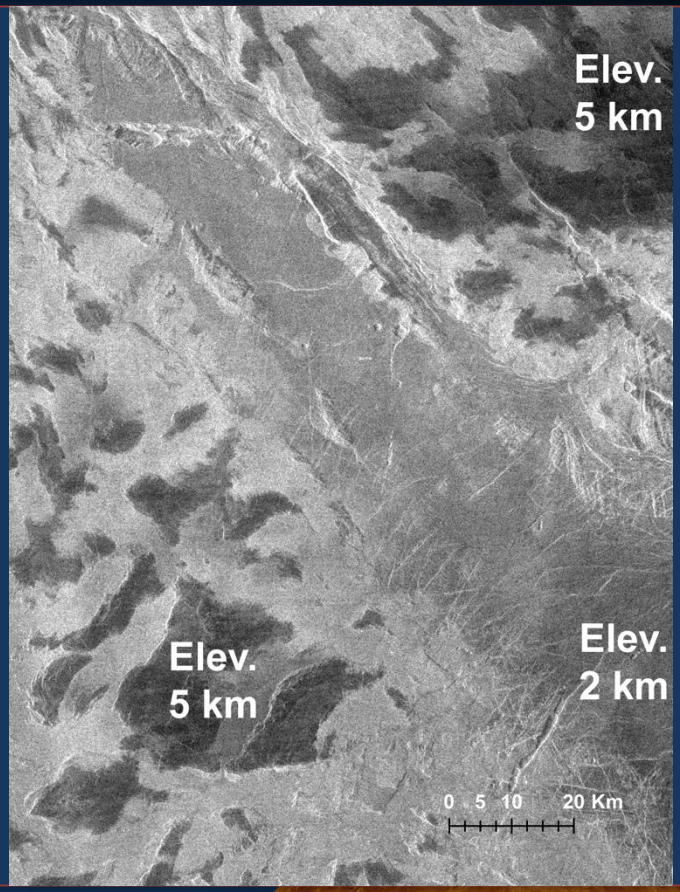
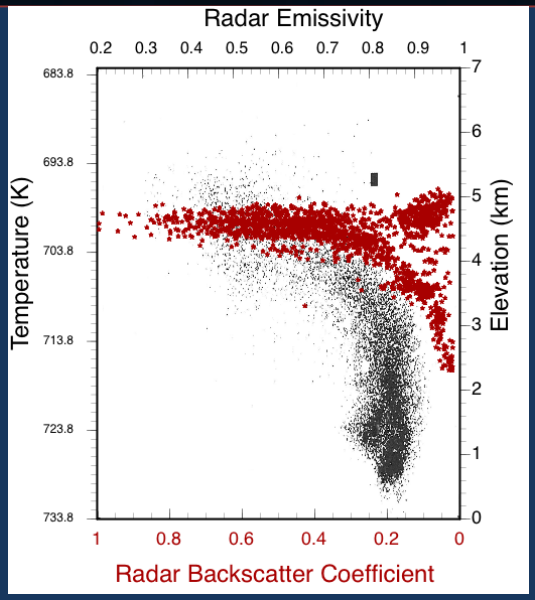
Venus' Radar-Bright Highlands: Ferroelectric Signature from the Mineral Chlorapatite



Radar backscatter in Venus' equatorial highlands increases sharply with elevation, up to ~4.7 km, and drops dramatically above at higher elevations.

We revisited this anomaly using the increased spatial and elevation precision of Magellan stereo elevation data.

Magellan SAR view of a portion of Ovda Regio, a highlands region near the equator.



New radar and elevation data (red) show much less noise than older data (black). Radar backscatter drops drastically at ~4.7 km elevation.

*This pattern of radar backscatter suggests a **ferroelectric** material, in which an electric dipole moment vanishes at a critical temperature, here ~700K. The only rock-forming mineral that fits is chlorapatite, $Ca_5(PO_4)_3Cl$, which likely forms as basalt rocks react with Venus' hot, HCl-bearing atmosphere.*

Venus' peculiar radar properties arise from chemical reactions with its hot acidic atmosphere.

Treiman A.H., Harrington, E. and Sharpton, V. 2016. *Icarus*, *280*, pp.172-182.