

## The use of multiscale 3D digital models for non-destructive morphological measurements on sculpted bedforms: implications for erosion and weathering models in bedrock rivers in protected areas

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Rock surfaces are the most sensitive portion to weathering and erosion processes, and therefore, a detailed analysis of surface morphologies is of paramount importance. This importance increases when dealing with heritage sites, such as geosites, cultural heritage sites or any other relevant rock outcrop in protected areas, as sometimes a relatively small surface change may lead to a significant loss of aesthetic or scientific values. There are number of non-destructive techniques to characterise surface morphology to various scales. This communication describes surface morphologies at different scales on the river bed of the Manzanares, a bedrock reach located in “La Pedriza” ; within the National Park of Sierra de Guadarrama (Central Spain). “La Pedriza” constitutes the largest granitic outcrop in Europe and a place of historic importance for the development of the geology both in Spain and globally. The studied portion is a place of particular geological interest where the erosion generated by the river reveals a series of microdioritic dikes intruding a coarse-grained Variscan leucogranite. This lithological combination generates dissimilar patterns in terms of weathering and erosion. Surface morphology analysis was made by means of 3D digital models obtained at different scales, from metric scale acquired with photogrammetry from a drone to micrometric scale obtained with a Innowep-TRACEiT surface roughness tester. Combining the results of these techniques relationships between roughness at different scales and erosion-weathering balance were determined as well as the main processes involved in surface weathering and erosion. The resulting features at various scales were identified and its relation to flow patterns and the response of different substrate lithologies to river flow.

Research funded by Madrid’ s Regional Government project Geomateriales 2 S2013/MIT-2914

Keywords: Non-destructive testing, bedrock rivers, rock weathering, Protected areas

