# Avalanches across the Cosmos!

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## Introduction

- Most models of avalanches are based on earth conditions, but on other planets factors such as gravity differs, which could affect an avalanches behavious.
- As more rovers and probes visit other planets, understanding avalanche behaviour on other planets is becoming increasingly important.

## Research question

**Research question:** How does the runout distance (horizontal distance travelled by avalanche) of rock avalanches vary across the planets of the solar system, depending on their gravity?

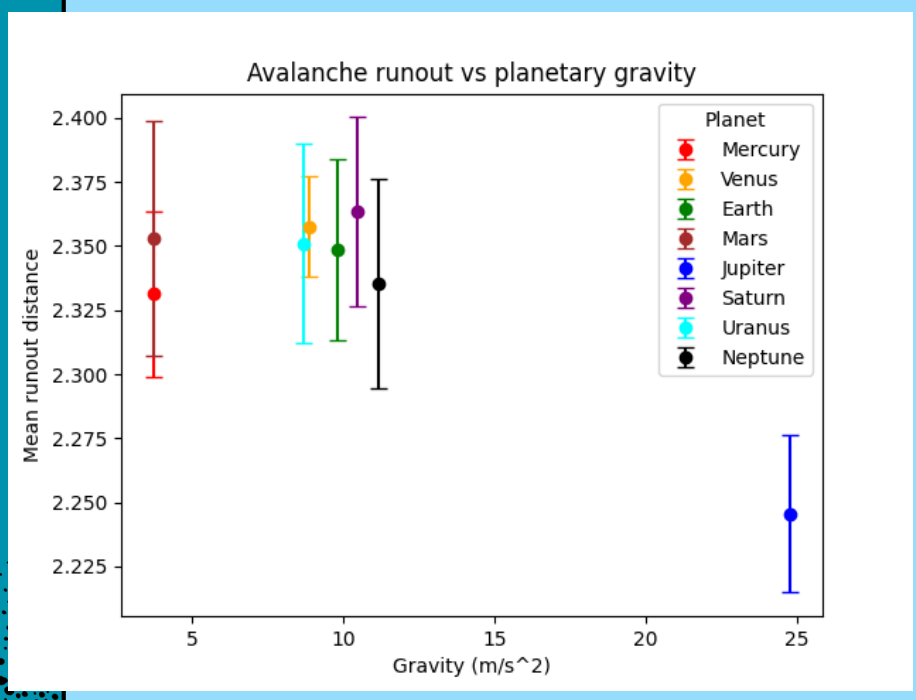
**Why:** Avalanches on other planets may affect landing sites, rover paths and future habitats. A model to predict runout distance can give insight into these risks.

## Methods

A sandpile model will be used to simulate avalanches on each planet:

- The terrain is represented as a 2d grid, each holding a random number of particles
- Particles are added randomly until a height difference threshold is exceeded and an avalanche is triggered
- Avalanche spills into neighbouring cells, and  onwards until the system stabilises
- Gravity change  affects two main factors:
  - Static threshold: Slope difference required to start avalanche
  - Dynamic threshold: Slope difference required to keep avalanche going
- After each simulation, the runout distance is measured

## Results




- Runout distance are similar across planets, with Jupiter (highest gravity) showing the shortest runout distances
- This suggest new models may only be necessary for bodies with very different gravity
- Jupiter skews towards smaller events, suggesting lower avalanche risk
- Planets with moderately high gravity show higher kurtosis (more prone to occasional extreme avalanches), while lower gravity planets exhibit fewer extremes.