**Probabilistic hazard modelling**

**CERG-C Volcanic Risk module** –22 May 2025

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**Instructions:** Answer each question **concisely** and **do not add any screenshot**. Upload your answers back on Moodle.

**Part I: Lava flow hazard**

**Question 1:** Single-vent simulations

* 1. In one sentence, describe what the colour at any given pixel of lava flow inundation maps expresses
  2. How do modelled flows compare to the closest historical lava flows in terms of length and width?
  3. Analyse and discuss the spatial distribution of inundation probability. How do they compare to the path of steepest descent approach?

**Question 2:** Simulations using surface area

**2.1.** Compare the run with its single-vent counterpart. How do they differ and why?

**Question 3:** Forecasting the flows from the 2021 eruption

* 1. From what you know about both the 2021 eruption and the dynamics of lava flows, compare and discuss the hazard forecast and the actual deposit. What are Q-LavHA's strengths and limitations?

**Part II: Tephra fallout hazard**

**Question 1:** Wind conditions

* 1. Visualize these wind patterns in the context of a hazard assessment. What is the main wind direction?
  2. Can you observe a seasonality in wind patterns?

**Question 2:** Eruption source parameters

* 1. From what distribution have each ESP been sampled from? (Hint: there are three types of distributions used here: *logarithmic*, *normal* and *uniform.*)
  2. What *prior knowledge* do these three distributions reflect?

**Question 3:** Probability calculation

* 1. Based on the 10 simulations below for pixel, what are the probabilities of this pixel to suffer tephra accumulations exceeding **50, 100** and **150** kg/m2?
  2. Estimate the approximative load associated with probability values of 30% and 70% from the survivor function.

**Question 4:** Hazard curves

**4.1** Assuming that the considered buildings are of a **MS** fragility class, what are the probabilities of roof collapse for associated with mass loads for 25% and 75% probability of occurrence?