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# Three dimensional modeling of depositional geometries. A case study from Tofane Group (Dolomites, Italy).

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At the end of the Early Carnian, the Carnian Pluvial Event (CPE) resulted in a major crisis of carbonate factories. The sharp change in carbonate production lead to a dramatic modifications in depositional geometries. Steep clinoforms of the high-relief pre-crisis carbonate platforms were replaced by low-angle ramps.
Spatial characters of depositional geometries can be decisive in identifying the genesis of geological bodies. We here show how 3D modeling techniques can be applied to help in quantifying and highlighting their variations.
As case study we considered two outcrops in the Tofane Group (Dolomites, Italy). The first outcrop (bottom of southern walls of Tofana di Rozes) exposes a platform-to-basin transect of pre- and post-crisis platforms, the second (Dibona hut) a clinostratified carbonate body deposited during the Carnian crisis.
Outcrop conditions at both sites, with vertical and hardly accessible walls, make the field tracing of depositional geometries particularly challenging. Line drawing on high resolution pictures can help (e.g. for clinoforms), but its use for quantification is hampered by perspective deformation.
Three dimensional acquisition and modeling allow to retrieve the true spatial characters of sedimentary bodies in these outcrops.
The geometry of the carbonate body at Dibona ($\sim$ 15000 sqm) was acquired with terrestrial LiDAR, while for Tofana photogrammetric techniques were applied because of the extension of the outcrop itself ($\sim$ 240000 sqm) and the lack of suitable points of view for terrestrial laser scanning.
At Tofana, field observations reveal the presence of tens-hundreds m large carbonate mounds grown on a pre-existing inclined surface, intercalated with skeletal carbonates and siltites-arenites. This system rapidly evolves into a carbonate-clastic ramp. Photogrammetric topography acquisition permitted to place and visualize geological features in a three dimensional frame, thus obtaining a conceptual sedimentological model.
A 3D model of the clinostratified body at Dibona was then realized to test if it fits in the larger scale conceptual model. Modeling was coupled with microfacies analysis.
The original inclination of clinoforms ($\sim 25°$) and amplitude ($\sim$ 30 m) point to a deltaic environment, deposited in a narrow passage between mounds. Facies (mainly mixed carbonate siliciclastic grainstones) are in agreement with this interpretation. Finally, 3D modeling allows to precisely describe the provenance and fine geometries of the delta body, despite its partial exposure.