

## **Collecting and Sharing Digital Outcrop Data for Virtual Fieldtrip Delivery in Times of Global Lockdown**

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Fieldtrips are a central part of most geoscientists training at all levels from school to late career. Geology is the understanding of the earth and its internal structure and being immersed in the landscape surrounded by outcrops is, for many geologists, the most enjoyable part of the subject and the opportunity to observe and interact with the features that are described in textbooks or mapped in low resolution seismic, makes the subject come alive. There are however downsides to fieldwork. Being outdoors all day is not everyone's idea of fun and for some it's not possible at all. Fieldwork is time consuming and expensive and there are significant health and safety issues and in times of global pandemic, fieldtrips are simply not possible.

In the early 2000's the advent of terrestrial laser scanning (Lidar) allowed outcrops to be captured with mm to cm precision and the "Virtual Outcrop" (VO) was born. A VO is a photorealistic 3D model of a cliff section in which all of the pixels are accurately georeferenced. VOs remained a specialist topic until the early 2010's when the advent of cheaper consumer drones and new photogrammetric softwares lead to their widespread adoption. VOs can be used to measure and map features such as sedimentary geobodies or structural lineations. They can also be used as the starting point for Virtual Fieldtrips (VFTs). Virtual Fieldtrips allow the user to be immersed in a digital realization of the outcrop, either on a computer or through a Virtual Reality headset. In a VFT the VO is augmented with additional data such as logs, plots of structural data or explanatory. Audio and video clips of an instructor can be embedded. Smaller scale models can be nested into the main VO to show hand specimens and data from the subsurface such as wells, seismic or geomodels can also be included. Virtual fieldtrips are less geographical restricted than their real-world counterparts. A VFT on deep water depositional systems may start in a slope canyon in Mexico, visit slope channels in Spain and end in lobe deposits of the Karoo basin in South Africa. Thus allowing the participant to see the best examples of systems from around the World.

With global lockdowns and reduced travel VFTs are providing a substitute for cancelled trips. Many geologists will feel that virtual fieldtrips are a poor substitute for the real thing but advances in technology are reducing that gap and in many cases the virtual experience may have significant advantages over a real-world trip, allowing more people to experience a far greater variety of outcrops than would otherwise be possible. The best geologist is still the one who has seen the most rocks, physically or digitally.