Unravelling the geology beneath the Meso-Cenozoic sedimentary cover of the intracratonic Paris Basin -Part 1: new insights from seismic and potential field methods

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The Paris Basin is an intracratonic basin made of Meso-Cenozoic sediments unconformably overlying a Variscan substratum (Figure 1). Deciphering the geology beneath its sedimentary cover is important for at least two reasons: (1) the area is a "data gap" in the middle of an important segment of the Variscan belt in Western Europe, and (2) the role of the structural inheritance on the Meso-Cenozoic sedimentation is not fully understood yet.

The basin basement is roughly made of two different geological units, namely (1) the Variscan substratum sensu stricto, made of heterogeneous deformed sedimentary, magmatic and meta-sedimentary rocks, with minor meta-magmatic rocks, and (2) the late Variscan (late orogenic) Permo-Carboniferous basins, made of thick siliciclastic sedimentary deposits.

These two geological basement units have their own geological characteristics and geophysical properties, which are fairly different from each other. For that reason, they must be investigated using dedicated methods. Seismic methods were implemented for studying the Permo-Carboniferous basins. Based on the reprocessing and interpretation of several thousands of km of seismic lines, we propose a new location and thickness map of the Permo-Carboniferous basins. On the other side, potential field methods were used for mapping buried polygenic basement rocks. Based on the combination of aeromagnetic and gravity data, supported by petrophysical signatures and field/borehole geological information, we propose a new map of the architecture of the Variscan substratum.

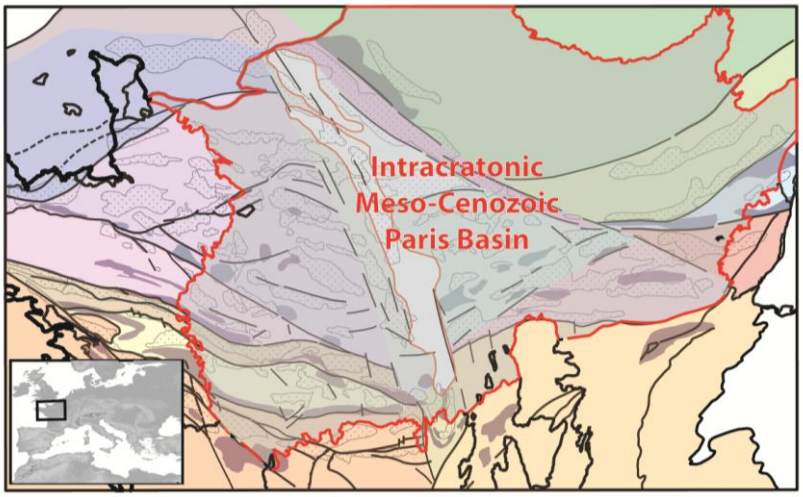

Figure 1 - The Variscan basement below the intracratonic Paris Basin; the colours represent the various Variscan domains

The combination of the above methods and related results provides an updated view of the Variscan to late Variscan basement of the Paris Basin. The structural and lithological continuities with the outcropping Variscan massifs are refined (e.g. with a better delimitation of the various Variscan domains), filling the "data gap" we mentioned earlier. These new results also open the possibility to discuss the influence of the basement structures on the Meso-Cenozoic sedimentary filling (e.g. reactivation of older structures in relation with variations of the stress field, and related migration of the depocenters). This integrated approach finally shows the importance to study intracratonic basins not only from a sedimentary filling point of view, but also from a basement perspective.