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Shedding light on subsurface structures and thermal and hydrodynamic regimes in a basin by critical spatial and temporal integration of multidisciplinary data: an application to the Anglo-Paris Basin

Jacques Dentzer (1,2), Sophie Violette (1,2), Simon Lopez (3), and Dominique Bruel (4)

(1) UMR 8538, Laboratoire de Géologie, Département de Géosciences, Ecole normale supérieure, PSL Research University / CNRS, 24 rue Lhomond, 75231 Paris Cedex 05, France (jacques.dentzer@ens.fr), (2) UFR 918, UPMC-Sorbonne Universités, 4 place Jussieu, 75252 Paris Cedex 05, France (sophie.violette@upmc.fr), (3) Direction des Géoressources, BRGM, 3 avenue Claude Guillemin, BP 36009, 45060 Orléans Cedex 2, France (s.lopez@brgm.fr), (4) Centre de Géosciences, Mines ParisTech, PSL Research University, 35 rue Saint Honoré, 77305 Fontainebleau, France (dominique.bruel@mines-paristech.fr)

Past acquisition of measurements has brought to light spatial and temporal thermal heterogeneities in the Anglo-Paris Basin. If these variations are to be better understood they need to be integrated into a multidisciplinary vision of the basin by comparing data against models, not only thermal, but also hydrodynamic, geological and geochemical. Integrating knowledge in this way has led to several advances. For instance, ranking of thermal data according to their quality and density allowed temperature profiles at equilibrium to be retained. These profiles show the transient nature of the basin's thermal regime resulting from paleoclimatic phenomena. On the basin scale, the thermal regime is not only conductive but also advective. Locally, fluid flows through faults have been proposed in previous studies to explain large thermal anomalies in the basin, reaching several tens of degrees. In addition, fluid flows across aquitards through newly discovered seismic chimneys, rarely observed onshore, explain a known but as yet unexplained major temperature anomaly. These chimneys are located in the area around Paris, where geothermal and drinking water resources are greatly exploited. This results in an anthropic hydrodynamic and thermal regime that needs to be monitored carefully, especially in the light of this discovery.