



Preliminary analysis of the factors conditioning the spatial distribution of large landslides in the Segre River basin (Eastern Pyrenees)

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Understanding the location of landslides in the territory is a major issue for risk analysis. Analysis of the spatial distribution of landslides and the factors controlling such distribution has become a standard task in the risk assessment of shallow landslides. However, these issues are rarely addressed in the literature in relation to large landslides. This work presents a preliminary study of the conditioning factors of the large landslides on a large area of the Eastern Pyrenees (2,114 km²), the upper basin of the Segre River, which spreads through three countries: Andorra, Spain and France.

An inventory of 87 large landslides was completed in the study area. In order to simplify the analysis of the conditioning factors only landslides mainly involving a sliding mechanism (i.e. slides and earthflows) were inventoried. The cross-border inventory sheet defined by the PyrMove research network was used (Moya et al., 2017). The information existing in the landslide databases in the three countries was compiled. The data were checked and completed by analysing the aerial imagery and by field reconnaissance. For the most representative landslide, a geological cross-section was interpreted from the geological map, field survey and, occasionally, using borehole data. The following characteristics were analysed to account for the spatial distribution of the landslides: landslide type, lithology and dip angle of the failure surface (FS), geological structure (trend and dip angle of bedrock bedding and foliation) relative to the FS, slope aspect of the landslide mass, a set of features of the watershed located above the landslide head (mean altitude, mean aspect and area) and, finally, the presence/absence of active erosion of the landslide foot.

The dominant mechanism is earthflow (48 landslides, 18 of them with a planar failure and 30 with a rotational one). The other landslides are translational slides (28), rotational slides (8) and compound slides (3). The area of the deposits ranges from 13,000 to 2,500,000 m². The stratigraphic control is quite noticeable; most of the landslides are in shales (38 in Ordovician shales and 28 in Silurian shales). Most of the failure surfaces dip angle ranges from 17 to 26°. The watershed characteristics are: area ranging from 8,000 to 1,900,000 m², altitude between 1,000 and 2,000 m.a.s.l. and dominant slope aspect to NW; that means that snow cover is probably a main source of water. Half of the landslides show active river erosion; this latter is a major factor contributing to instability in the future. The influence of the geological structure is still being analysed though not clear trends have been found until now.

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