EGU24-16693, updated on 19 Jan 2025
https://doi.org/10.5194/egusphere-egu24-16693
EGU General Assembly 2024

Impact of Terrain Visibility on Field-Based Landslide Inventories and the Role of r.survey

Txomin Bornaetxea[1], **Ivan Marchesini**[2], Michele Santangelo[2], Alessandro Mondini[3], and Federica Fiorucci[2]

[1]University of the Basque Country, Department of Geography, Prehistory and Archaeology, Vitoria . Gasteiz, Spain (txomin.bornaetxea@ehu.eus)

[2]Italian National Research Council - Research Institute for Geo-Hydrological Protection (CNR-IRPI)

[3]IMATI CNR: Istituto di Matematica Applicata e Tecnologie Informatiche Enrico Magenes Consiglio Nazionale delle Ricerche

Landslide inventories form the backbone of numerous natural hazard studies, providing essential data for assessing susceptibility, hazard, and risk. However, the accuracy and comprehensiveness of these inventories are influenced by various factors, including the visibility of the terrain from observation points. This study delves into the critical relationship between terrain visibility and the quality of field-based landslide inventories, with a focus on the implications for hazard analysis.
Traditionally, the visibility of a territory has been an overlooked factor, often assumed to be uniform across inventories. However, our research, leveraging the r.survey tool in conjunction with digital elevation models, reveals that the density of landslide information is strongly correlated with visibility. In areas of high visibility, field-based inventories exhibit a higher density of landslide reports, whereas regions with poor visibility are often underrepresented. Conversely, inventories derived from satellite imagery, while consistent, may also lack detailed information, particularly regarding smaller landslides in potentially visible zones, such as areas near roads.
The introduction of r.survey, a GRASS GIS plugin, has allowed for an effective visibility assessments. It not only calculates the visibility from various observation points but also incorporates the concept of solid angles to account for the size and orientation of observed objects. This innovative approach enables the development of a 'Size-specific Effective Surveyed Area' (SsESA), refining our understanding of the actual terrain covered during field surveys.
Furthermore, our ongoing empirical studies aim to establish a minimum solid angle threshold to determine the visibility of landslides, crucial for improving the accuracy of landslide inventories. Such insights are invaluable for statistical modeling, as biases in inventory data directly influence hazard assessments. By enhancing our understanding of visibility-related biases, we can refine inventory methodologies, ensuring more robust and accurate landslide susceptibility models.
In conclusion, terrain visibility significantly impacts the quality and comprehensiveness of field-based landslide inventories. Through the continued development and application of tools like r.survey, we can mitigate visibility-related biases, fostering more reliable hazard assessments and better-informed mitigation strategies.