

DEEP-SEATED GRAVITATIONAL SLOPE DEFORMATIONS AS ORIGIN OF THE TERRACES ON THE NORTHERN SLOPE OF VALTELLINA (ITALIAN CENTRAL ALPS)

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The Valtellina is one of the main valleys of the Italian Central Alps, E-W oriented along the Linea Insubrica, a transcurrent fault that divides the Austroalpine domain to the North from the South Alpine domain to the South .

The landscape of the northern slope of Valtellina is characterized by the occurrence of a succession of several terraces placed at different altitudes ranging between 1000 and 450 m a.s.l. The lower terraces are several kilometers in length, while the upper ones are less than 4–5 km. The terraces in general are joined at the foot of the slope in a zone up to two kilometres in width.

All the terraces are carved on the metamorphic or intrusive outcropping bedrock and covered by glacial and fluvioglacial deposits. Almost all the terraces show some elongated rock hills, mainly along the downward edge while the flat surface area upward is built by till and/or fluvioglacial deposits. Sometimes there are other minor reversed slopes carved on the bedrock upward. The till that fill these terraces, related to the Last Glacial Maximum (LGM) are continuous also on the upslope. Moreover the occurrence of many evidences of the glacial erosion on the rock hill (roches moutonnées and striae) suggests that the formation of the terraces was earlier, at least, than the LGM.

These terraces were interpreted by previous authors (VENZO, 1971; BELTRAMI et al., 1971, NANGERONI & GIACOMINI, 1961) as glacial terraces carved by the Valtellina Glacier. In some cases VENZO (1971) explained the reversed slopes at the outer edge of the terraces as morainic ridges deposited after the LGM .

To investigate the evolution of the slopes along Valtellina a 1 km high resolution seismic reflection profile was shot, perpendicular to the direction of the valley close to Valgella, together with a seismic refraction profile meant to better control the velocity of the upper part of the valley (see more details in Biella et al, this issue) The Valgella site was chosen because the slope is characterized by 6 terraces located between 900 and 500 m a.s.l. and many other reversed slopes occur up to the mountain-top.

The profile shows a main deep reflector, interpreted as the bedrock at the bottom of the valley. This bedrock appears undisturbed in the central part while in the northern sector another slight convex reflector can be recognized, showing upward an irregular and undulated morphology.

A similar but less important phenomenon occurs also on the other side of the valley.

The slight convex reflector could be interpreted as the lower part of the failure surface of a huge deep-seated gravitational slope deformation (DGSD). This interpretation of the reflector together with the surface morphology allow us to assume that the entire slope is interested by a DGSD or creep mass rock.

It is reasonable to extrapolate our interpretation of the Valgella slope to all the terraces that occurs along the northern slope of Valtellina because the surface morphology and the geological assessment are the same.

The origin of these terraces is related to the gravitational evolution of the slopes and to the weakness of the rocks due to the Linea Insubrica that should run along this part of the slope.

The terraces can be considered completely independent by the glacial action except for the local and minor morphological details post-dated with respect to the formation of the terraces.

References

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