



# Debris-flow interaction with structures

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## Structure parameter

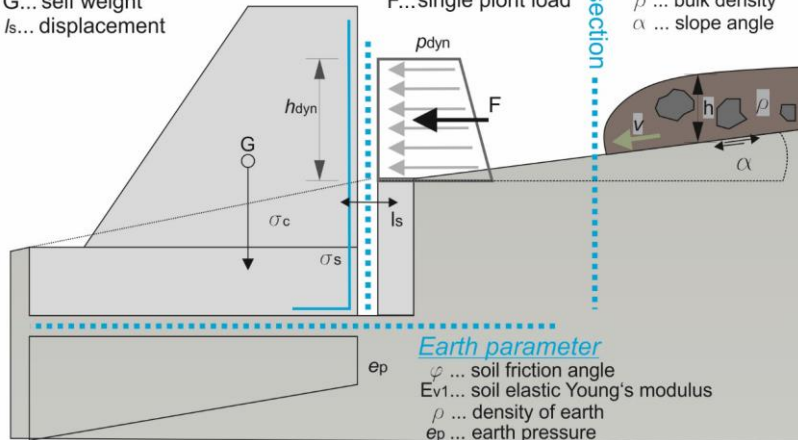
$\sigma_c$ ...compressive strength of concrete  
 $\sigma_s$ ...tensile strength of reinforcement  
 $G$ ... self weight  
 $l_s$ ... displacement

## Impact load parameter

load distribution  
 $p_{dyn}$ ...load value  
 $F$ ...single piont load

## Flow process parameter

$h$  ... flow height  
 $v$  ... velocity  
 $\rho$  ... bulk density  
 $\alpha$  ... slope angle

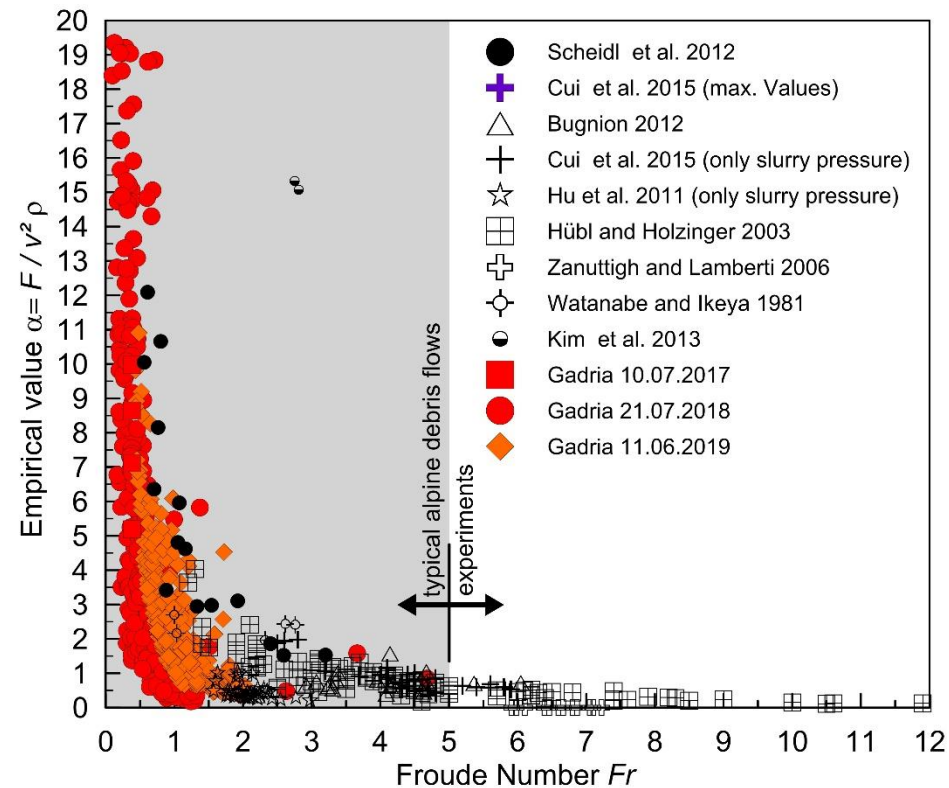
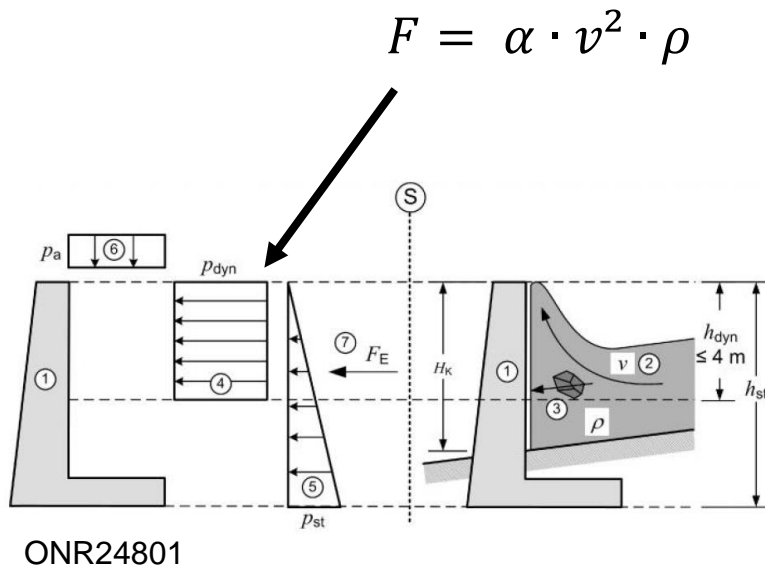


## Earth parameter

$\varphi$  ... soil friction angle  
 $E_{v1}$ ... soil elastic Young's modulus  
 $\rho$  ... density of earth  
 $e_p$  ... earth pressure



- Velocity profiles
- Run-Up
- Impact Forces
- Density
- Sediment concentration
- Pore fluid pressure
- ...





- Confirmation of the Froude number dependence on the empirical coefficient for debris-flows impact force calculation.
- Furthermore, this indicate a problem of the hydrodynamic model in low Froude regimes.

