SLB) in the frame of the Variscan orogeny: structure and tecto-sedimentary schedule

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The Sarro-Lorraine Basin (SLB) is only known in subsurface in the eastern part of the Paris Basin beneath the Mesozoic sedimentary cover. It is the western extension of the Saar-Nahe basin outcropping in Germany. The nature of its sedimentary filling, of Pennsylvanian (Westphalian-Stephanian) to Permian age, is known through numerous coal and oil exploration wells, most of which drilled before the 1990s. The sedimentary deposits consist of clayey to conglomerate silicoclastic sediments rich in coal (mainly Westphalian), typical of fluviolacustrine environments.

Significant uncertainties remain regarding the structure of the SLB, mainly due to the limited number of seismic profiles available to the scientific community.

The commonly accepted hypothesis (based among other things on rare seismic profiles dating from the 1960s) proposes that the subsidence initiated in the Namuro-Westphalian and continued at least until the beginning of Permian times. The sedimentation would have been controlled by a network of normal faults (e. g. the Metz fault) located in the north of the future basin, potentially with a strike-slip component.

In order to remove the uncertainties mentioned above and to question the established interpretation, the BRGM (French Geological Survey) and the University of Lille (France), in addition to 175 km reprocessed by BRGM, have recently reprocessed more than 180 km of industrial seismic lines acquired in the 1980s.

The interpretation of these seismic profiles reprocessed with modern methods gives a new image of the geometry and cartographic extension of the SLB (e.g. the clear unconformity between the Westphalian and Stephano-Permian sedimentary series, Permian post-rift deposits, possible extension of the SLB to the north beyond the Metz fault). We interpret the observed sedimentary and structural geometries in terms of negative tectonic inversion at the end of the Variscan orogenic process: the normal faults controlling the stephano-permian sedimentation ("rifting") are thus rooted in the thrusts coeval with the Westphalian molasse-like sedimentation.

In order to place the SLB in the Variscan geodynamic context, these new observations are confronted with Variscan deformations known further east in Germany, where they are described in details; the SLB would then record the syn- to post-orogenic evolution (according to the tectonic inversion process) of a segment of the Saxo-Thuringian zone directly south of the Rheno-Hercynian suture.