

# ENCAMPADANA<sup>1</sup>

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## Location

The slope of Encampadana is located close to the village of Canillo, on the left margin of the Valira d'Orient River, in the Principality of Andorra (Figure 1).



**Figure 1. Location of the Encampadana site**

## Description

The Encampadana slope (Figure 2) consists of phyllites, dark slates and argillaceous limestone of Devonian age, and black carbonaceous shale of Silurian age. The slope has developed a mechanism of sagging. The morphological features that characterise the movement are a large graben (Figure 3) close to the ridge and up-slope and up-movement facing counter-scarps (Figure 4). Many sagging phenomena are known to be controlled by systems of foliation surfaces or joints striking approximately parallel to the hillside and dipping at steep angle (T-sagging) while single-sided sagging (rotational sagging) may result from deep-seated deformation or mass creep (Hutchinson, 1988). The site of Encampadana displays two systems of rock joints and foliation and, on the other side, in the lower part of the slope, there is an exposure of black carbonaceous shale highly deformable. Therefore, both sagging types are possible at Encampadana.

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**Figure 2. View of the Encampada slope facing towards the East. The highest peak on the right is Encampadana.**

Until now geological, structural and geomorphologic reconnaissance of the landslide site have been conducted (see Figures 5–8). Several trenches (Figure 9) have allowed for the identification of several activity periods in the past. Recent surveys (1998) show activity signs in the upper part of the slope.

### **Elements at risk**

The slope affected has an extent of more than 1 km in length and a height of 800 m. The volume of the mobilised mass involves, at least, several tens of millions of cubic meters. An important ski resort is located in part of the Encampadana slope while at the bottom of the valley there is a small village (El Tarter) and the main road linking Andorra with the French border. The collapse of the Encampadana slope would cause the damming of the Valira d'Orient River, threatening the town of Canillo and other downstream communities.



**Figure 3. Graben**



**Figure 4. Scarps**

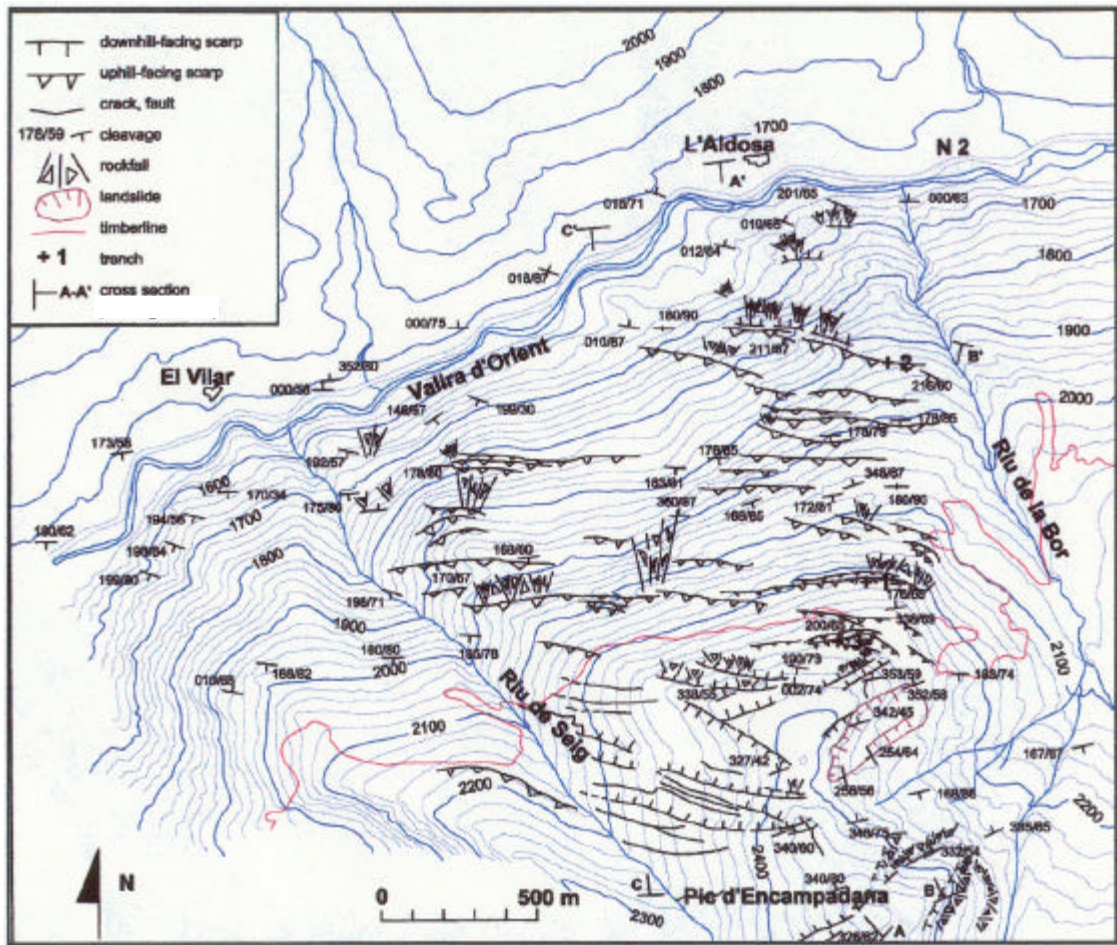


Figure 5. Geomorphological map of the area

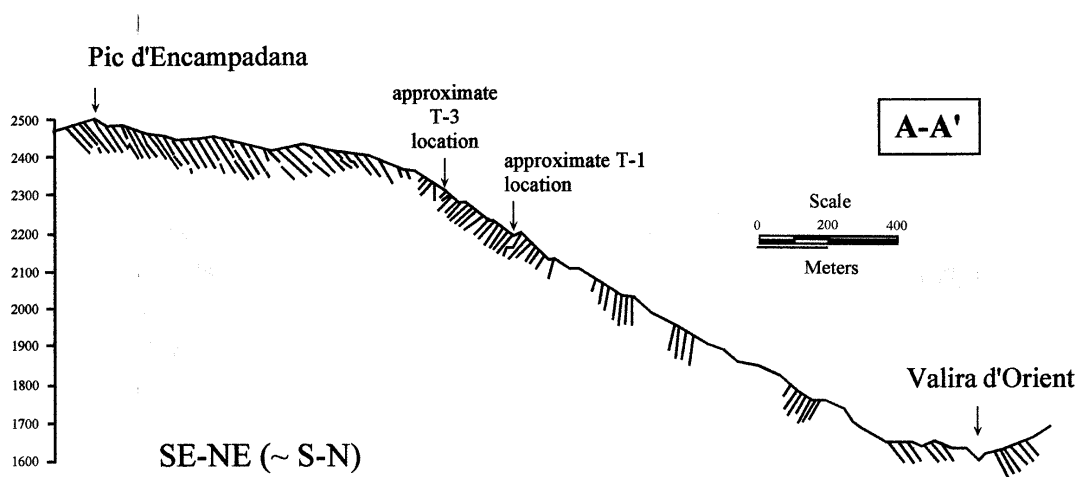


Figure 6. Cross-section A-A'

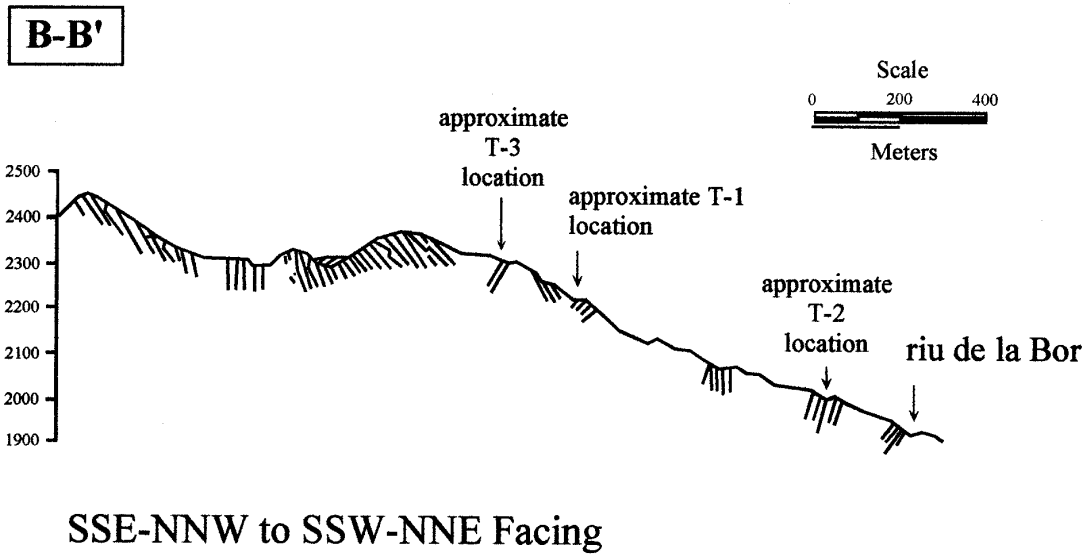


Figure 7. Cross-section B-B'

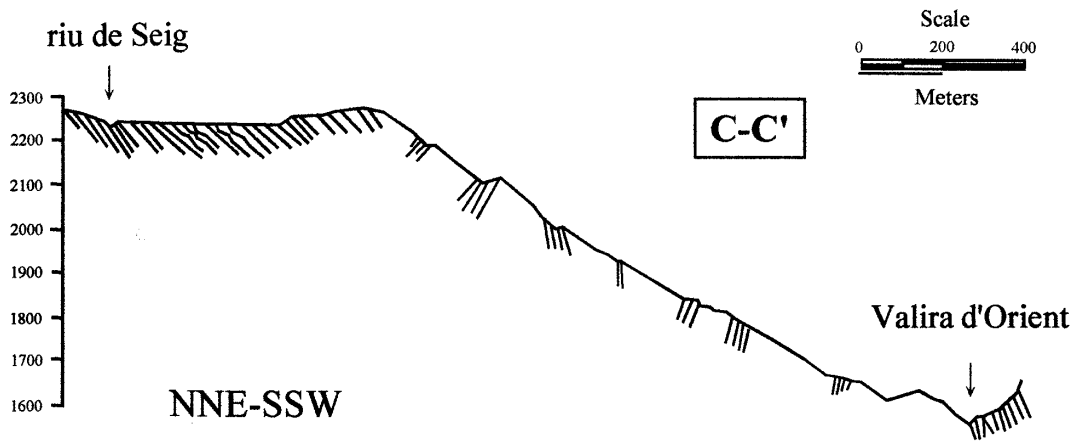


Figure 8. Cross-section C-C'



Figure 9. Views of trenches 1 and 3

## References

1. Santacana, N. (1994). *Estudi dels grans esllavissaments d'Andorra: els casos del Forn i del vessant d'Encampadana*. Master Thesis, Dept. of Geotechnical Engineering and Geosciences, ETSECCPB-UPC, Barcelona.