Multiscalar Approach of Merapi Volcanic Erosion
- Approche Multi Scalaire d’Erosion de Volcan Merapi -

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**INTRODUCTION**

**Lahar** = Indonesian word \(\rightarrow\) internationally used term

= erosion of volcanic materials due to rainstorm

\(\neq\) lava

- Merapi pyroclastic materials (2010)
- Kelud fresh ash deposits (2014)
- Rainstorm
- Studies with field instrumentation
- Researches with in-situ observation
- Long period studies (2 rainy seasons)

**Objectives**:
1. Lahar initiation
2. Lahar dynamics

[Image: Kelud volcanic ashes were deposited at Merapi](http://clmss.ssec.wisc.edu/goes/blog/archives/14910)
STUDY SITES

Introduction - Study Sites - 1. Lahar Generation - 2. Lahar Dynamics - Remarks
Introduction - Study Sites

1. Lahar Generation

2. Lahar Dynamics

Remarks
1. LAHAR GENERATION

[Collaboration: Tom C. Pierson, Jon J. Major (Cascades Volcano Observatory, United States Geological Survey)]

- Rainfall
  (Distribution, Intensity, cumulative rainfall)
- Flow characteristics
  (flow depth, sediment concentration, discharge)
- Infiltration
- Deposited material
  (volume, grain size)
- Mass movement

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1. LAHAR GENERATION

[Collaboration: Tom C. Pierson, Jon J. Major (Cascades Volcano Observatory, United States Geological Survey)]

Physical simulations

Scenarios: grain size, ash deposit, rainfall
2. LAHAR DYNAMICS

[Collaboration : Philippe Mourot (MYOTIS), Patrick Wassmer (Université de Strasbourg), C. Bambang Sukoco (Balai SABO, Ministry of Public Works and Housing of Indonesia)]

- Triggering rainfall
  (Intensity, moving rainfall)

- Seismic signals
  (time, frequency, amplitude, waveform)

- Lahar hydrodynamics from video analysis
  (flow depth, surface velocity, discharge, number of boulders, landslides, erosion process)

- Physical properties of lahars
  (grain size analysis, depositional process)
2. LAHAR DYNAMICS

[Collaboration: Philippe Mourot (MYOTIS), Patrick Wassmer (Université de Strasbourg), C. Bambang Sukoco (Balai SABO, Ministry of Public Works and Housing of Indonesia)]

1. Rainstorm before lahar
2. Lahar front
3. Lahar peak
4. After lahar (author as scale)
REMARKS

1. During 2 rainy season:
   daily in-situ observation vs field instrumentation

2. Run-off and landslides $\rightarrow$ lahar initiation

3. Lahar hydro-dynamics $\rightarrow$ continuously changing

4. This research can help model developers who generally has limited access to the field.
Example of lahar model
SEDIMER research project

WP2. Lahar generation on the Merapi slopes
Resp.: J.-C. Komorowski, R. Gertisser

WP3. Lahar dynamics and numerical modelling
Resp.: S. Cronin / T. Pierson

WP4. Geomorphic impacts on river channels
Resp.: H. Piegay or F. Gob / J.-C. Thouret

WP5: Physical, social and economic impacts of the lahars, and assessment of socio-economic and physical vulnerability
Resp.: F. Leone, S. Jenkins

WP6. Capacities: Assessment of risk mitigation and crisis management measures
Resp.: P. Texier, A. Marfai

WP7. Strengthen capacities of practitioners and policy makers
Resp.: D.S. Hadmoko, J. Morin
Development of scientific networks during this PhD thesis:

- French enterprise on geophysical instrumentations
- MoU signed on 2013 between these two institutions

Terima Kasih – Merci Beaucoup