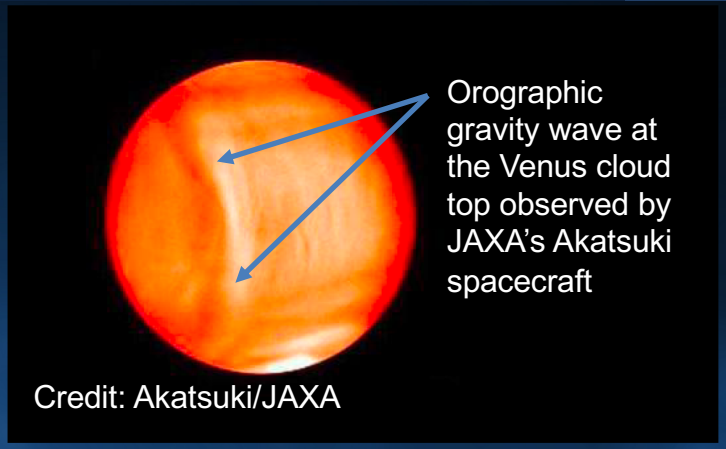
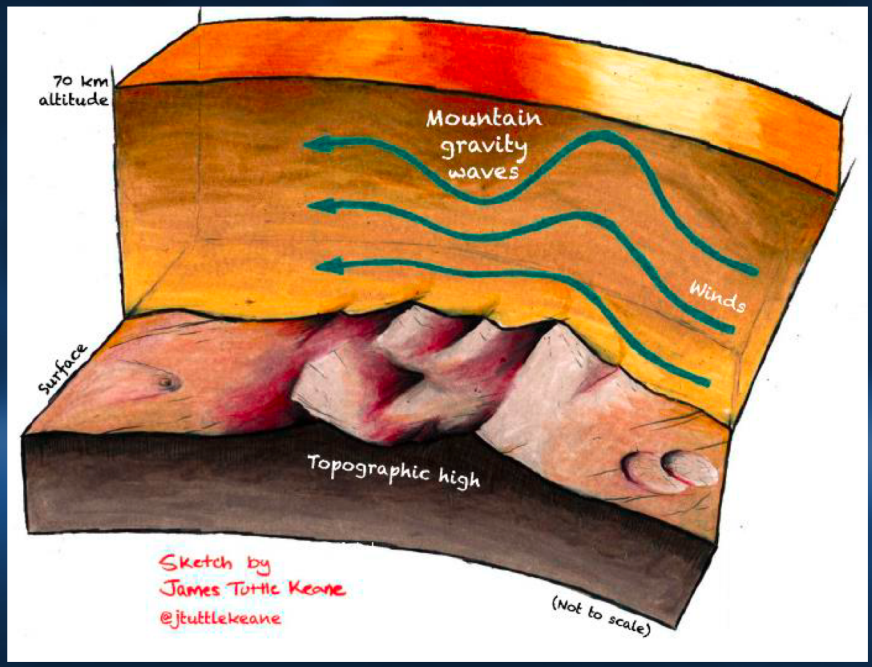
Atmospheric Mountain Waves on Venus



Credit: Akatsuki/JAXA

Simulations of orographic gravity waves (mountain waves) observed by Akatsuki (left) are simulated with a numerical model of the atmosphere, showing mountain waves can impact the rotation rate of Venus, resulting in changes of several minutes in the length of day.



- The Akatsuki spacecraft discovered a 10,000 km long mountain wave at the cloud top, occurring in the afternoon only.
- A model of the Venusian atmosphere is run for the first time that includes simulated mountains at scales below the grid of the model (~300 km). These reproduce the waves, at the same locations and timing of observations. The model shows that mountain waves exert a torque on the solid body from the flow of the atmosphere.
- This mountain torque is found to be a substantial part of the total budget of torques between the atmosphere and the planet, and results in a change of length of day of several minutes.
- Identifying exchanges of angular momentum (i.e., torques) between the atmosphere and the surface is essential to (1) solve the mystery of the origin of the atmospheric superrotation (2) estimate the moment of inertia of Venus and to understand its deep interior.

Navarro et al. (2018) *Nature Geoscience*