

# Unraveling debris-flow erosion

## Effects of debris-flow composition on erosion

EGU

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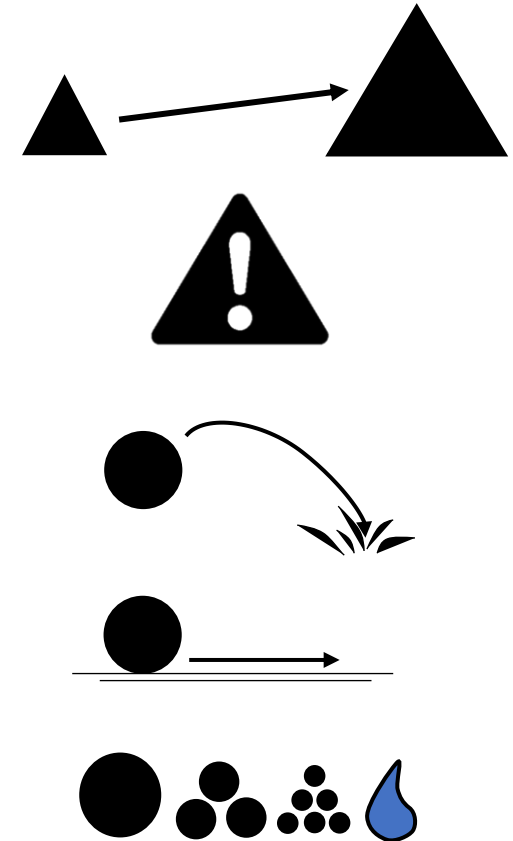
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Tjalling de Haas, Pauline Colucci

# Background & Motivation

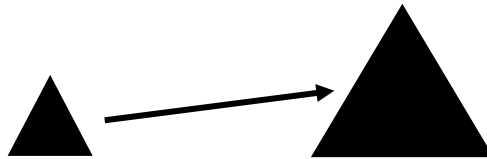
- Understanding debris flow erosion for
  - Volume growth prediction
  - Hazard potential
- Two forces behind erosion
  - Impact
  - Shear
- Influence debris flow composition is unclear



# Research aim & Methods

- Unravel the effects of debris-flow composition on:

- Erosion **magnitude**



- Erosional **mechanisms**

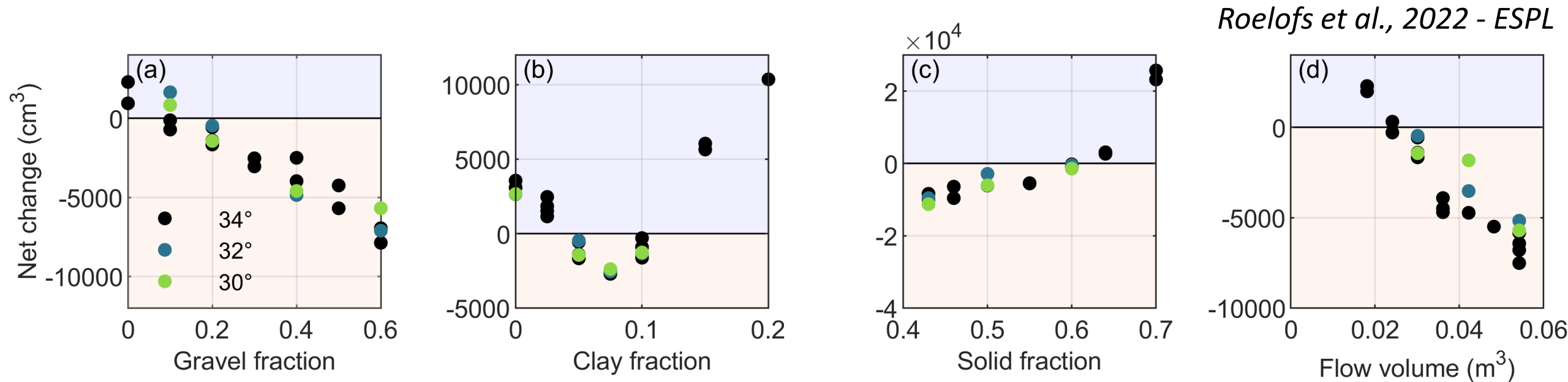


- Small-scale debris-flow flume

- Erovable bed
- Varying grain-size distributions, solid-water content & volume of the DF
- Geophone → impact force
- Flow depth → shear force



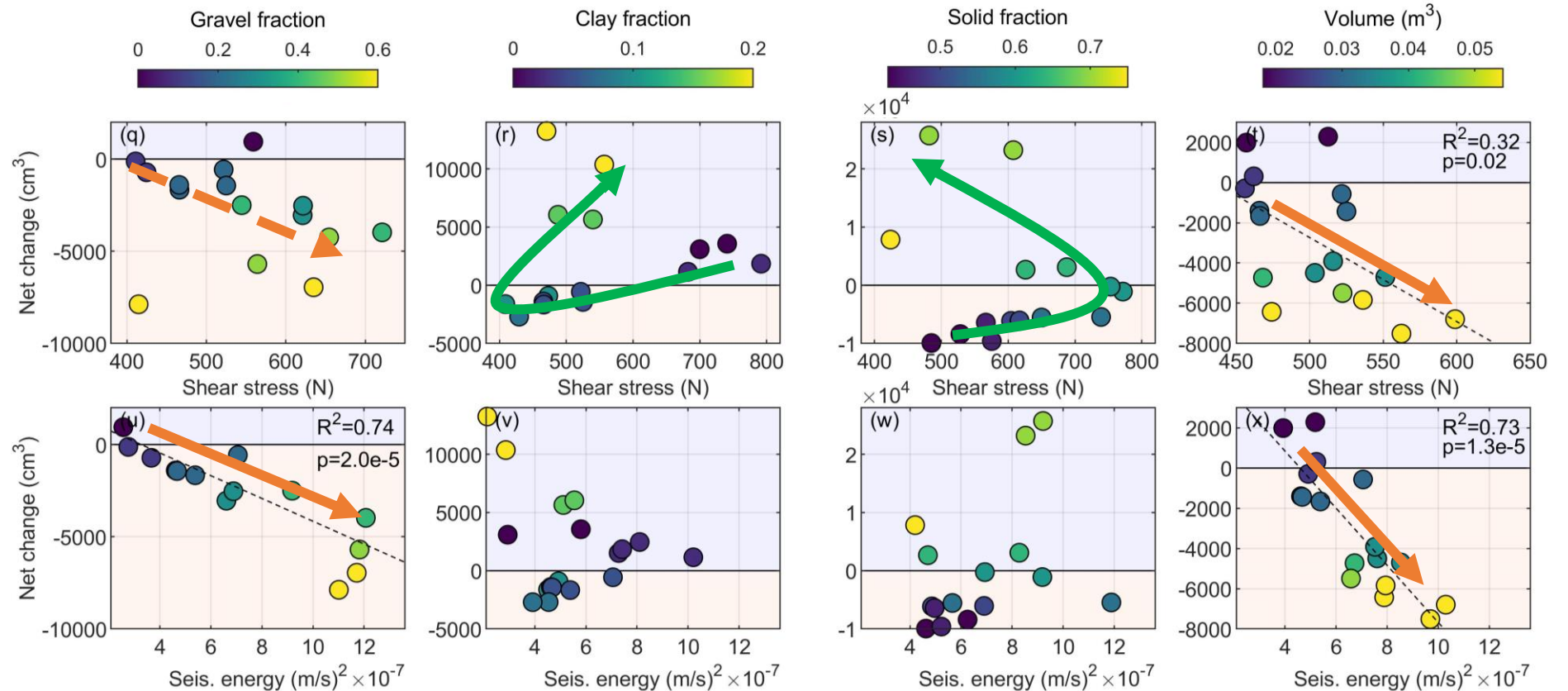
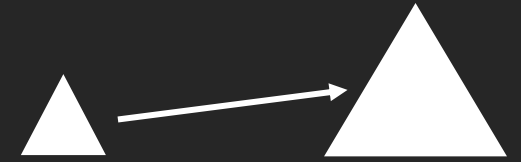
# Results



- **Positive correlation** between erosion and **gravel fraction & volume**
- **Negative correlation** between erosion and **solid fraction**
- **Non-linear trend** in net change for different **clay fractions**

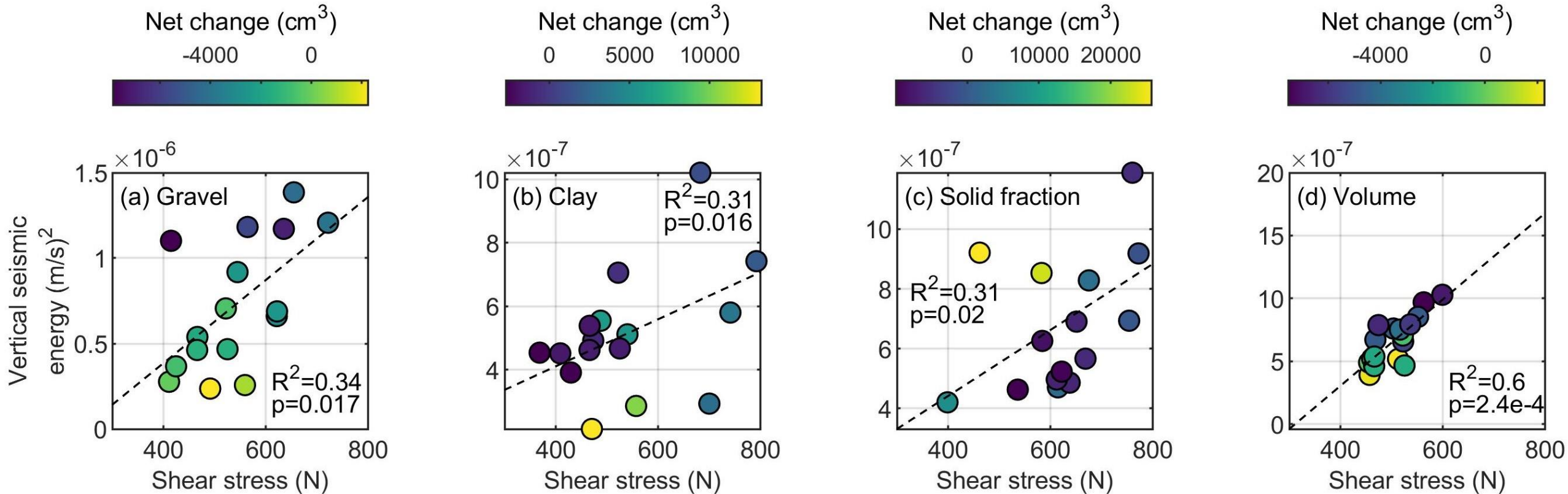
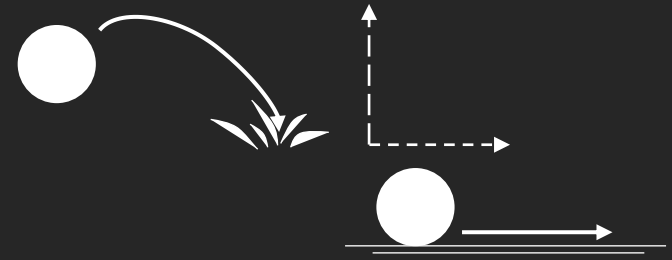


# Results



- Positive linear trends for **gravel & volume**
- Non-linear trends for **clay & solid**

# Results



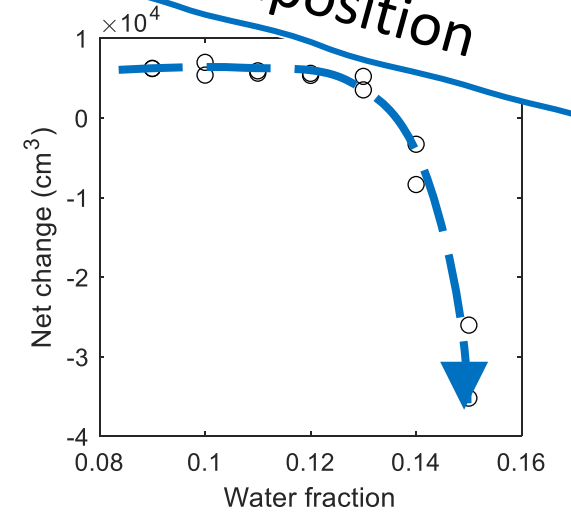
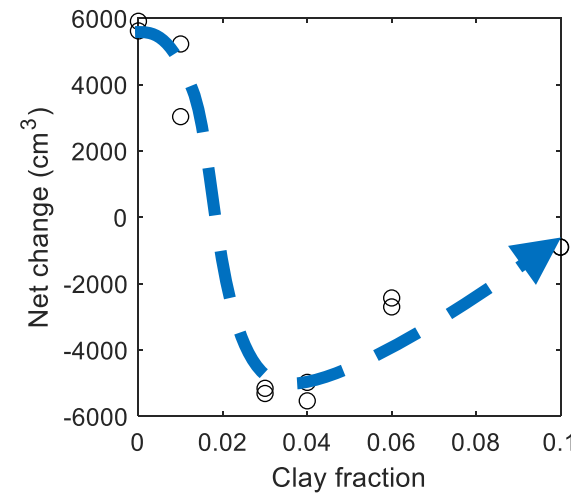
- Impact and shear forces correlate  $\neq$  erosion

*Roelofs et al., 2022 - ESPL*

# Discussion & conclusions

To be continued:  
Effects of bed composition

- Debris flow composition affects
  - Erosion magnitude
  - Erosion processes
- Increase in volume & gravel fraction
  - Linear increase in erosion
  - Linear increase in shear stress & impact forces
- Increase in clay & solid fraction
  - Non-linear effect on erosion magnitude and mechanisms
  - Interstitial fluid → pore pressure transfer → liquefaction



QR code to ESPL

