

# ***Interactive comment on “Multidisciplinary Approach to Rainfall-Triggered Rockfalls: the Case Study of the Disaster of the Ancient Hydrothermal Sclafani Spa (Madonie Mts., Northern-Central Sicily, Italy) in 1851” by Antonio Contino et al.***

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Dear Reviewer #1,

We are very grateful to you for expressing appreciation for our paper and providing us with useful suggestions and insightful comments. Below, you will find our answers to your careful suggestions, as well as changes made to our manuscript based on the corrections that you have recommended.

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We are very glad to accept your precious suggestion to change the initial part of the title, because it places emphasis on the innovative historical approach developed in the paper.

P1L27-29: Text and respective references, removed.

P1-2L30-45 This part, introducing the topic of landslides, is not essential. We welcome your valuable suggestion to change its position in the paper (P2L45ff), because it improves its readability.

P2L70: "1.60 m above road level". Added.

P7L228: "6,7" → "6.7". Corrected.

P8L252: Based on our estimations: total height difference (height of fall) is about 385 m; horizontal distance (length of runout) is about 572 m; shadow angle is about 31°-32°. Ratio of H/L = 0.67.

A reliable estimation of the rock volume deposit is very difficult, because no pre-event topographic map, to be compared with subsequent surveys (e.g., official maps of Italy, 1878), is available. The official cartography of the Bourbon Kingdom, "Map of the Palermo Region" (scale 1:20,000; equidistance: 18.52 m; original survey of the "Topographic Office" in Naples: 1849-52) originally included the Sclafani section. Unfortunately, this section is missing in the cartographic archives of the Italian Military Geographical Institute (Florence).

By using a new empirical relationship proposed by Guzzetti et al. (2009), which links the surface area to the volume of the landslide, we have attempted to estimate the rock volume, obtaining a value of about  $6.8 \times 105$  m<sup>3</sup>. The same magnitude is obtained using the graph of volume versus ratio of H/L (Tianchi, 1983).

It is not possible to estimate the mass due to the heterogeneity of the deposit and the difficulty of determining the percentages of its constituent materials.

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P10L337: Your question has been very enlightening. Undoubtedly, it is not easy to accurately classify a historical event that took place 150 years ago considering, among others, subsequent natural and anthropogenic changes (e. g., planting of tree species, terracing, excavations for road construction). The road built in 1930, whose excavation required the use of explosives, had a significant impact on the landscape, heavily changing its morphology, especially near the source area).

The event was a complex one; the type of initial failure evolved into another movement mechanism, when the material moved along the slope and changed its volume, incorporating materials entrained in its path. Indeed, in the kinematics of the event, the rockfall component cannot be ruled out, because the fragmented rock had to move beyond a break-away scarp (difference in height of about 70-90 m; topographical gradient of about 50°-60°, see fig. 05) at the lower cliff.

The accumulated material does not reflect the composition of the lithotypes outcropping in the source area (Ellipsactinia breccias), but rather the one of the rocks present in the entire slope (Ellipsactinia breccias, radiolarites, siliceous shales, marls, calcilutes, dolomites etc.).

Failing eyewitness reports, documentary data do not permit to easily classify the event. Synchronous documentary sources report the Italian term “scoscendimento”, which at that time referred to a catastrophic landslide event, a veritable collapse of rock (see P10L324-327). In view of this, and considering that the surface covered by the accumulated material is significant, it is reasonable to suppose that the type of initial failure was a rockslide, probably a “rock collapse” (sensu Hungr and Evans, 2004).

#### Additional Literature

Hungr, O., Evans, S.G.: The occurrence and classification of massive rock slope failure, *Felsbau*, 22, 16–23, 2004.

Guzzetti, F., Ardizzone, F., Cardinali M., Rossi, M. and Valigi D.: Landslide volumes

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and landslide mobilization rates in Umbria, central Italy, Earth and Planetary Science Letters, 279, 222–229, 2009.

Tianchi, L.: A mathematical model for predicting the extent of a major rockfall, Z. Geomorphol., 27 (4), 473-482, 1983

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Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., doi:10.5194/nhess-2016-397, 2017.

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