

Vulnerability curves VS. vulnerability indices. Which method explains loss best?

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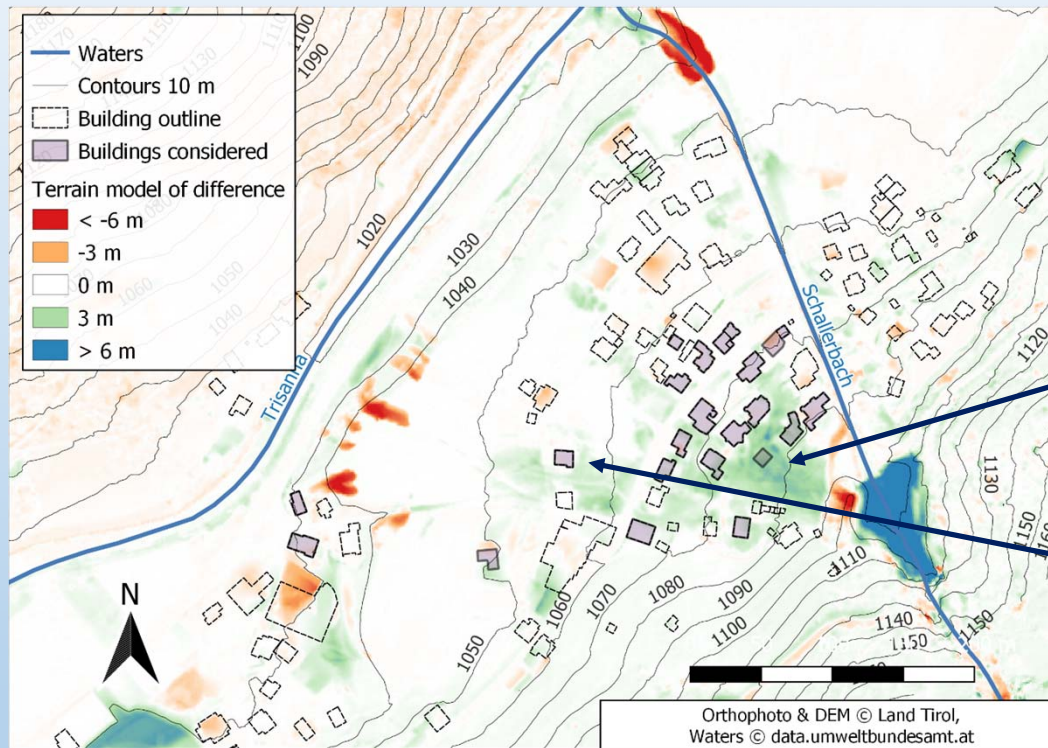
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Background

- Vulnerability = Essential part of risk management
- However little knowledge about effects of **torrential hazards** on **buildings (physical vulnerability)**
- 2 existing approaches tested and compared
 - Vulnerability Curves
 - Vulnerability Indicators



Schallerbach 2015 Torrential Event

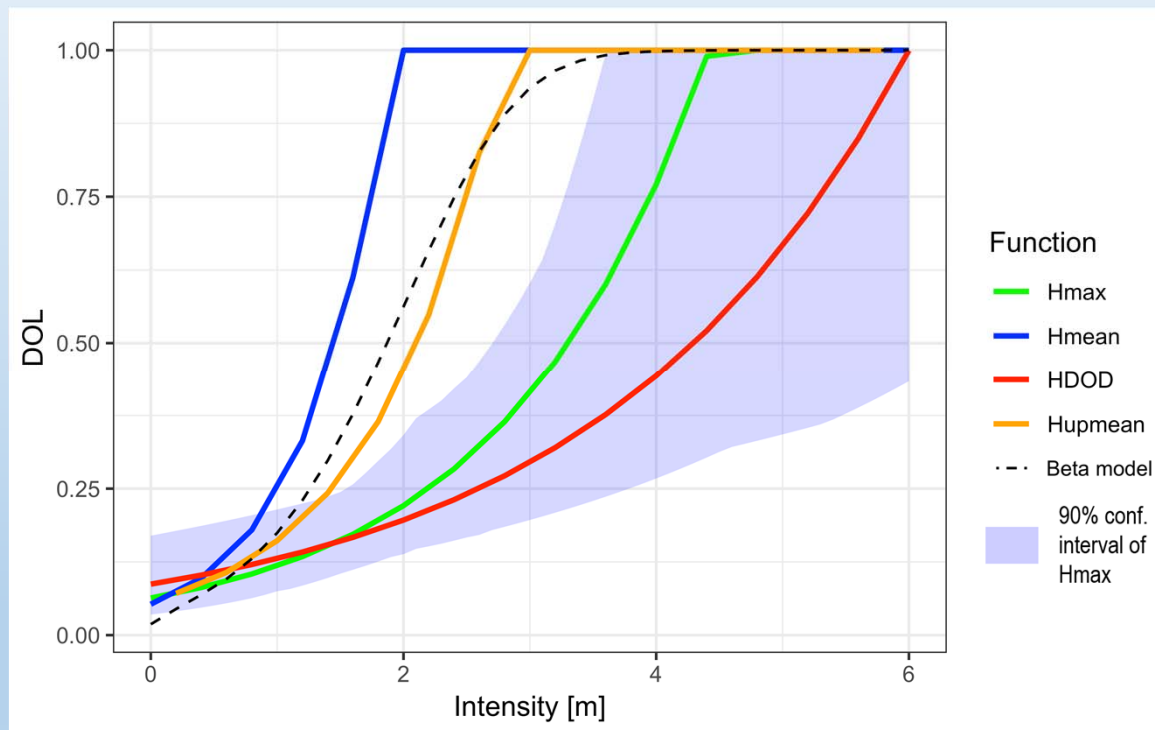


>50.000 m³ deposited and
> € 6.2 Mio reported damage on residential houses

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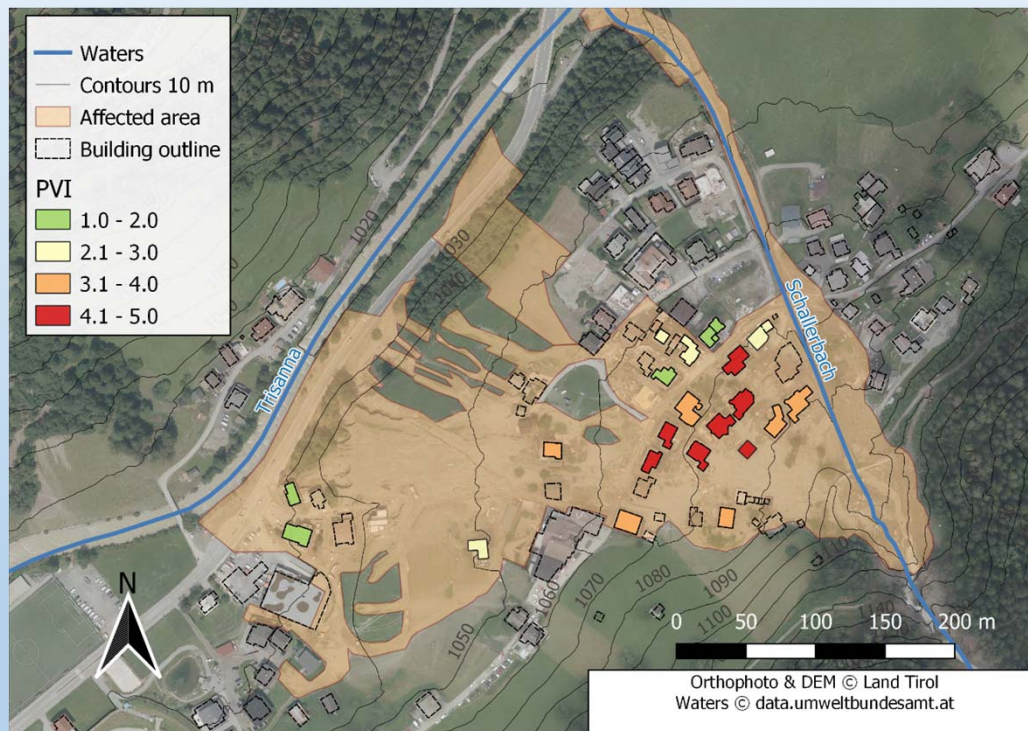


Vulnerability curves



- Vulnerability curve relate the deposit height with degree of loss (DOL)
- Big influence of the way the intensity is assessed (coloured functions)
- Maximum deposit height (Hmax) = standard procedure
→ blue area = confidence interval
- Existing beta model (Fuchs et al., 2019) differs considerably

Vulnerability indices



- Indicators based on building characteristics and surrounding
- Indicators weighted and summed up to **physical vulnerability index (PVI)** - accordingly to Papathoma-Köhle et al., 2019
- Map showing particularly vulnerable buildings (coloured in red)



Summary

Vulnerability curves:

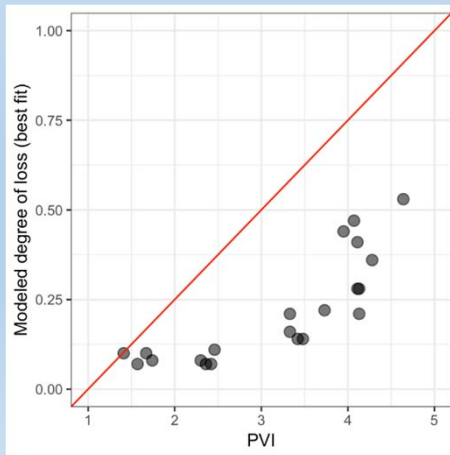
Overall damage of this case study better represented with curves

- + Less data acquisition necessary if there is existing function
- + Can be translated into monetary costs

Vulnerability indices:

Outliers of this case study predicted better with PVI than with curves

- + Spatial visualisation of highly vulnerable buildings
- + Characteristics of elements at risk considered



Successfully shown for first time that results of vulnerability curve and index can be compared → **Step towards more universal approach**

Future: Combining advantages of both methods?!?



Literature

- Fuchs, S., Heiser, M., Schlögl, M., Zischg, A., Papathoma-Köhle, M., and Keiler, M.: Short communication: A model to predict flood loss in mountain areas, Environmental Modelling and Software, 117, 176-180, <https://doi.org/10.1016/j.envsoft.2019.03.026>, 2019.
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- Papathoma-Köhle, M.: Vulnerability curves vs. vulnerability indicators: application of an indicatorbased methodology for debris-flow hazards, Natural Hazards and Earth System Sciences, 16, 1771-1790, <https://doi.org/10.5194/nhess-16-1771-2016>, 2016.

