Development of a Unity package allowing GIS-like mapping in a Virtual Reality environment.

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We develop and propose a solution allowing the visualization and interpretation within a VR environment of Digital Elevation Models and 3D models derived from Structure From Motion, so as to conduct quantitative geomorphological/geological analyses. For this, we use an Oculus Rift headset, Touch controllers and the Unity game engine. We have developed and tested this solution using a dataset from a submarine survey of a normal fault (SUBSAINTES 2017 cruise), and that includes regional terrain models (microbathymetry, resolution ∼1 m) and higher resolution terrain models of outcrops, with imagery texture-mapped (derived from structure-from-motion, resolutions of ∼1 cm or better), all acquired with deep-sea vehicles.

The free and open Unity package that we are developing allows data visualization at a 1:1 scale in a georeferenced system. We developed tools allowing measurements similar to those performed during field survey (ruler, compass). Finally, we added the possibility to map objects in the same way than in a GIS software. The user can create pseudo shapefiles of 3D points, 3D lines or 3D polygons with attribute values, and generated files can then be used in classical GIS software or other tools.

Users have tested this solution and provided a positive and enthusiastic feedback as it permits a realistic perception of the studied objects (shape, geometry), integration of datasets, and acquisition of quantitative and georeferenced data and observations, in addition to an accurate 3D rendering. This solution was also tested in the classroom (Master course on active tectonics) to better discussing geologic observations and measurements. Further developments included improved data import/export tools (e.g., for different standard DEM file formats) and implementation of multiplayer online gaming capabilities allowing scientists to work remotely and simultaneously, or interacting with a whole classroom in the same environment.