STRATIPONDVIEW: FABRIC VISUALIZATION INSIDE DIPPING STRATIGRAPHIC UNITS

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PROJECT OBJECTIVES

- Apply the PondView Method to visualize sedimentologic and structural features in high-resolution 3D GPR cube in the Madonna della Mazza quarry.
- Visualize facture network in quarry using the StratiPondView method.
- Compare the results with outcrop and the short cores drilled in the quarry.

PROJECT RATIONALE

Interpretation of high-resolution 3D GPR and seismic data relies on the continuity of subsurface features between adjacent vertical and horizontal slices. However, 3D information is often lost because cross sections and time slices are opaque and only show information contained in the very thin layer of a single sample. 3D volume rendering can capture the 3D nature of fracture networks but low amplitude features are lost. The limitations of single sample slice animation, interpretation and 3D volume rendering can be overcome by the PondView Method (PV) that adds 3D information about the zone above and below the GPR or seismic horizontal slice (Grasmueck and Viggiano, 2018).

This project applies and tests this method on a high-resolution 3D-GPR data set from the Madonna della Mazza quarry near Pretoro, Italy (Fig. 1). Here we explore



Figure 1: Madonna della Mazza quarry with stratal slice of dipping beds using the pond view technology applied in the high-resolution 3D GPR cube that was acquired in the quarry.

how far this method can achieve better visualization of both the sedimentologic and structural complexities in the strata.

NEXT STEP IN VISUALIZATION AND INTERPRETATION

So far, we have processed the 200 MHz 3D-GPR data including a migration 3D with а constant velocity of 0.09 m/ns, and constructed a Geomodel usina Paleoscan, which resolves the individual horizons of the quarry succession (Grasmueck et al., 2021). Blended spectral attributes decomposition revealed the prograding sand-waves in the distal portion of the delta drift and was moderately successful in imaging of graded beds, layers with lithoclasts and reworked horizons (Fig. 2).



Figure 2: Top: 2D in line of the GPR cube of the Madonna della Mazza quarry with a 1 m thick horizon that contains lithoclasts is outlined with yellow boundaries. Short highamplitude reflections indicate the presence of lithoclasts. Below: Stratal slice in the middle of the stratigraphic unit that contains the lithoclasts using the StratiPondView method.

To improve the visualization of all features including the fractures in the quarry we will 1) refine the Geomodel with a denser fault network and 2) do another 3D migration with noise reduction. We will then compare the interpretation with the outcrop and the cores we drilled in the quarry.

SIGNIFICANCE

This study visualizes, for the first time, sedimentary structures in the rock record in three dimensions. This third dimension offers a better quantification of the sedimentary product from the flow processes in this carbonate contourite drift.

REFERENCES

- Grasmueck, M. and Viggiano, D., 2018. PondView: Intuitive and Efficient Visualization of 3D GPR Data, Expanded Abstract, IEEE Proceedings 17th International Conference on Ground Penetrating Radar, June 18 - 21, 2018, Rapperswil, Switzerland.
- Grasmueck, M. and Eberli, G.P., 2021. 3D-GPR stratal slicing of sedimentary structures in a carbonate contourite deposit. CSL Annual Review Meeting Abstract Book, p. 31-35.