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**Roughness description and characterisation of major fractures in three different chalks of the North-West European Basin**

Upper Cretaceous chalk in the North-West European basin has been widely studied, notably in the support of human activity such as North Sea hydrocarbons reservoir production, the construction of the underground tunnel under the Channel, and the production in many chalk quarries in the UK, France and Belgium. Depending on their age, depositional environment and lithology, chalk deposits present specific mechanical and petrophysical characteristics, which can vary greatly from one location to another. The basin displays networks of faults and joints resulting from global and regional tectonic events. These structural features directly affect the behaviour of the rock mass, notably in terms of stability. Lab study of the chalk often focus on intact samples or artificially created fractures produced by (Brazilian) tensile test or by shear test, without direct comparison with the natural objects.

A comparative study between natural fractures and lab-generated fractures in chalk is here presented. Chalks from Harmignies in the Mons basin (Belgium), Arras and Cap Blanc Nez (France) were systematically studied with the same process: on-site observation of outcrops, survey of fractures (faults and joints) within the local and regional tectonic context, collection of samples bearing geological features of interest (plumoses, ridges, fault striations…). After observation and initial classification of fracture surfaces, a large amount of scans -249 in total- was conducted with a high-precision laser on those such surfaces. This was done for natural fractures and for several series of lab-generated fractures: for each chalk type, three series of shear tests with different confinement and a series of (Brazilian) tensile test. The 3D topographic reconstructions resulting from scans were then processed to compute roughness indices, by means of statistical parameters (mean asperities height Ra, standard deviation σa, the RMS Z2 parameter) and fractal dimension (yardstick rule and semi-variogram methods). For reference, JRC profiles measurements were also undertaken with steel gauges. Moreover, for each chalk type, UCS and porosity were measured on cylindrical cores.

Preliminary analysis shows that computed roughness for the samples studied is best expressed by Z2 and fractal dimensions, although Dvar occasionally departs from Z2 and Dyard, which follow similar trends. Lab-generated fractures display higher roughness indices than natural fractures. Arras chalk samples distinctively show higher roughness indices than Harmignies or Blanc-Nez chalk.