Chalk fractures geometry: a comprehensive description of fracture surfaces

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ABSTRACT Beyond the fundamental identification and characterisation of faults and joints in chalk, the fine description of fracture permeability, by means of analysing roughness, preferential flow channels and related tortuosity, is crucial in multiple applications such as underground stability studies, tunnelling, oil and gas production and related water injection, pollution control around contaminated zones, etc. Chalk exhibits a plastic behaviour beyond the elastic limit. The shearing, potentially extensive pattern of failure, leads to frequent and abundant fractures. As dynamic plate tectonics give form to various tectonic contexts, the resulting fractures can provide important flow channels within the porous media. Fracturing and alteration processes induce specific surfaces. Structures such as hackles, striations, or plumose patterns may emerge. Fault surfaces can display ridges or deep linear channels affecting the chalk matrix. The understanding of fractures surface geometry by observation and qualification is hence crucial, as it directly affects fluid transport. Textural modifications and surface properties (such as fracture plane roughness) derive directly from the fracturing mechanism and the flow process. As a result, the description and classification of rock fractures can be conducted via systemic cause-to-effect approach. In this study, we use a cross-motion table with CCD laser sensor to scan natural fractures in chalk as well as lab generated fractures. Working with samples collected in extensions of the North West European basin, the 3D characteristics of the surfaces are put in context with the tectonic background. Surface measurements will be compared to conventional techniques such as the JRC and other current methods (fractal and statistical fracture description), in view to consider an extension of fracture characterisation methods in three dimensions. Establishing a semi-automated method, this study will enable visualisation and classification of natural joints and faults, in view to improve fracture permeability depiction in fundamental studies or practical applications.