Geophysical Research Abstracts
Vol. 21, EGU2019-14369, 2019
EGU General Assembly 2019
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VirtuaField : Virtual Fields for training students to field practice

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Photogrammetry and Lidar techniques allow geoscientists to obtain High-Resolution 3D representations of outcrop geometries and textures. These 3D topographic models, often termed as Digital Outcrop Models (DOM), are currently mainly used for research purposes because they represent a numerical support, on which accurate and georeferenced interpretations of geological and geomorphological structures (faults, fractures, strata traces, facies mapping) can be achieved. While Virtual Reality (VR) technique has gone into our daily life via VR headset and gaming, VR has been used for many years in professional life for flight or fire simulators for, respectively, future airline pilots and firemen. VR is the unique way to provide full 3D view, which can preserve the 1:1 scale, while benefiting from the numerical nature of the support. Thus, the main idea of the *VirtuaField* project is to combine the DOM technology with the VR technique to provide students with a pedagogical tool enabling learning field practice.

Indeed, in structural geology and tectonics, field observations are crucial and allow collecting datasets. Field trip experience are thus an important step in student career: they learn how to observe, to collect data, to perform measurements and to compile their knowledge for solving a scientific issue. However, due to logistic constrains (e.g., time, money, distance to outcrops), a limited number of field trips are provided to students. Moreover, some interesting and didactic outcrops may be too dangerous for a student group (e.g., roadsides, cliffs, outcrops in conflicting zones) or even, simply inaccessible (e.g., cliffs along coastlines). Thus, the *VirtuaField* project aims at providing students with virtual scenes representing effective and typical outcrops, into which they will be able to both discover a wider range of outcrops and to train their ability to solve scientific issues on the field. Using VR headset, the students visit the virtual outcrops as if they were in the field. They can observe the outcrops but also supplementary pedagogical documents (pictures, explanations) and scanned rock/fossil samples, georeferenced in the outcrop scene. They can also perform structural measurements (e.g., plunge or distance measurements, data collecting) and draw interpretations (fault & fold traces, facies mapping). Two visit modes are envisaged: the exploratory and the evaluation modes. The exploratory mode allows students to freely visit outcrops. In the evaluation mode, the students follow a pathway with mandatory stops associated with scientific questions students can answer using the available information within the scene. In 2018, the VR tools were developed for astronomy applications, and first feedbacks from students were obtained. In 2019, VR software will be adapted for geological and geomorphological problematics.