Exploration of the characteristics of landslide triggering rainfall using rain gauge and numerical weather prediction for Yogyakarta and Central Java, Indonesia

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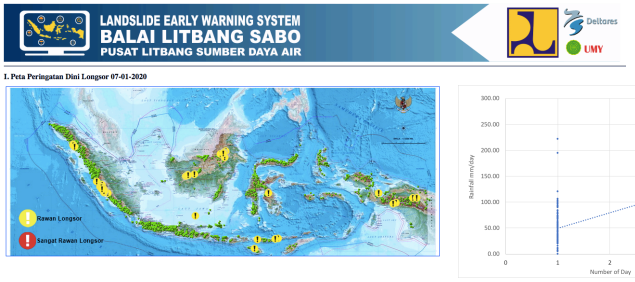
MOTIVATION



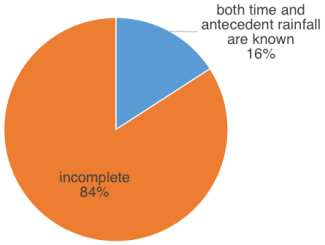
- The existing system for landslide early warning use **national** rainfall **thresholds**, based on median of **1-day and 3-days accumulated rainfall**
- Use rainfall data derived from satellite products and rainfall forecast data with a spatial resolution of 0.25° x 0.25°, which is not adequate for catchment-scale landslide analysis

OBJECTIVE

- To define novel **regional** thresholds, based on **hourly** rainfall
- Various **thresholds** represent the **levels of exceedance probability**
- Exploration of the usage of the **high-resolution numerical weather prediction** (NWP) output in simulating the rainfall inducing the landslides for several historical landslide events.

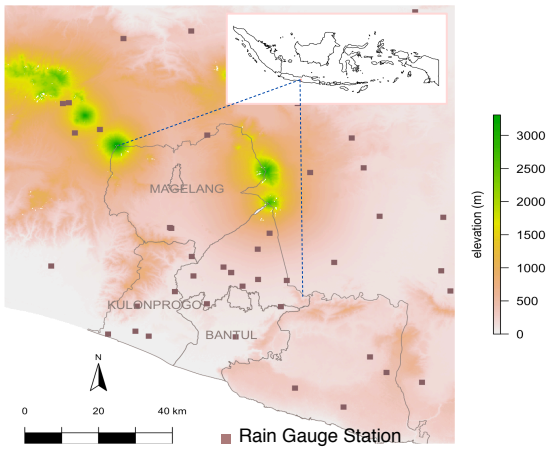
DATA AND METHODS

- **Landslide events inventory**: Updated and collected landslide events, added the estimated time of the events from authorized and unauthorized sources. + the **antecedent rainfall** triggering the landslides (currently, only 2017-2019 events were analyzed)

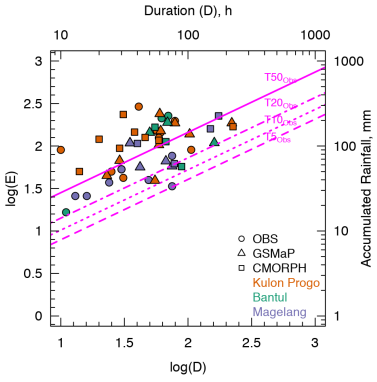


- Construct **rainfall thresholds** using the relation of accumulated rainfall and duration (ED), equivalent to mean intensity and duration (ID).
- Frequentist method (Brunetti et al., 2010)

CURRENT STUDY AREA



RESULTS



$$E = \alpha D^{\gamma}$$

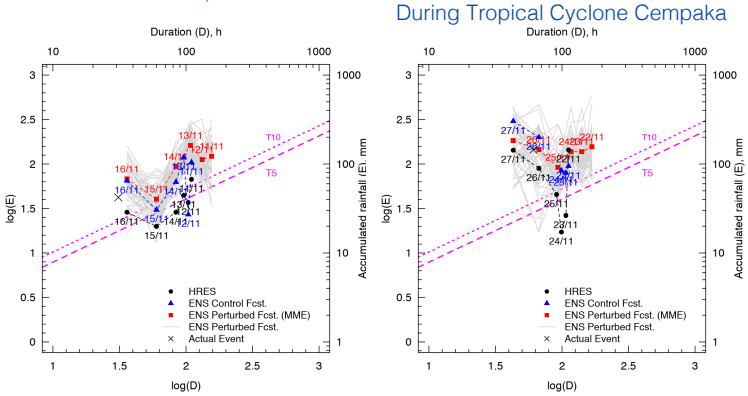
$$T10:\ E = 0.3D^{0.71}$$

$$T5\ :\ E = 0.2D^{0.71}$$

Multilevel of exceedance probability for rainfall thresholds, with T50 corresponds to best-fit of the model.

17 Nov 2017, 12 UTC

28 Nov 2017, 19 UTC
During Tropical Cyclone Cempaka



Performance of the rainfall simulated by NWP (with 0.1°x0.1° of spatial resolution). Each date (dd/mm) near the points shows the start date of the simulation. For the two cases, the actual landslide events (x) are within the range of simulation members.

CONCLUDING REMARKS

- We demonstrated our attempt in improving the landslide early warning with a regional thresholds approach and in exploring the potential application of high-resolution NWP output in reproducing the rainfall triggering landslides.
- This is a preliminary **exploration study**, the inventory will be extended.