

Integration of 3-D Outcrop Data Into Reservoir Models

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ABSTRACT

Outcrop analogues are essential to better understand subsurface reservoir architectures. They provide useful information about geobody sizes, geometries and connectivity. The interest in outcrop analogues has been recently renewed with the development of high-tech virtual outcrop methodologies. There are many advantages in the specific techniques developed for data acquisition from outcrop: continuous collection of data from otherwise inaccessible areas, access to different view angles, increase in possible measurements, attribute analysis, fast data collection rate, and eventually training and communication. Then, these various data are analysed to characterize the spatial distributions of facies. This makes it possible to build 3D geomodels at the reservoir scale. They yield likely representations of subsurface reservoirs. New methodology based upon 3D outcrop studies has been developed, to better calibrate and constrain reservoir models. The primary step of this workflow includes the acquisition of 3D photogrammetric data from a Small Unmanned Air Vehicle (SUAV) and field sedimentological sections. These 3D data enable to build a continuous representation of the outcrops, which is then processed as usually performed when studying subsurface reservoirs with horizon picking and facies interpretation. This second processing step provides a better quantification of all the input parameters required for completing the subsequent geostatistical modeling step before going to seismic or fluid flow simulation. The proposed workflow was applied to a turbidite reservoir analogue in Northern Spain (Ainsa). In this special study, we built reservoir models considering either a conventional data set with 1D pseudo-wells or the 3D outcrop data collected with the SUAV. In both cases, the available data were used to constrain the reservoir architecture and facies distributions. The comparison between the two types of models stresses the benefits of geotagged 3D outcrop data for reservoir modelling.