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Offshore geological mapping from high resolution datasets – a “new” way to investigate the evolution of the anglo-parisian basin.

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As the French Geological Survey, one of the objectives of BRGM is the updating of the geological knowledge of the French territory. Whereas the onshore area has been completely mapped at the 1/50,000 scale and will be progressively rendered in 3D (RGF program), the geology of the continental shelf is summarized on the 1:1,000,000 scale from the synthesis of various documents including 1:250,000 maps from the 70s.

Since the late 90s and early 2000s the use of recent very high resolution (VHR) marine seismic and bathymetric acquisition systems together with precise positioning from GPS allow (i) to improve the geological mapping and (ii) to reveal details that can only be seen on such kind of data. Recent data acquisition cruises, collaborations, and data sharing with other research institutes (Universities, Ifremer, SHOM...) set up a framework to undertake modern geological mapping over the shelf [1] and to answer scientific questions related to sedimentary basin evolution.

The English Channel is our current area of study. The sedimentary series of the Anglo-Parisian Basin outcrop directly at sea bed or lies under a thin plio-quaternary cover, thus providing a unique access to the meso-cenozoic series using VHR data. The first study focusing on the Jurassic of the Bay of Seine (offshore Normandy) started in 2007 [2]. Work has been completed and extended toward the NE and the cretaceous series in order to produce a new geological map of the area at the 1:250,000 scale.

Beside the mapping aspects, seismic and bathymetric data show incredible details in the sedimentary and structural features along continuous sections or area. Seismic data acquired in 2013 and 2015 show multiple erosion surfaces at the base of Cretaceous and within mid-Cenomanian, as well as details in contourites-like undulating geometries within the upper cretaceous chalk. All this features provide information on the orientation of paleogeography and the evolution of depositional environments through time, and offer additional constraints to improve our knowledge of the anglo-parisian basin sedimentary evolution.

In addition, VHR seismic and bathymetric images reveal the unforeseen complexity of the structural pattern and offer an opportunity to understand the kinematic and evolution of deformation in an intracratonic basin that recorded phases of “rifting” and inversion.

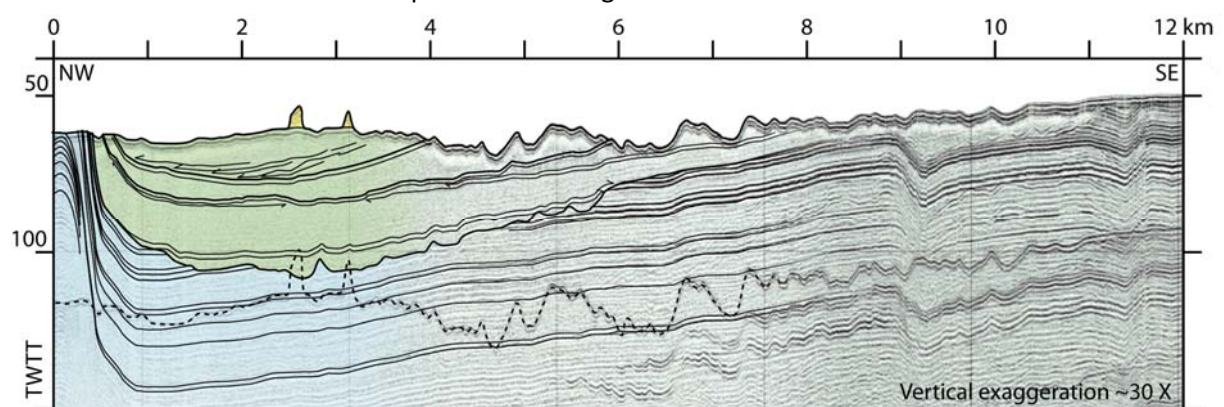


Figure 1: Illustration of the interpretation of a VHR seismic data offshore Normandy showing the unconformity between Jurassic (in blue) and Cretaceous (in green). TWTT: Two-Way Travel Time (ms).

References:

- [1] Thinon I et al. (2008) Geological map of France – Lorient sheet, BRGM Editions
- [2] Benabdellouahed M et al. (2014) Géologie de la France (1): 21-45