Review of the manuscript No. egusphere-2023-1892 '*Evaluation of debris-flow building damage forecasts*' submitted to *NHESS.*

Recommendation: accept

Focus of the paper is on reliable forecasts of building damage which are caused by debris flows. Such prognosis may provide situational awareness and guide land and emergency 10 management decisions.

Relevance: The presented study is the original primary research within the scope of the journal. The manuscript meets general criteria of the significance in risk assessment. The study has been conducted in accordance to the technical standards in modelling and spatial data analysis.

Abstract is well written and clearly describes the undertaken study.

Structure: The article is well organized with structured sections.

Introduction presents a background, defines research goals and provides a clear statement of research problem. It presents the purpose of the research investigation which is supported by the pertinent literature. Literature is well referenced and relevant.

Research questions and goal are identified: Developing methods of debris-flow runout modelling to generate forecasts which requires combining hazard intensity predictions with fragility functions that link hazard intensity with building damage.

English language: acceptable. Clear, unambiguous, professional English language used throughout.

Data used in this study are described: The authors evaluated the performance of building damage forecasts for the 9 January 2018 Montecito postfire debris-flow runout event, in which over 500 buildings were damaged.

Methods: Methods described with sufficient information: The authors constructed forecasts using either peak debris-flow depth or volume flux as the hazard intensity measure and applied each approach using three debris-flow runout models (RAMMS, FLO-2D, and D-Claw). The workflow is well structured. Generated forecasts were based on combining multiple simulations that sampled a range of debris-flow volume and mobility, reflecting typical sources and magnitude of pre-event uncertainty.

Results are reported: The authors found that only forecasts made with volume flux and the D-Claw model could correctly forecast the observed number of damaged buildings and the spatial patterns of building damage. They also noted that the best forecast only predicted 50% of the observed damaged buildings correctly and had coherent spatial patterns of incorrectly forecast building damage (i.e., false positives and false negatives).

Discussion interpreted the major outcomes of this study: The results obtained by the authors indicate that forecasts 20 made at the building level reliably reflect the spatial pattern of damage, but do not support interpretation at the individual building level. The authors found the event size strongly influences the number of damaged buildings and the spatial pattern of debris-flow depth and velocity.

Conclusion The authors concluded that future research on the link between precipitation and the volume of sediment mobilized may have the greatest effect on reducing uncertainty in building damage forecasts.

Actuality, novelty and importance of the research: The authors found that both depth and velocity are needed to forecast building damage, comparing debris flow models against spatially distributed observations of building damage is a more stringent test for model fidelity than comparison against the extent of debris-flow runout.

Academic contribution: The paper increases the knowledge in methods of risk assessment and prognosis of potential consequences of geological hazards.

Figures Figures are of acceptable quality, easy to read, relevant and suitable.

Recommendation: This manuscript can be accepted based on the detailed report above.

With kind regards,

05.02.2024.