National Aeronautics and Space Administration

Linked Magmatic-Tectonic Models of Corona Formation on Venus

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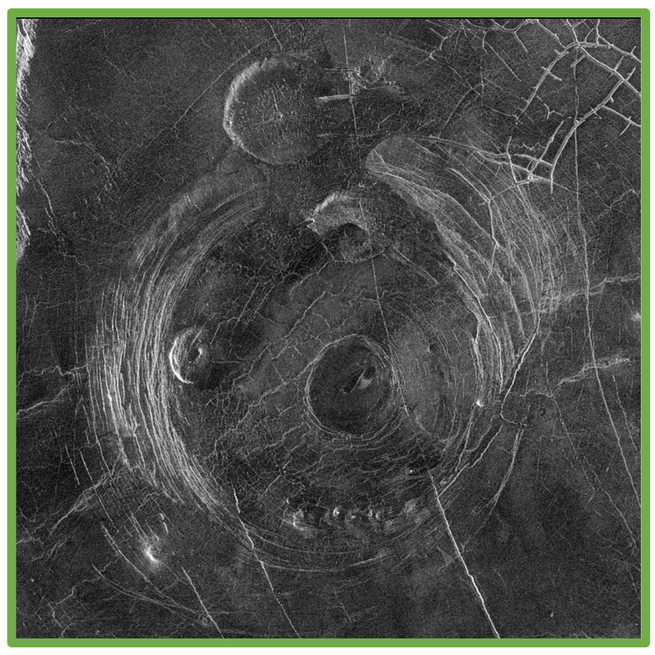
Introduction:

- Coronae are quasicircular Venusian surface features
- Generally defined by an annulus of fractures in the surface.
- Generally 100 to 1000 km in diameter
- Have complex interiors, including any combination of the following:
  - Volcanic domes
  - Discontinuous topographic ridges surrounding the interior.
  - Extensive (10^4-10^6 km^2) lava flows
  - Giant (>100km radius) radiating dike swarms
- Seemingly plentiful (>500) but unique to Venus.
  - None on Earth or any other silicate body.
- Most accepted formation mechanism is uplift followed by collapse
  - Generally modeled as a tectonic process despite clear volcanic link



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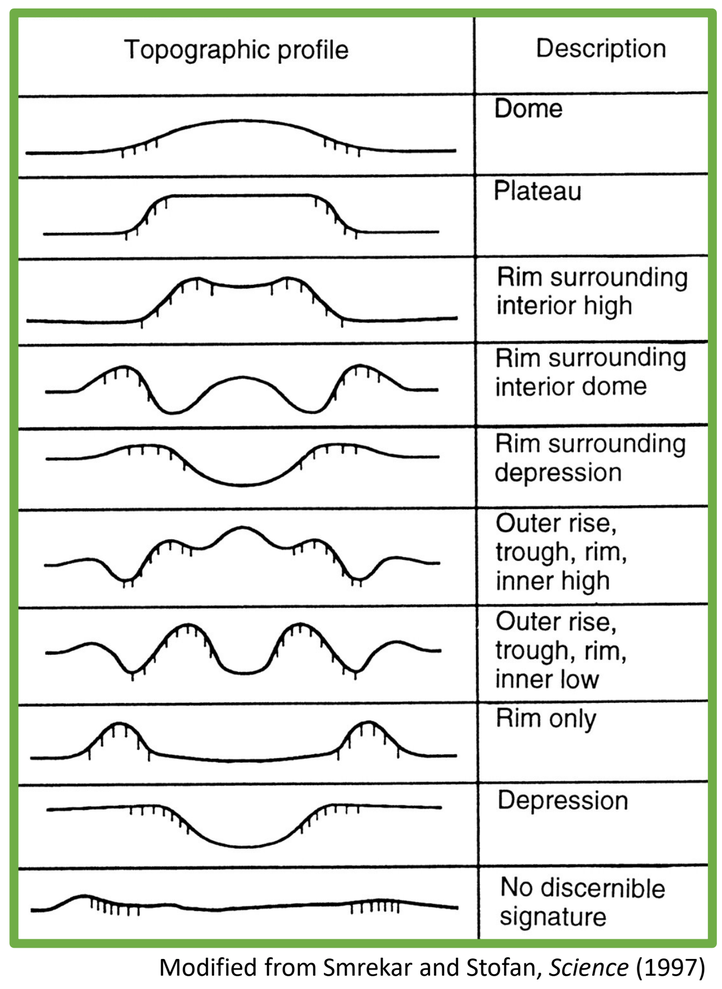
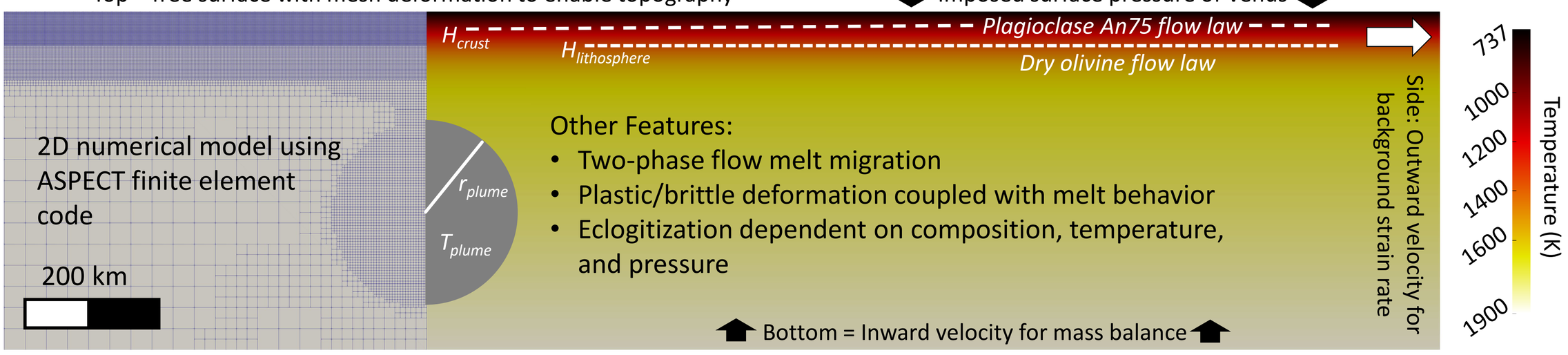


Modified from Smrekar and Stofan, *Science* (1997)

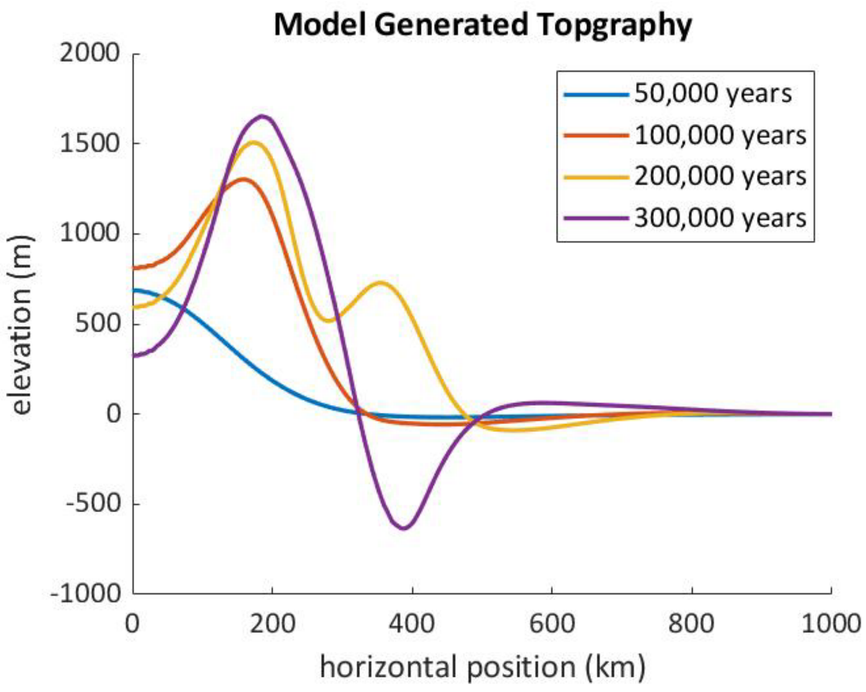
Objective:

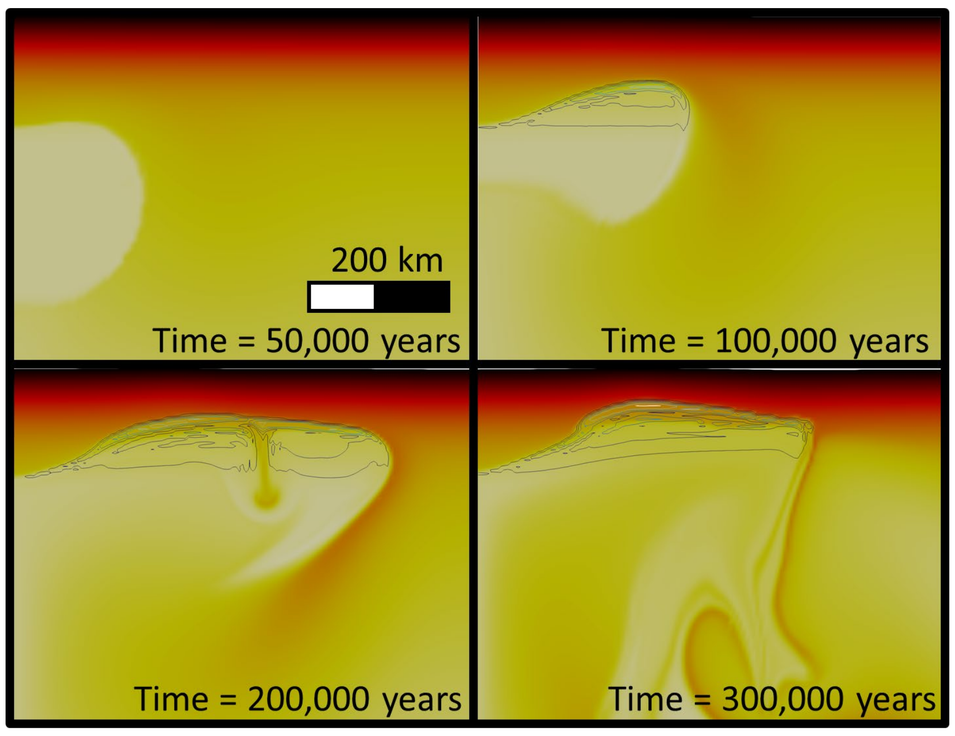
- Create a model of corona formation, integrating tectonic and magmatic processes
  - Use model output and spacecraft data to constrain interior structure and dynamics of Venus
  - Explain fundamental interior differences between Earth and Venus

Model:



Results:





- Most plumes spread laterally against the base of the lithosphere
- Topography supported by buoyant, melt rich regions
  - Troughs created by eclogite downwellings

Conclusions / Further Work:

- Modeled corona topography generally match observed
  - Tend to overestimate magnitude
- Current observed corona may indicate active magmatic activity
- Further investigations into alternative rheological flow laws
- Further models with high resolution surface for cracking

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Poster Number: PRD-P#018

Publications:

Manuscripts in preparation

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