Co-funded by the
Erasmus+ Programme
of the European Union

Erasmus Plus GeoPlaNet Strategic Partnership

IO08: Geological 3D Model

OUTLINE

This document has been prepared by the University of Padova in collaboration with the University D'Annunzio and the whole consortium of the Erasmus+ Strategic Partnership GeoPlaNet-SP (ref. 2020-1-FR01-KA203-079773. The IO began within the context of the summer school on Planetary Geological Mapping and Field Analogues organized in the framework of the same partnership and was finalized afterwards to serve as reference training case for master-degree and phd students as well as post doc and young researchers .

DESCRIPTION OF THE INTELLECTUAL OUTPUT

The Intellectual Output of the Geological 3D Model consists of the geological interpretation of a section of the Bletterbach gorge right slope (Aldino-Trentino Alto Adige). The section was reconstructed as a Digital Outcrop Model (DOM) by a photogrammetric acquisition carried out with a drone during the Predazzo session of the School on Planetary Geological mapping and Field Analogues (see IO10). The interpretation was carried out using VRGS software which allow to derive simplified geomodels in 3D working either at the desktop and in VR environment using Oculus viewers . Although this work begun in Predazzo with the students, the limited time available did not allow its finalization during the school. For this reason the 3D model was accomplished afterwards to serve as a reference for analogue studies even in planetary contexts.

Geological Context

As described in IO09 the Bletterbach gorge has been carved within the semi-arid alluvial series of the Arenarie della Val Gardena formation. The formation is constituted by Late Permian fluvial red beds interleaved by overbank clays and arid soils, dominated by sulphates nodules and veins, similar to the sedimentary sequences found in the Gale crater by the Curiosity rover. The section under study in particular shows the following facies : a) composite sandstone bodies, typical of braided-rivers, separated into depositional units by erosive bounding surfaces; b) mixed-load sinuous channels with evidence of lateral accretion as point bar sequences; c) fine overbank deposits with isolated channels (ribbons); d) coastal sabkha environments interested by sin- and post-pedogenic sulphate veins.

Geological Interpretation

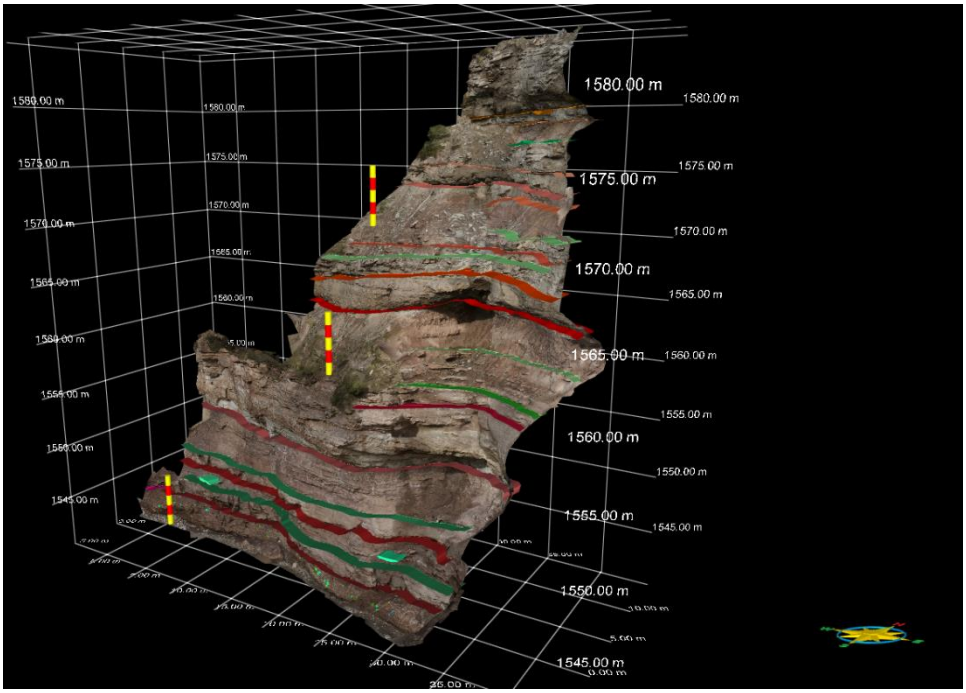


Figure 1. 3D geological interpretation of the wall section of the Bletterbach gorge, reddish and brownish planes are erosive contacts at the base of composite sandstones, greenish planes are the base of overbank fine sediments, cyan bodies indicate small ribbons. Scale bars=5 meters

The 3D geological interpretation has been carried out using the tools to extract dip and dip azimuths of strata and veins, trace polyline and planes among geological bodies, reconstruct geo-polygons and produce stratigraphic logs (fig 1).

In particular, we derived the dip and azimuth of strata beds all over the sequence and of the sulphate veins associated to the sabkha deposits (fig. 2,3).

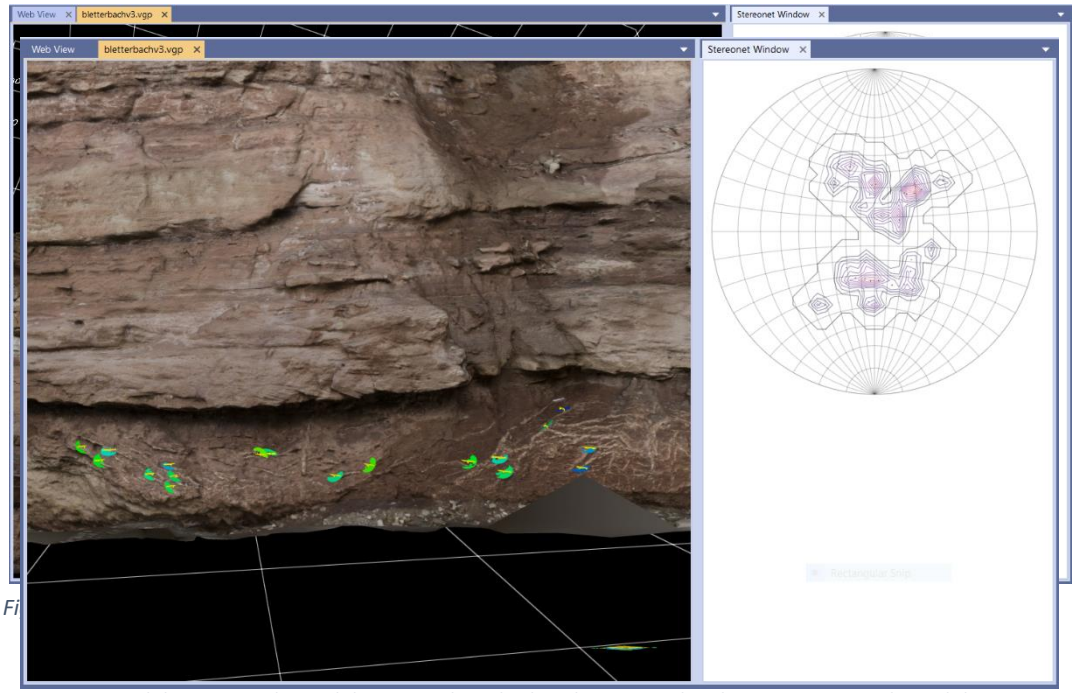
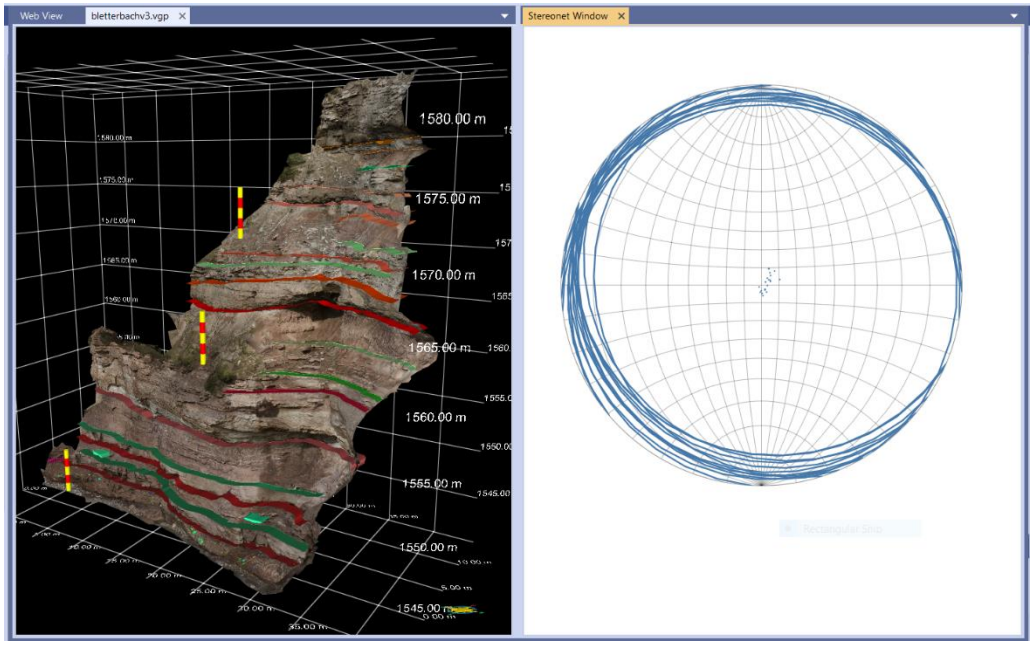


Figure 3 Sulphate veins dip and dip-azimuth and related contour-plot showing a certain bimodal distribution.

We used the polylines to draw the contacts between different geological bodies distinguishing the erosive contacts of facies a (braided rivers) and b (sinuous channels) and the base of the flooding events creating overbank fine deposits which often evolve into semi-arid to arid soil facies (fig. 4). Within the



overbank fines, potential small ribbons has been highlighted though the geo-polygon tool (fig. 4). Finally we created a stratigraphic log indicating the grain sizes and facies of the sequence (fig. 5).

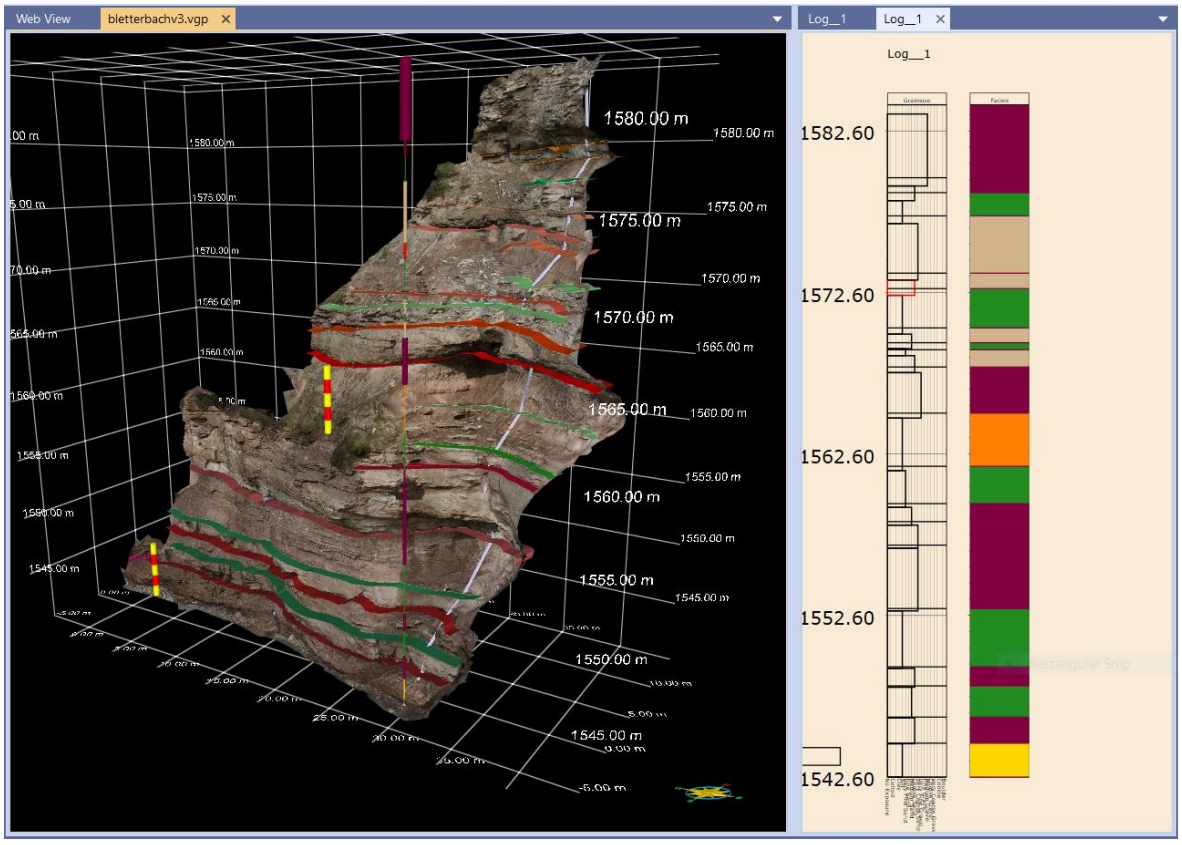


Figure 3 Digital Outcrop Model interpretation as in figure 1 and stratigraphic column. The stratigraphic column is derived by picks along the grey line visible on the slope in the 3D view (left panel). The stratigraphic columns (right panel) show the grain size and the facies variability respectively (yellow: sabkha, red: composite sandstones; green: overbank fine sediments; orange: clays and semi-arid soils; pale brown: silty and clays interlayers). The stratigraphic column is also shown in the 3D view (left panel) as a vertical line with different colours and size in function of the variable facies and grainsizes respectively.

The activity of the 3D geological interpretation through dip and dip azimuth measurements has been carried also with the students during the School on Planetary Geological mapping and Field Analogues, but it was not finalized. The planes tracing and the stratigraphic log has been specifically accomplished afterwards during the final preparation of this IO.

AVAILABILITY

The 3D geological model together with a video showing the final result is downloadable at the following public repository:

https://researchdata.cab.unipd.it/id/eprint/869