

# Modeling the dynamics of dense pyroclastic flows on Venus: insights into pyroclastic eruptions

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Some large highland volcanoes on Venus have long-runout, diffuse-looking deposits proposed to have formed from pyroclastic flows.

**These putative pyroclastic deposits likely point to local magma sources rich in volatiles!**

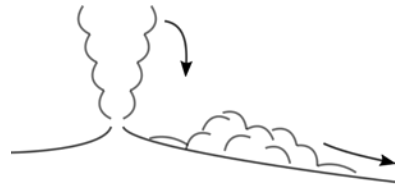
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The units at Pavlova and Didilia corona, and Anala Mons could have formed in two distinct ways shown below.

The units at Irnini Mons need emplacement by more voluminous, and higher-energy flows.

## Takeaway 1: 2 styles of formation

Impulsive collapse



impulsive collapse of columns 1.2 – 1.4 km high

Sustained fountaining



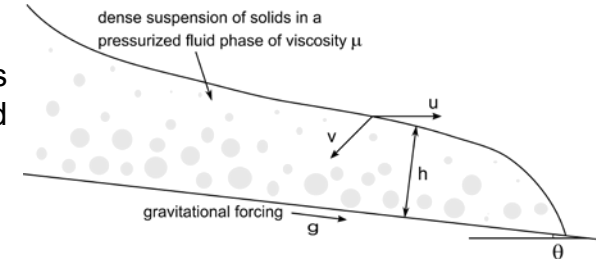
sustained fountaining from ~50 m height lasting > 400 s

Emplacement would be analogous to low energy LARIs on earth

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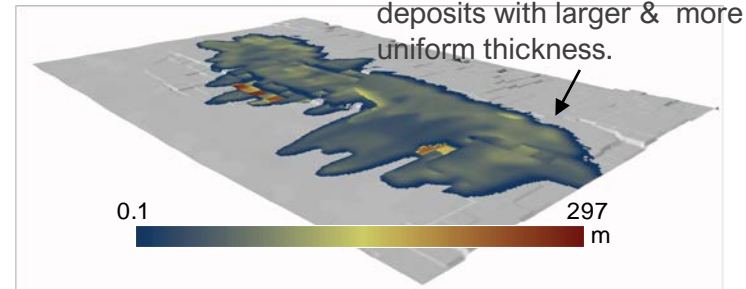
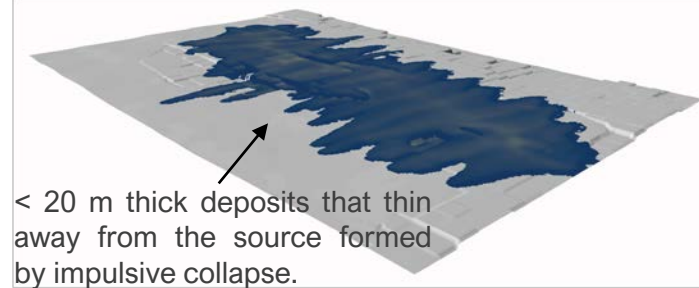
We investigated the emplacement of diffuse deposits at Pavlova and Didilia corona & Irnini Mons and Anala Mons

We treated pyroclastic flows as dense granular flows and modeled their transport



## Takeaway 2: distinct final morphology

Pavlova Corona: 3D perspective view of deposit thickness



Fountaining eruptions form deposits with larger & more uniform thickness.

Deposits formed by the two different mechanisms could be distinguished with higher-res topography!

## Takeaway 3: fluidization

Deposits occur on shallow-sloping (<2°) volcanic flanks.

The pyroclastic flow would have had to be **highly fluidized to travel long distances on shallow slopes.**

Initial pore fluid pressure > 95 % of total stress at the base is necessary.

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