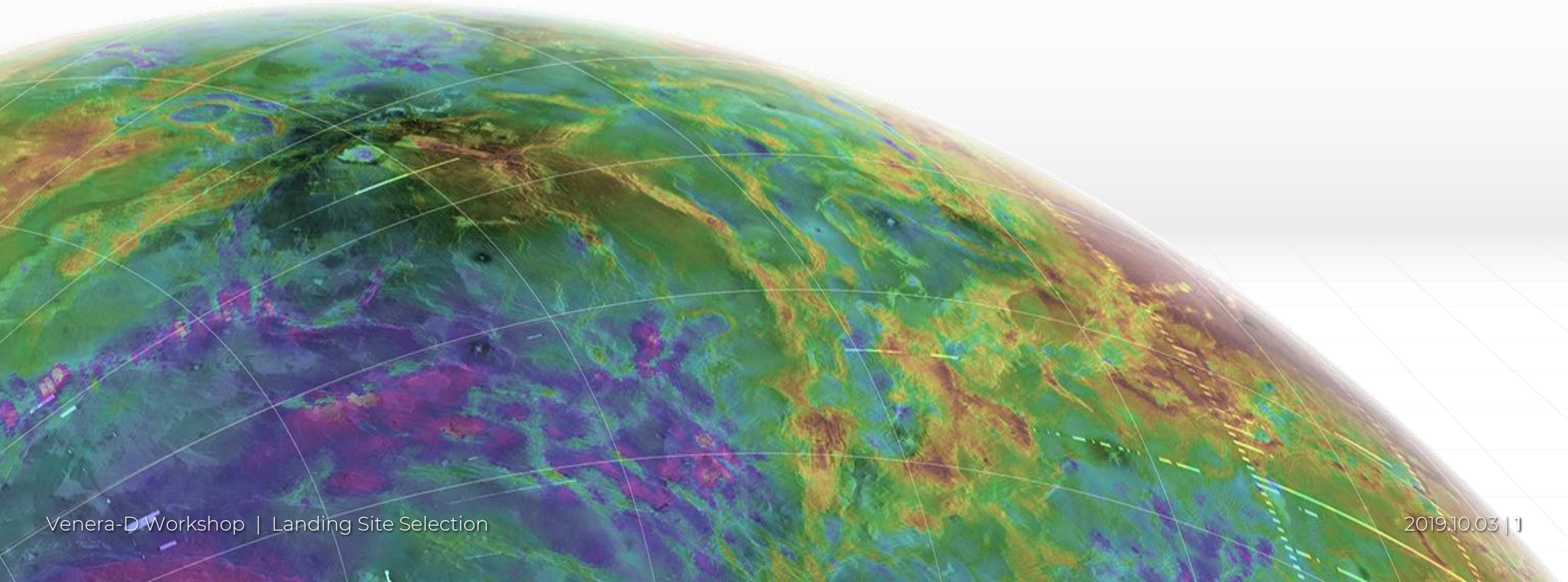
mobile crustal blocks as landing site targets

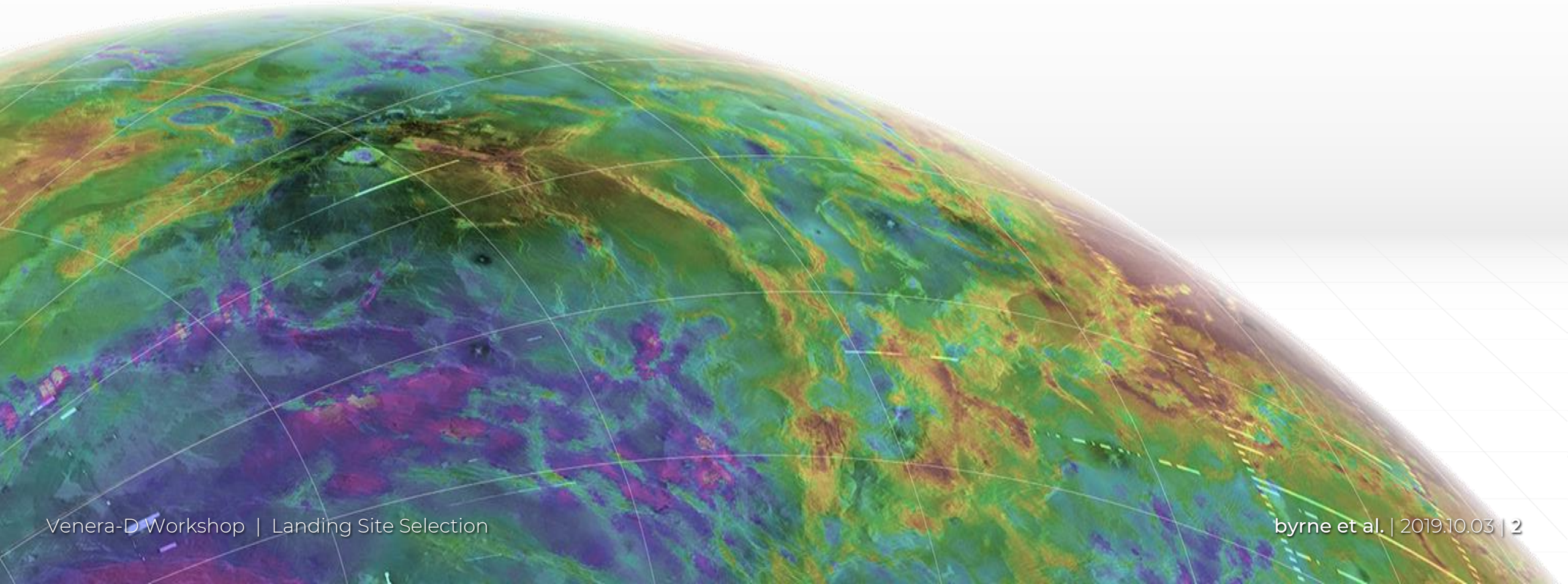
paul byrne

with

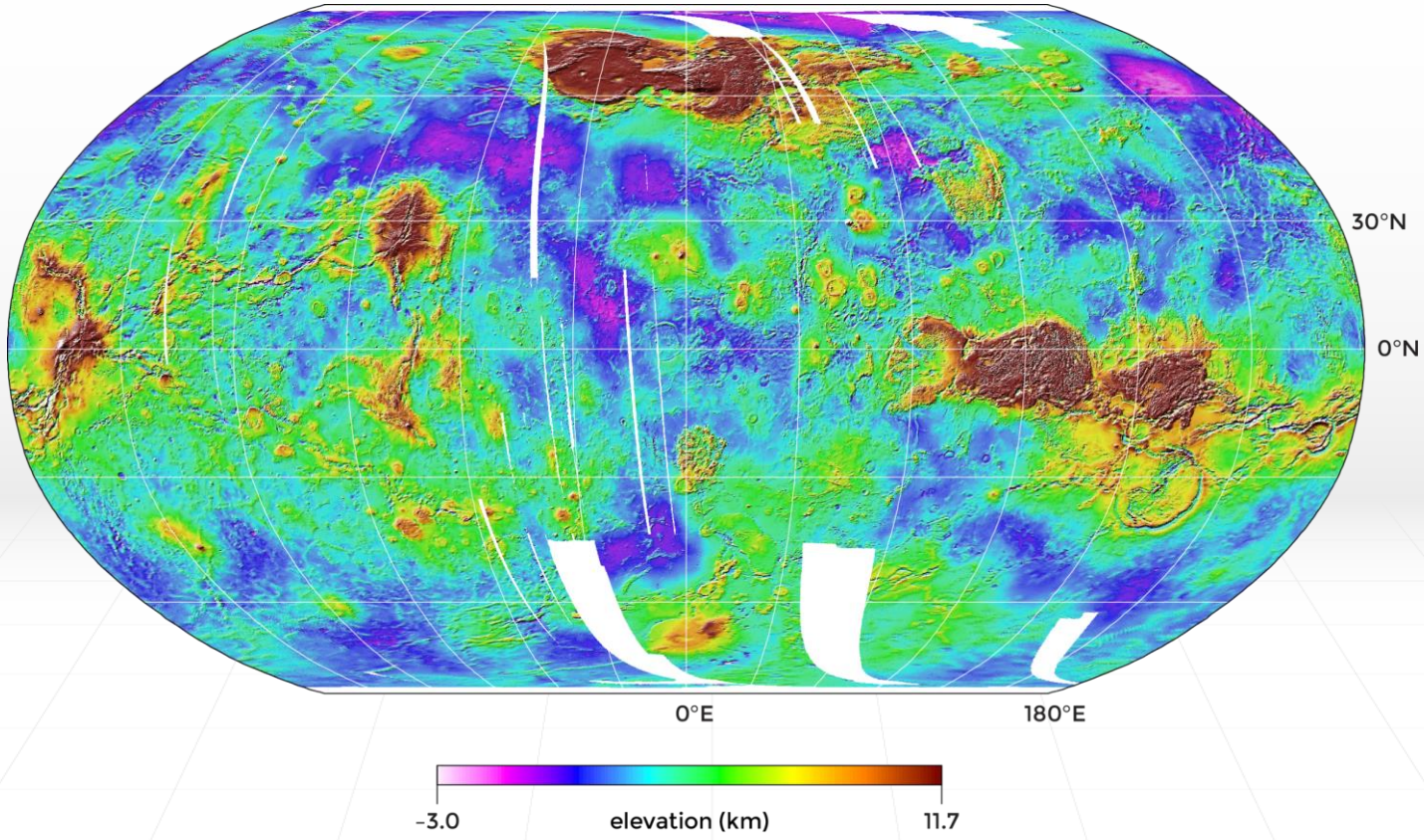
richard **ghail** | a. m. celal **şengor** | peter **james** | christian **klimczak** | sean **solomon**



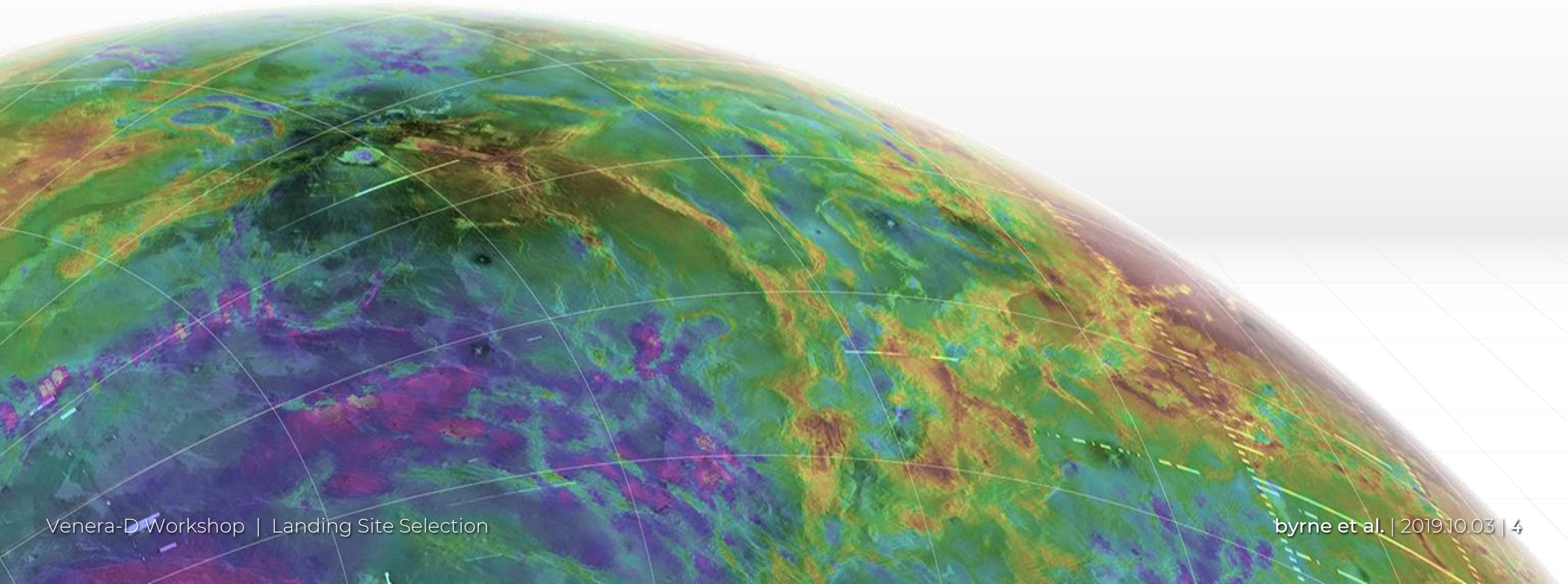
Venus is a heavily **tectonically deformed world**...



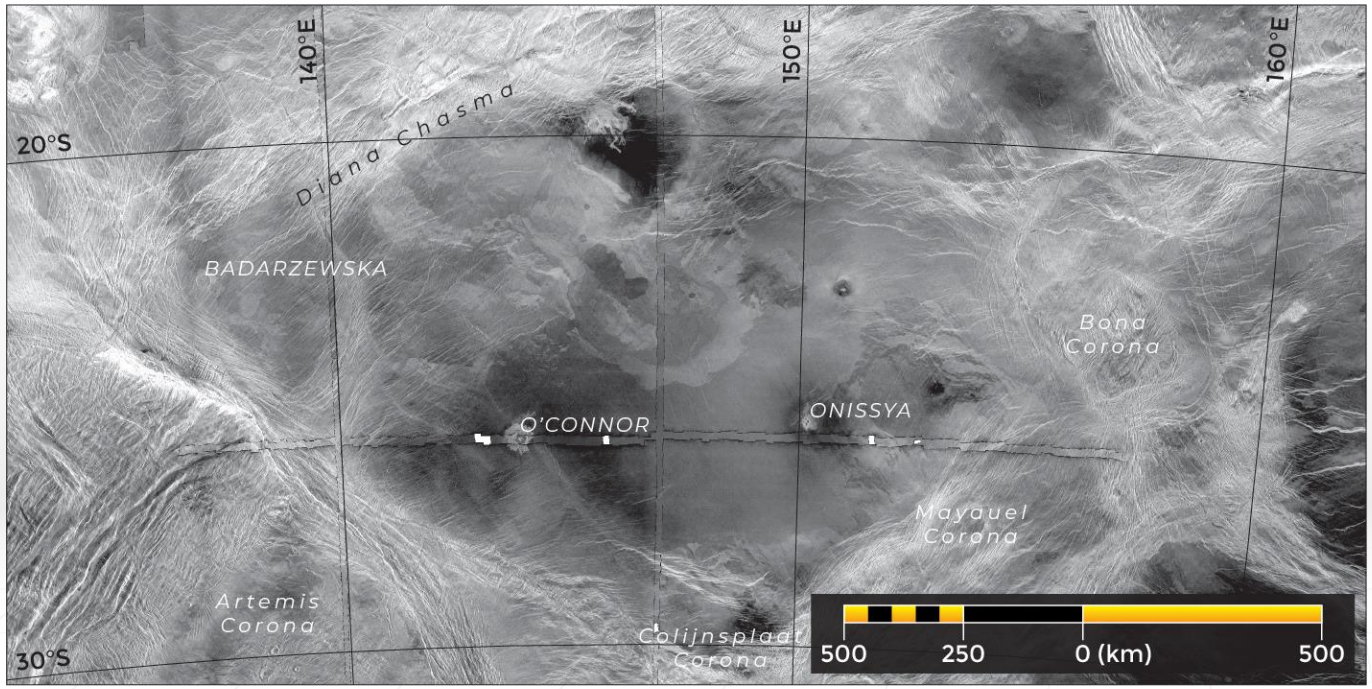
...but shows no evidence for **Earth-style oceanic plate tectonics**



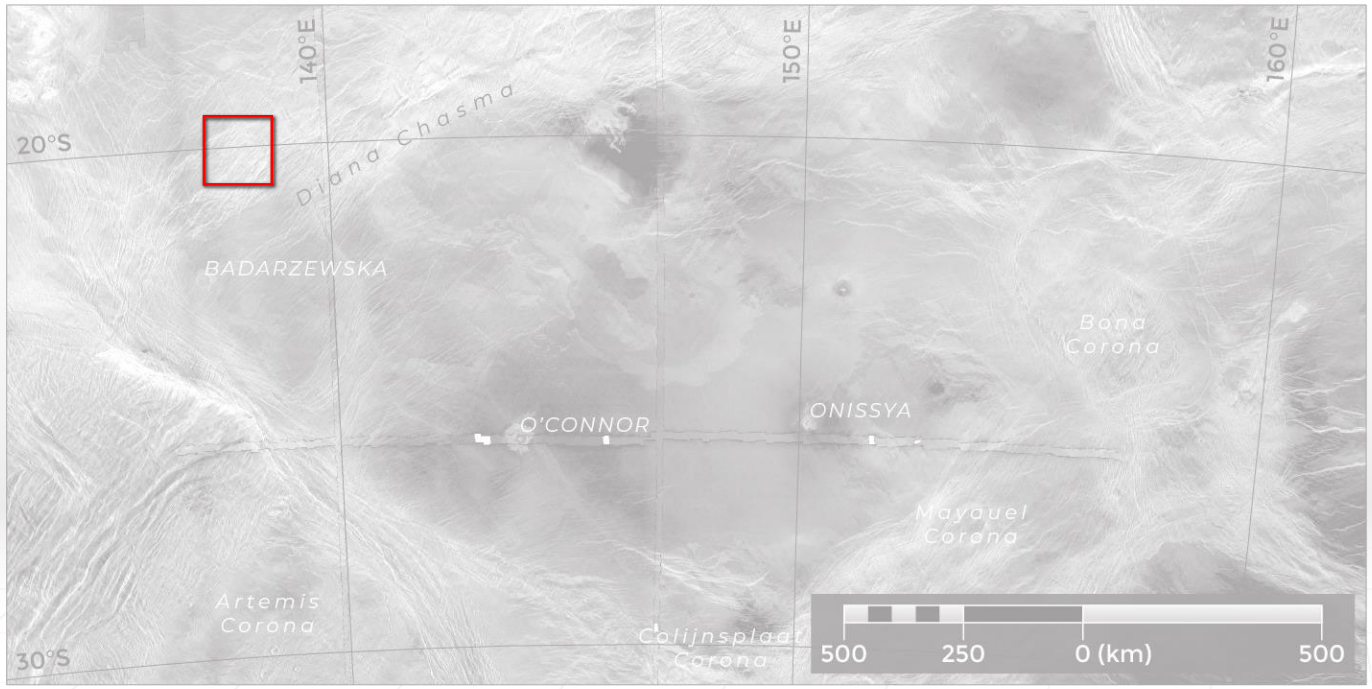
yet the Venus lithosphere appears **fragmented**

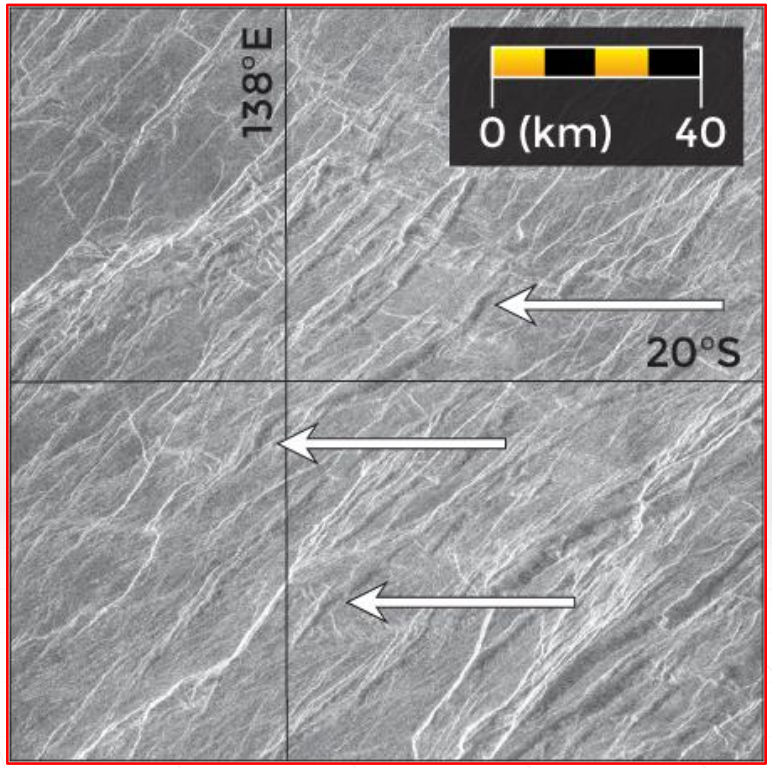


tectonic belts commonly delimit **low-lying plains**

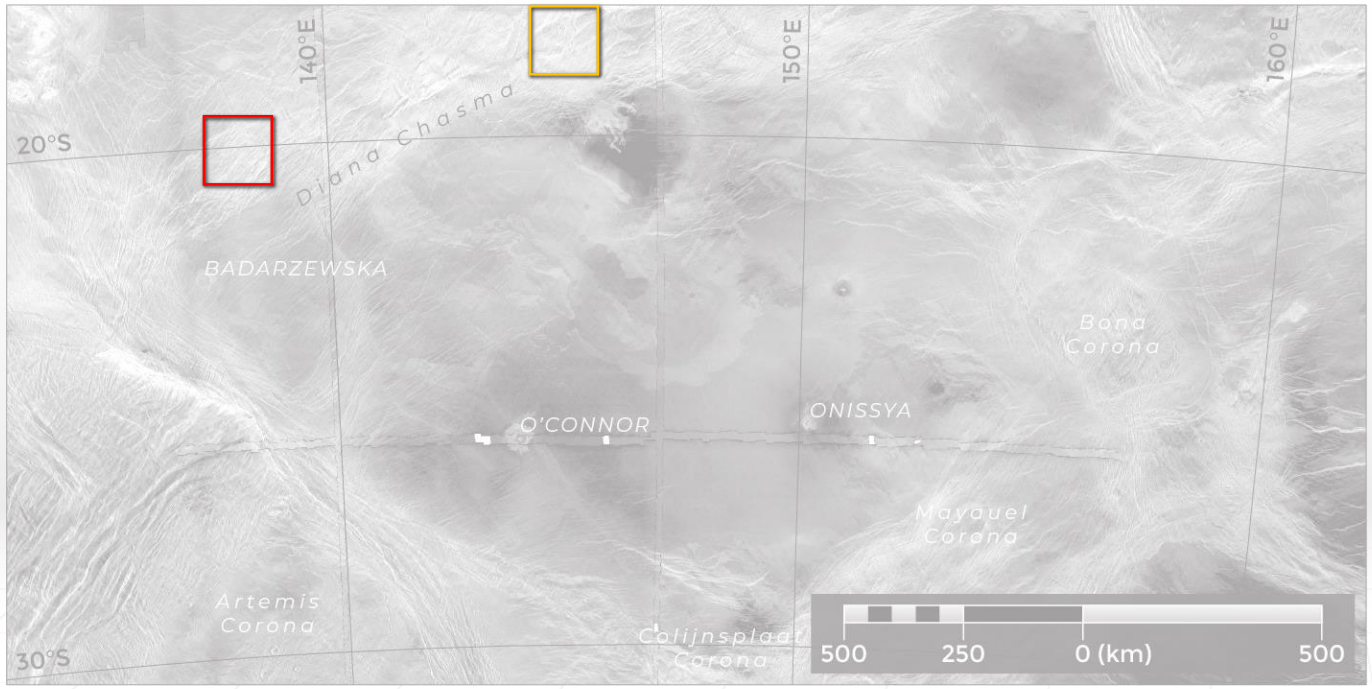


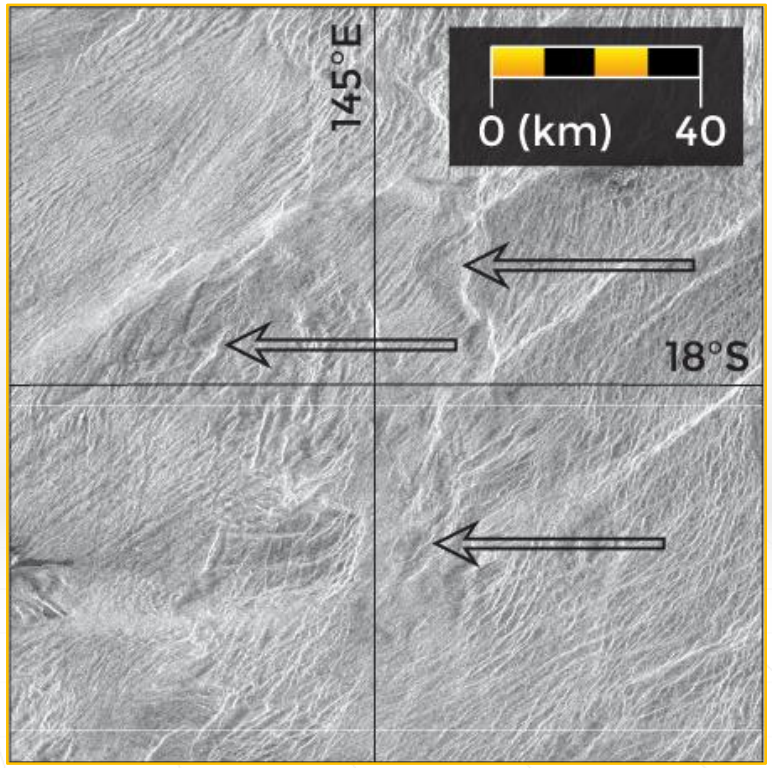
the bounding belts typically show evidence for **lateral shear**



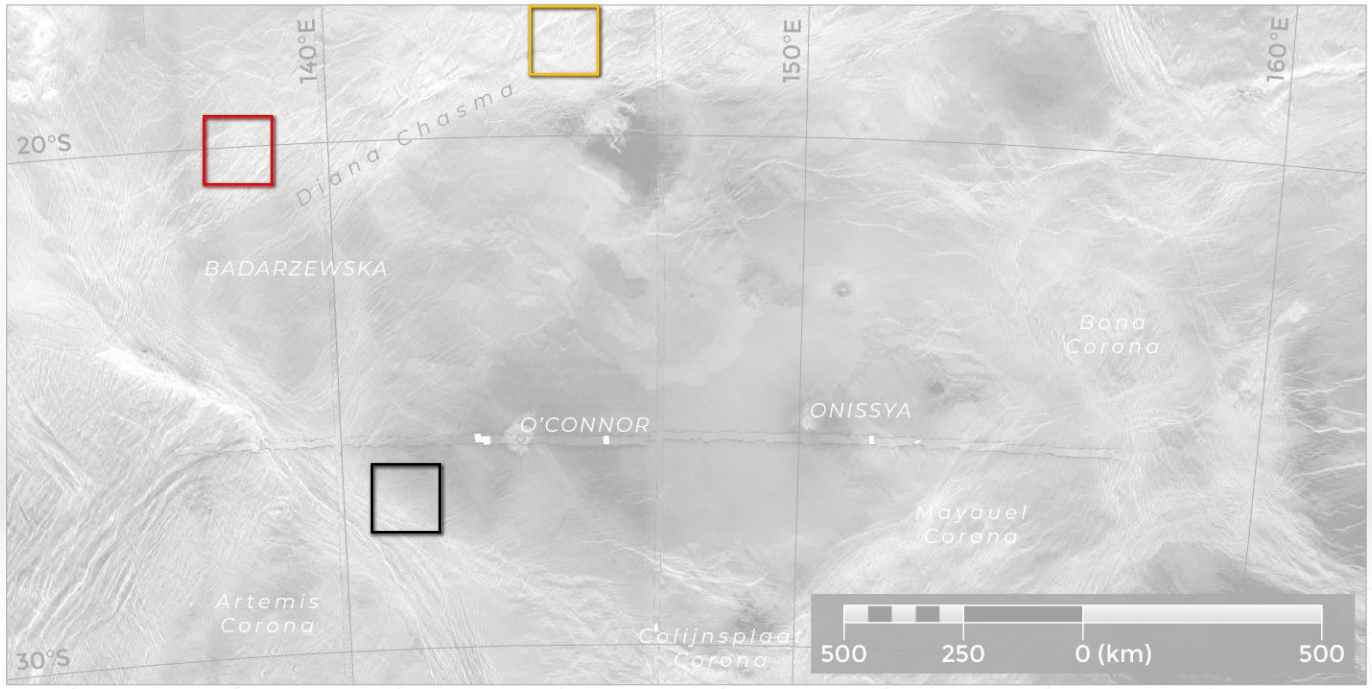


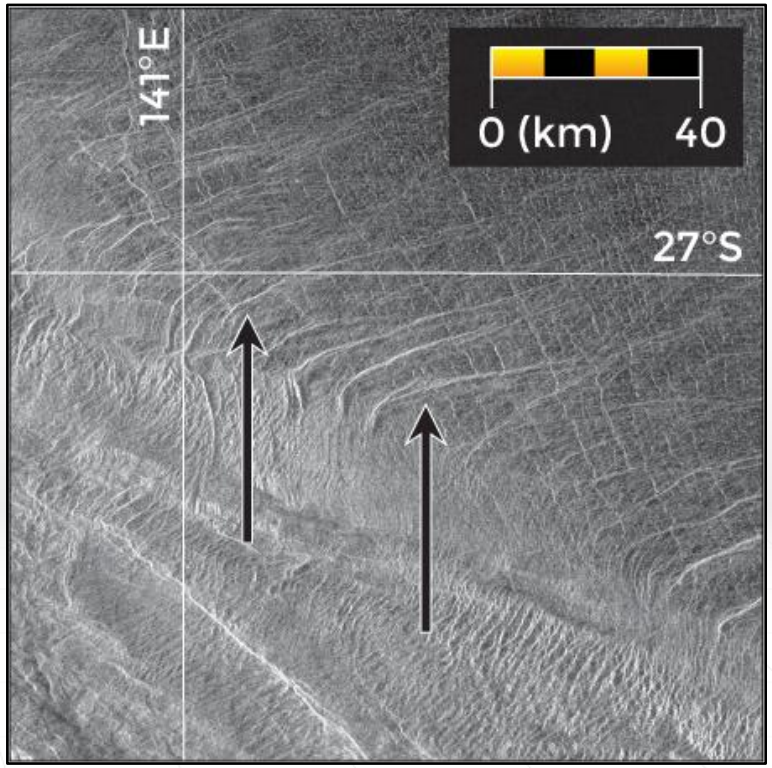
the bounding belts typically show evidence for **lateral shear**



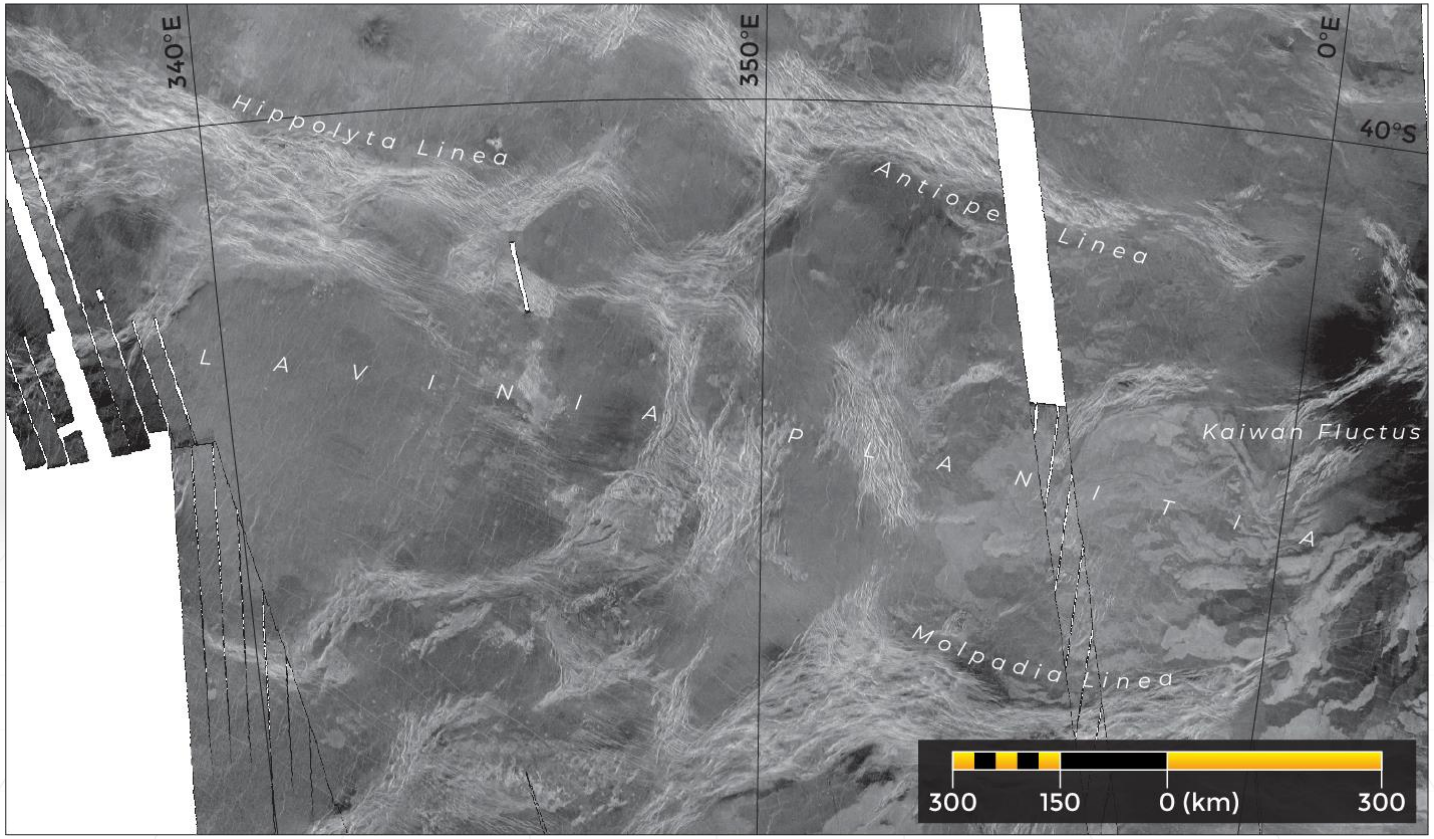


the bounding belts typically show evidence for **lateral shear**

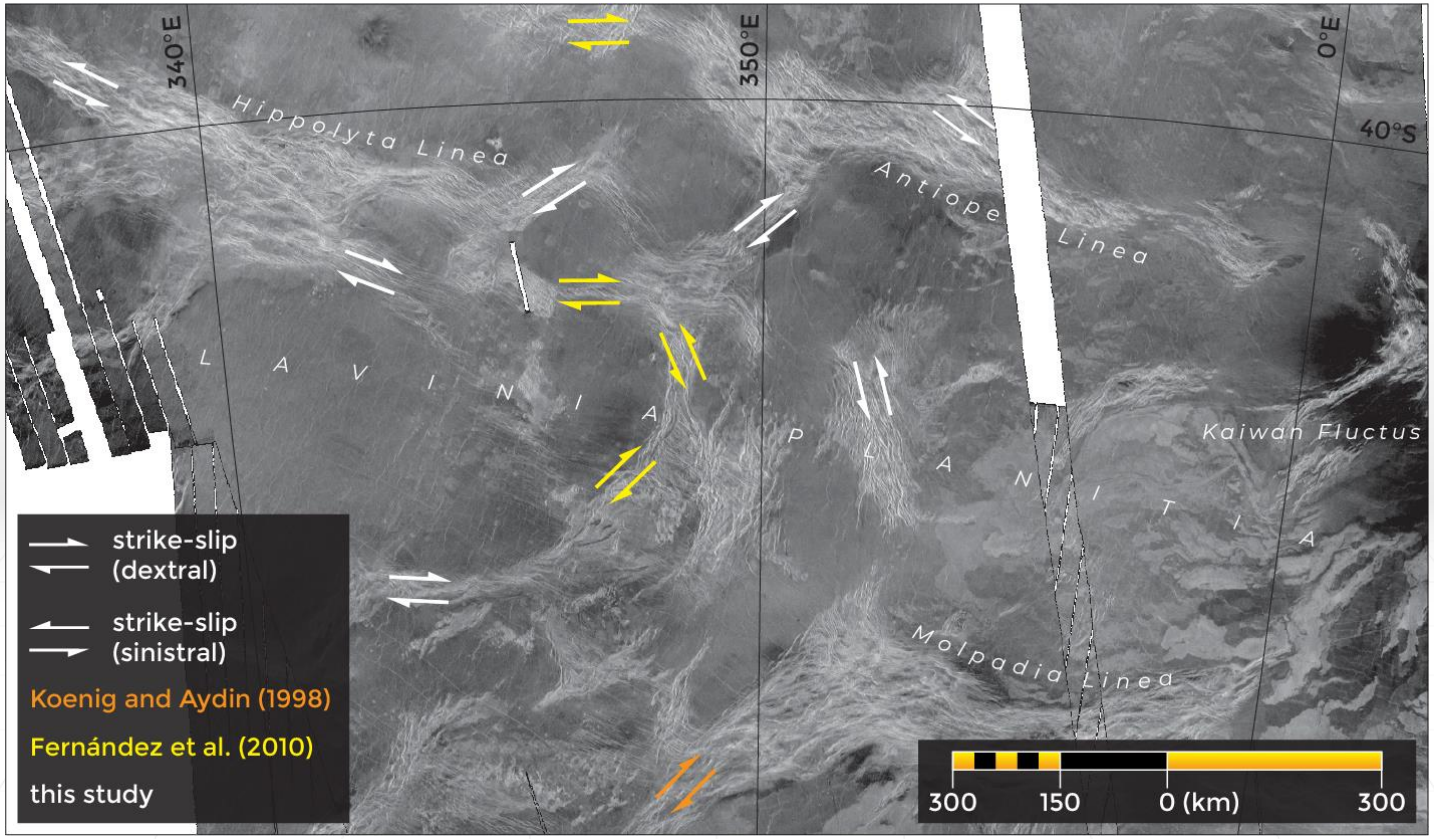




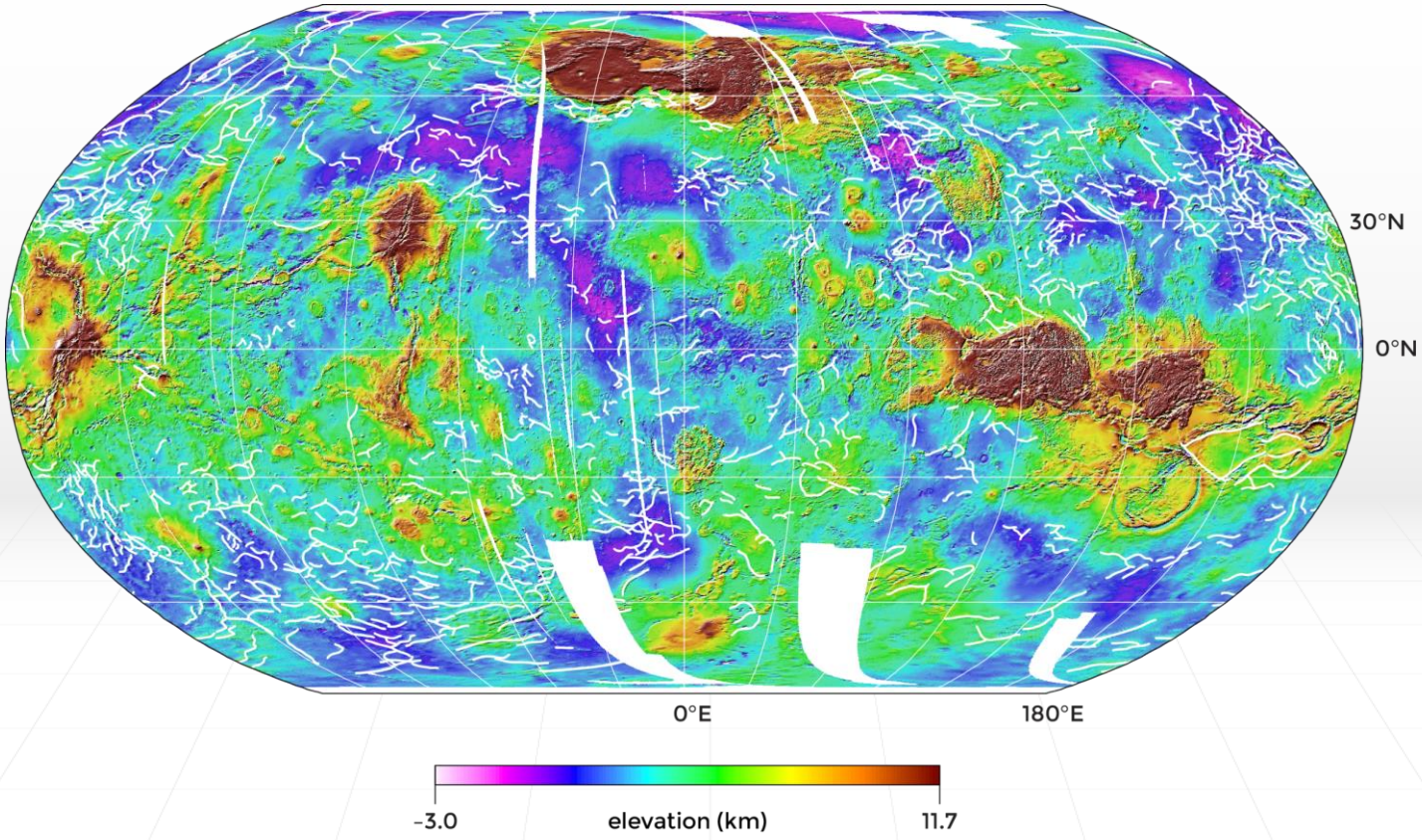
these belts seem to define individual **crustal blocks**...



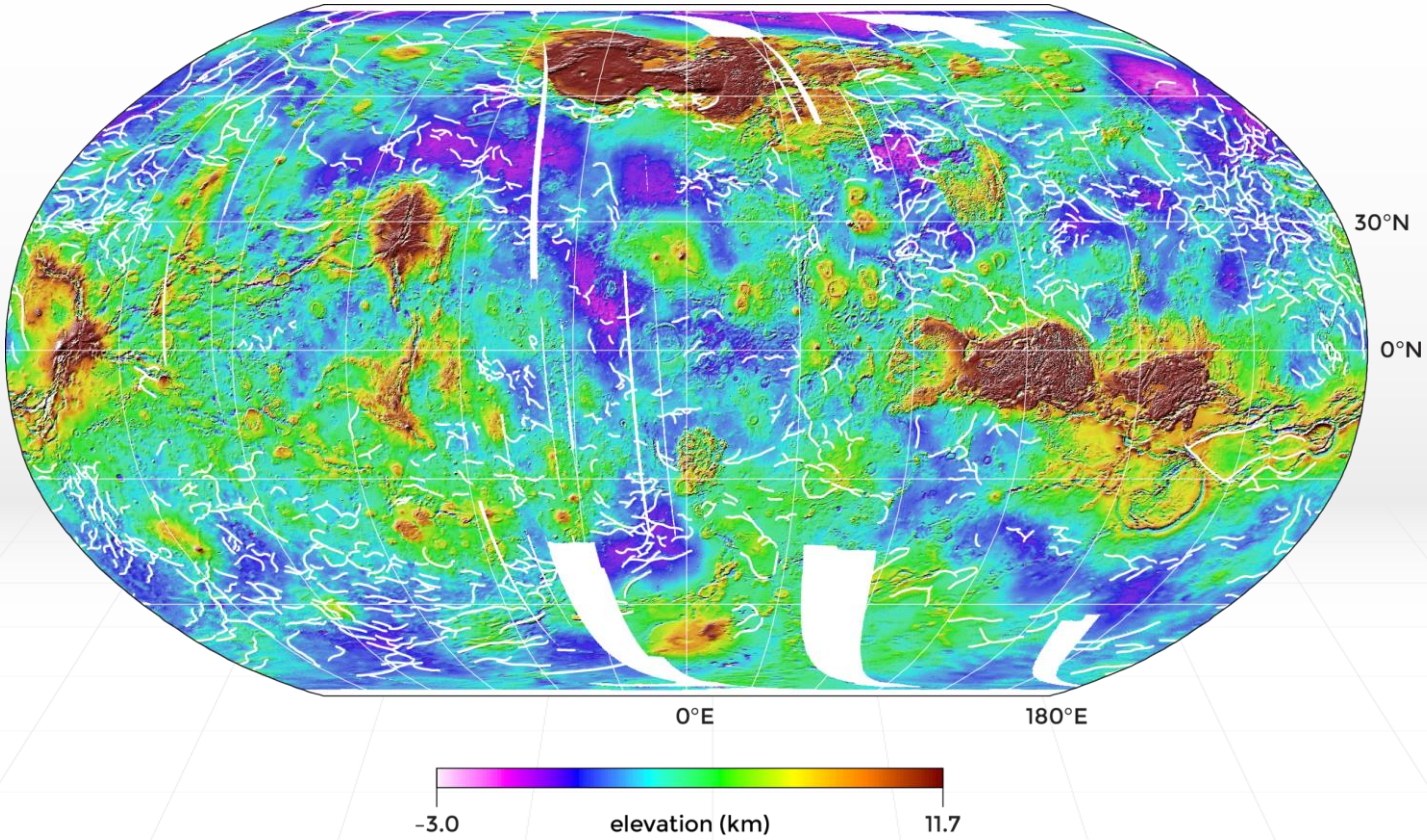
...that **jostled** and **moved** like **pack ice** after the plains were emplaced

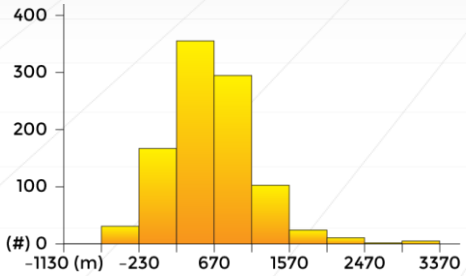


the majority of these structures are situated to the **Venus lowlands**...

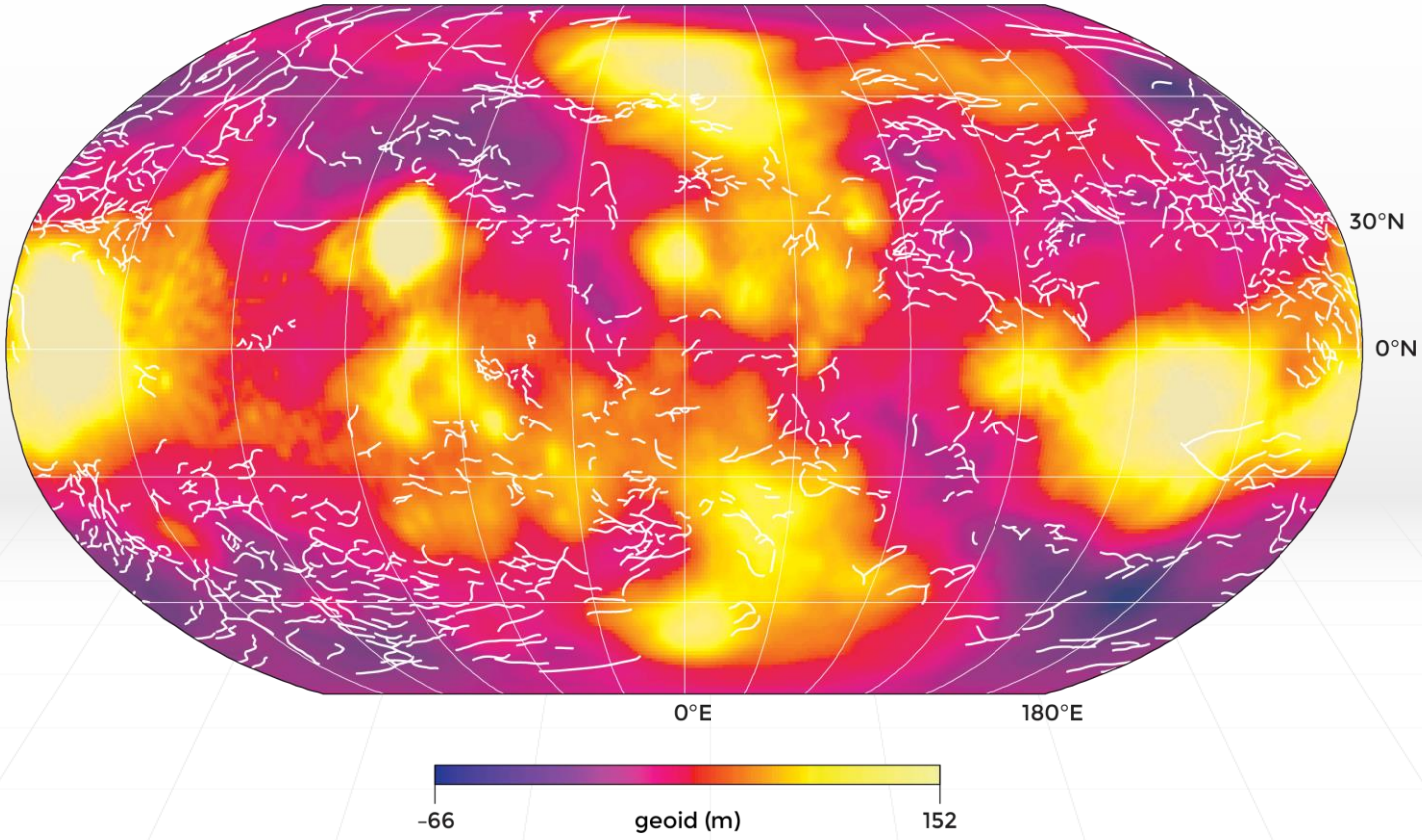


the majority of these structures are situated to the **Venus lowlands**...

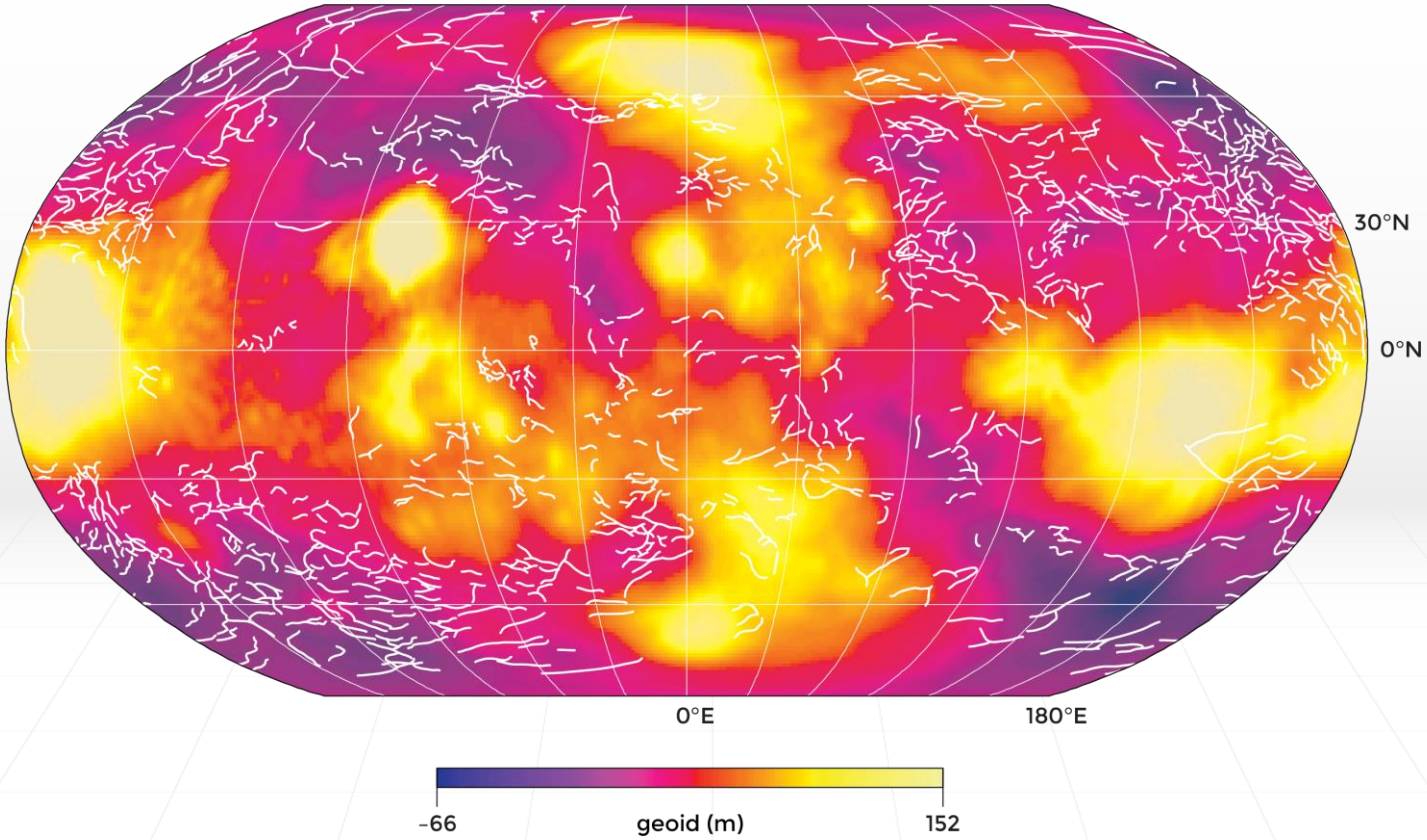


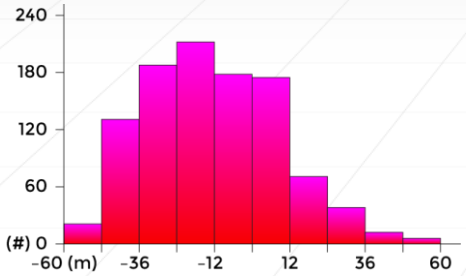


...and are collocated with **geoid lows**

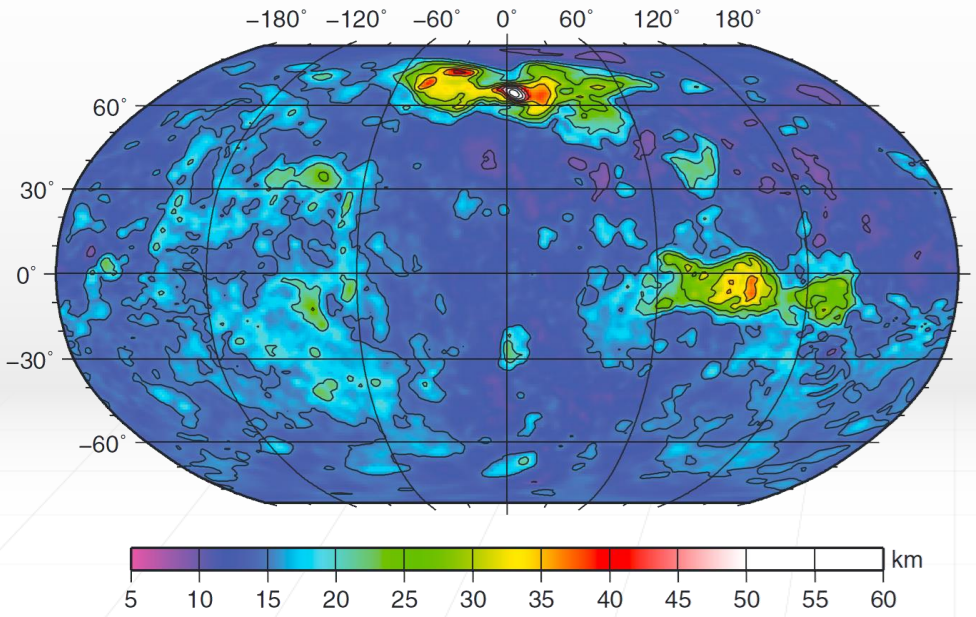


...and are collocated with **geoid lows**



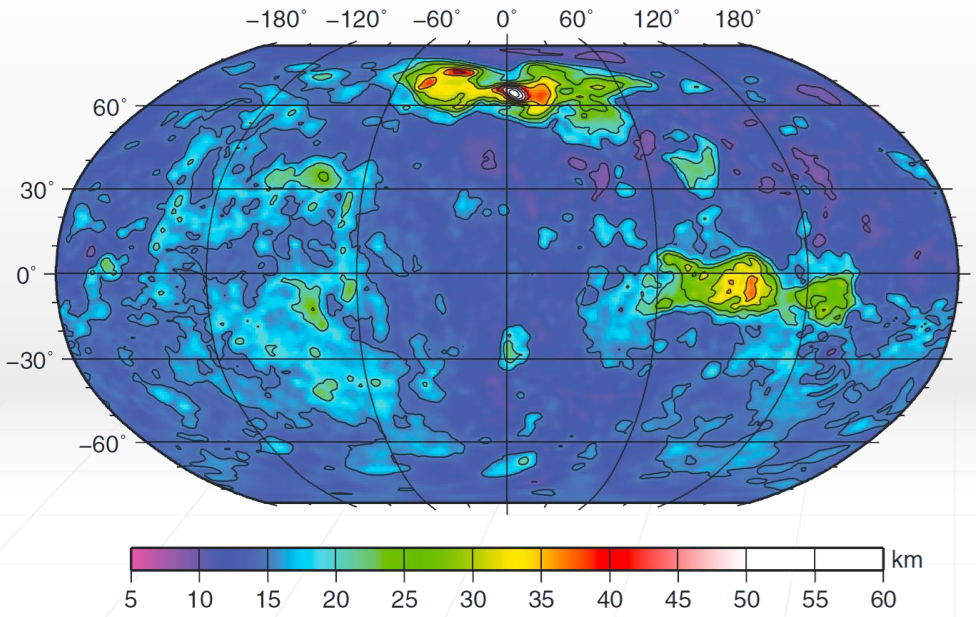


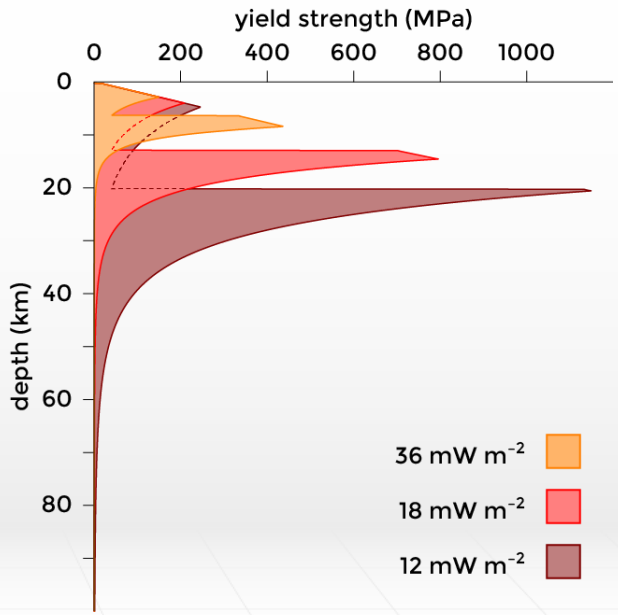
we tested if **mantle flow** and a **weak lower crust** might enable block motion



James *et al.* (2015) | *JGR*

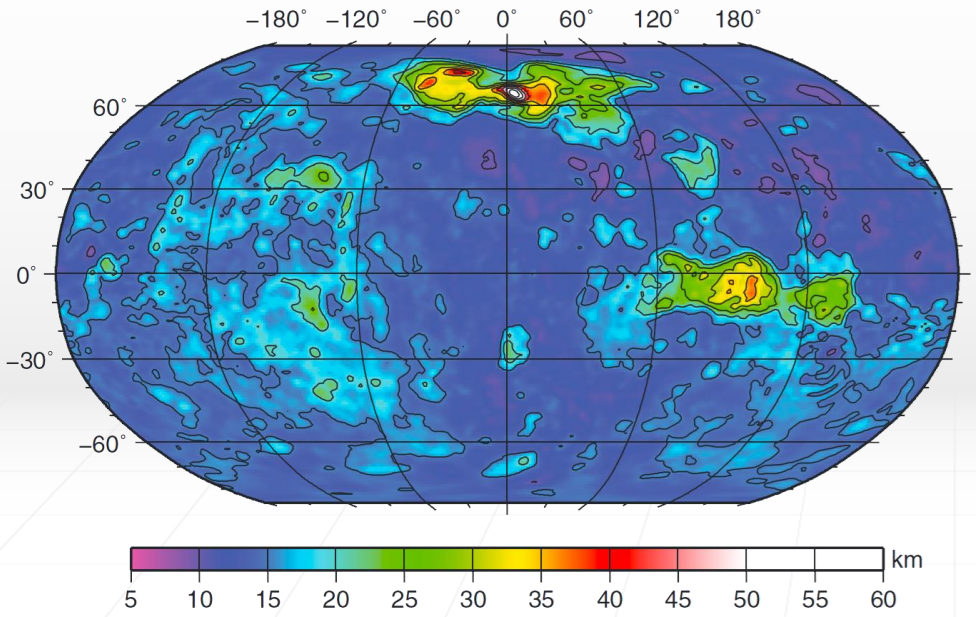
we tested if **mantle flow** and a **weak lower crust** might enable block motion

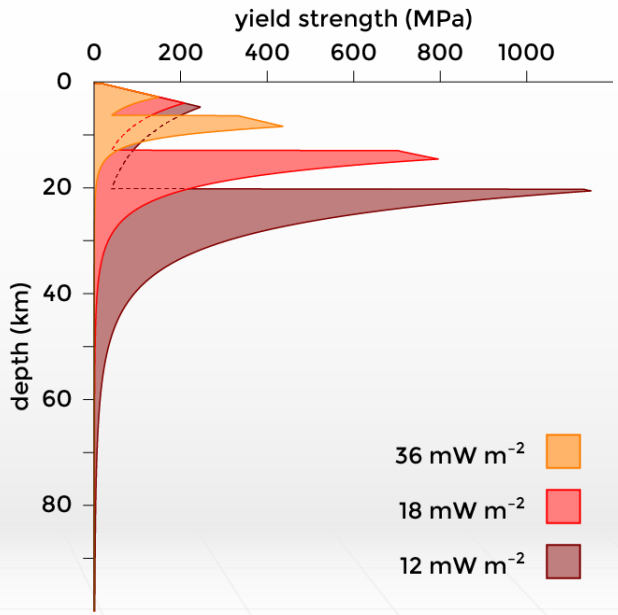




James *et al.* (2015) | *JGR*

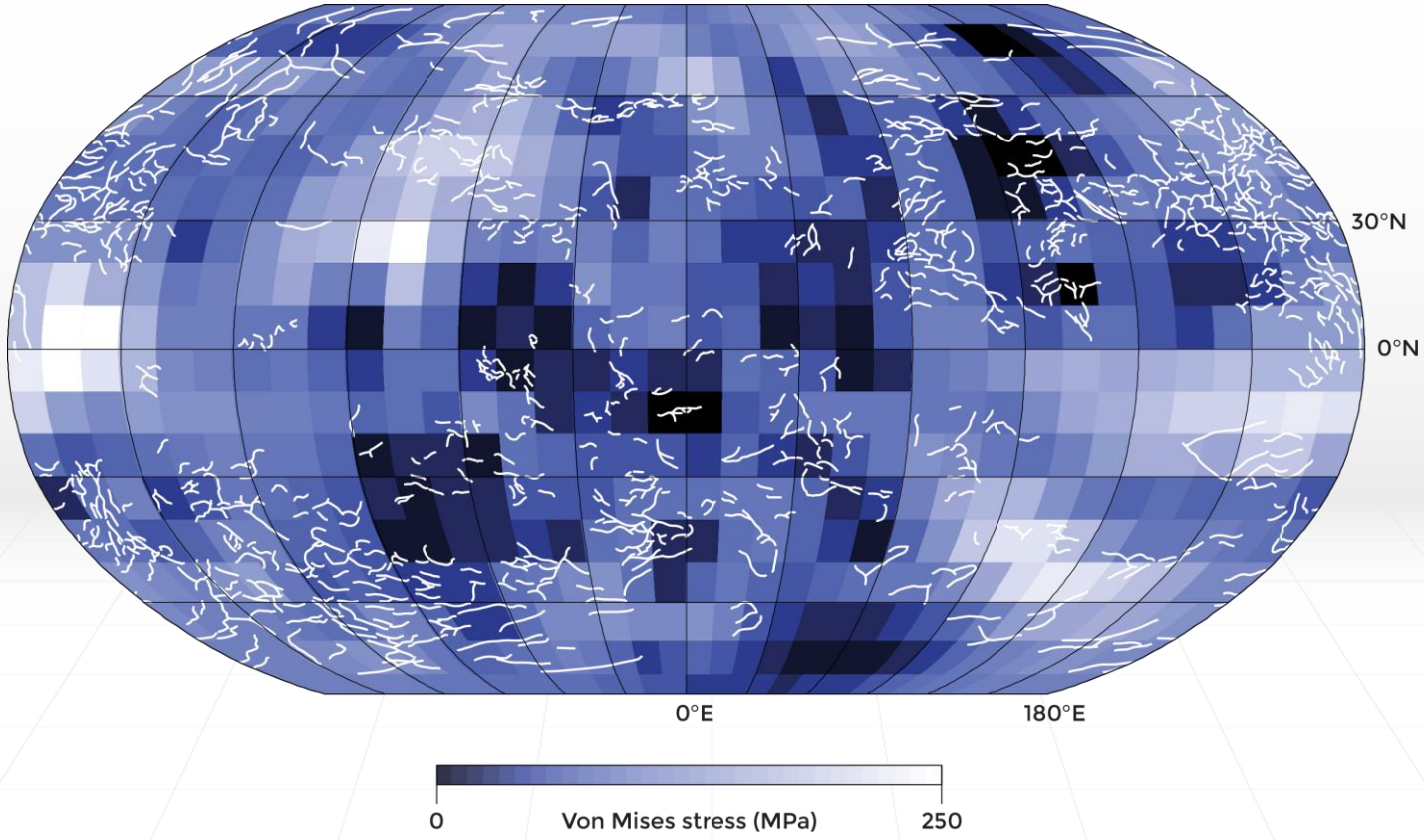
we tested if **mantle flow** and a **weak lower crust** might enable block motion



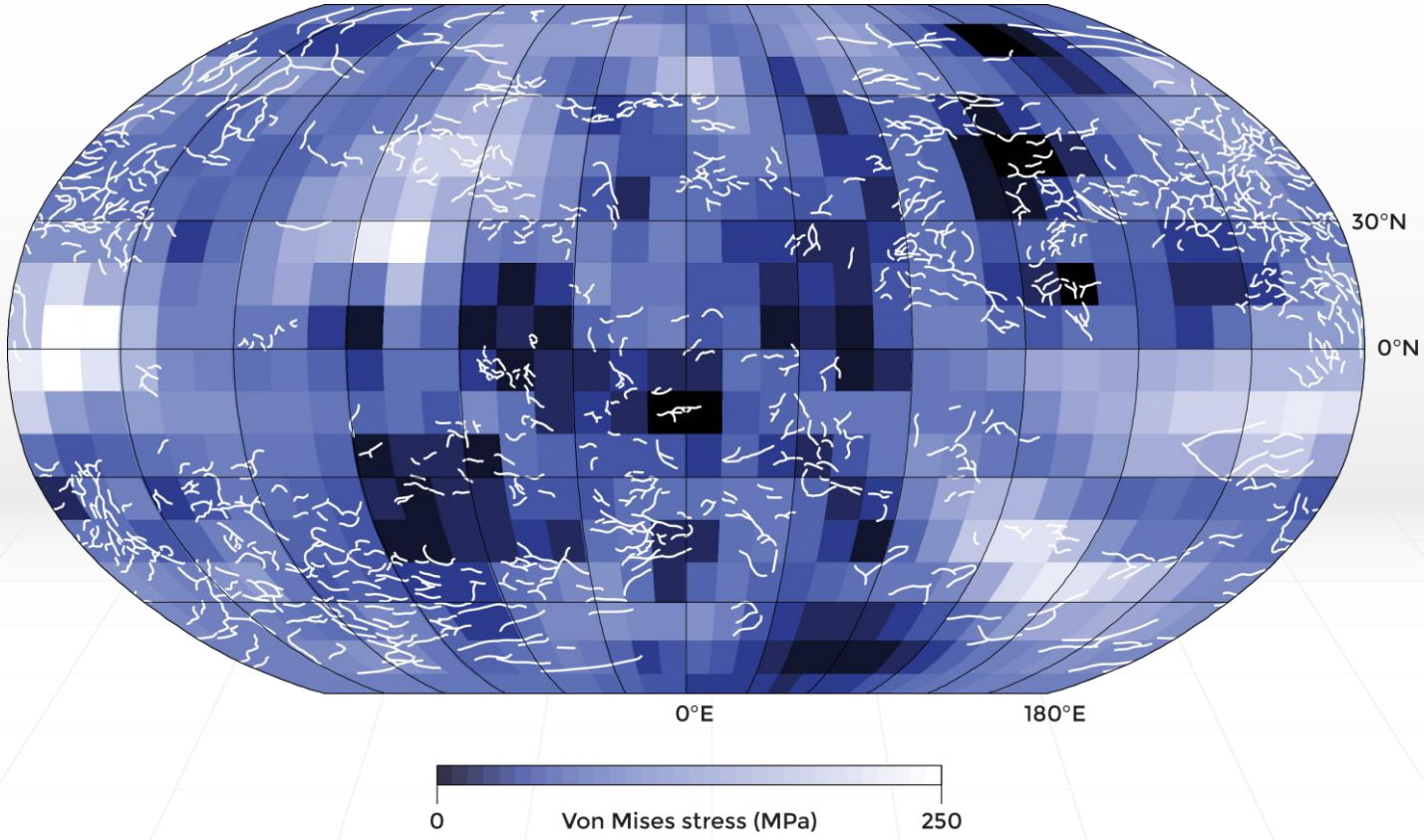


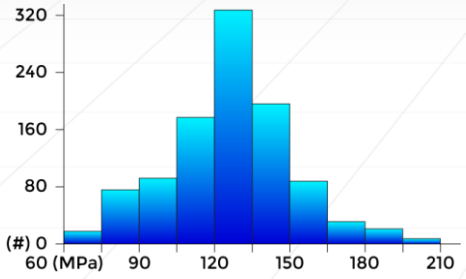
James *et al.* (2015) | *JGR*

mantle stresses likely **exceed the strength** of the lower crust

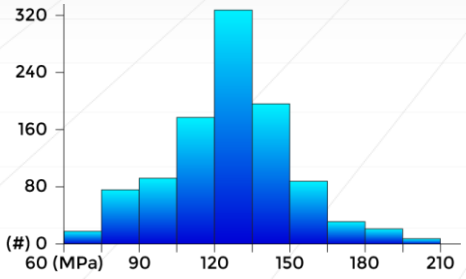


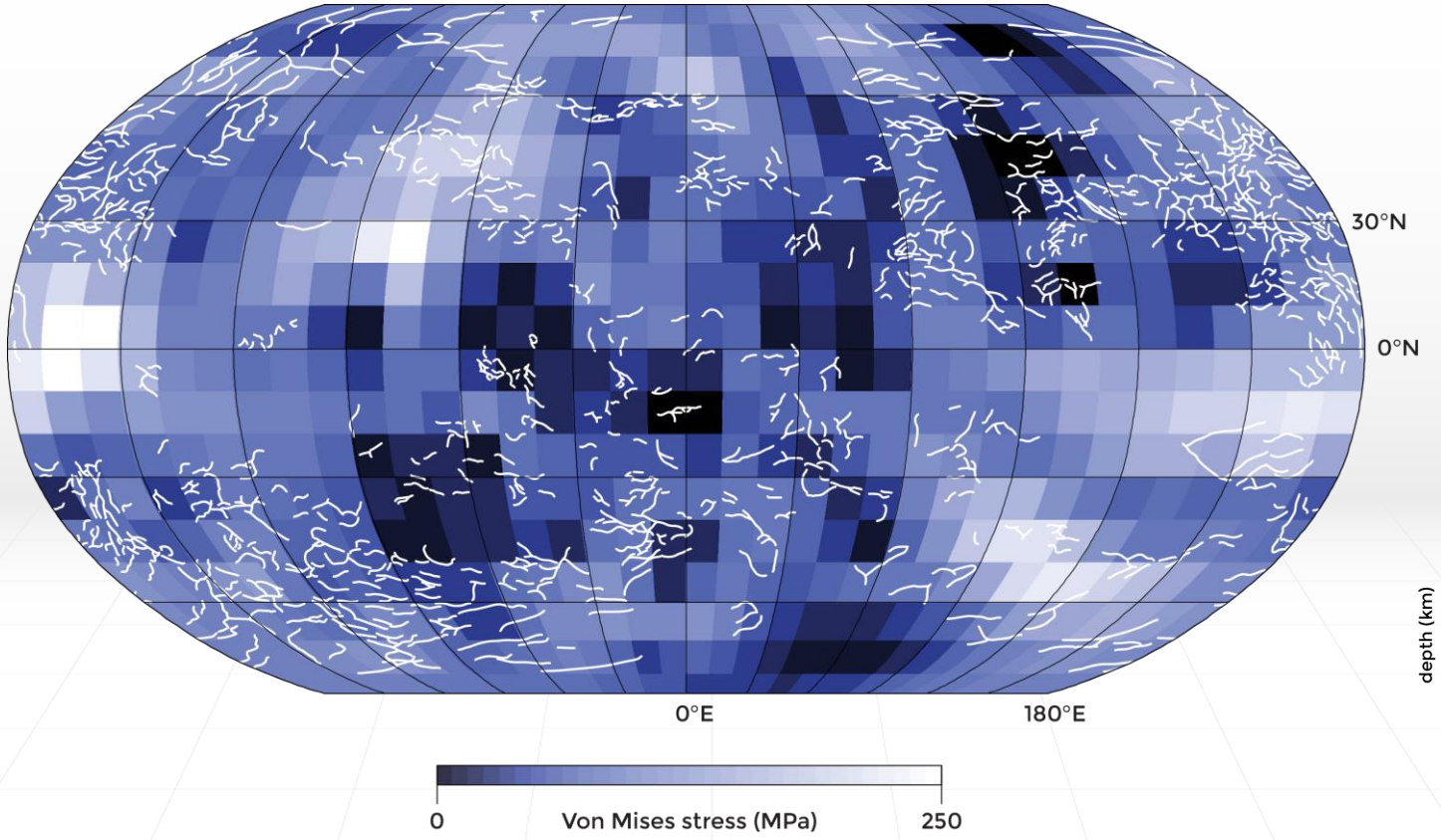
mantle stresses likely **exceed the strength** of the lower crust

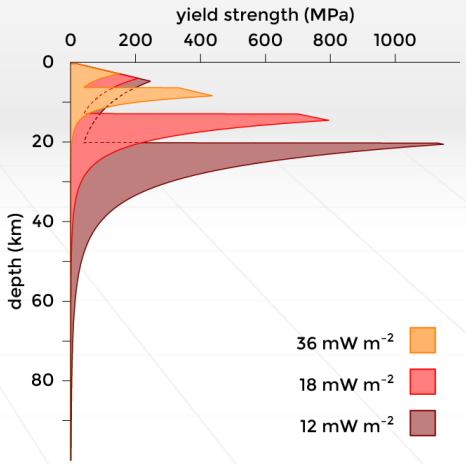




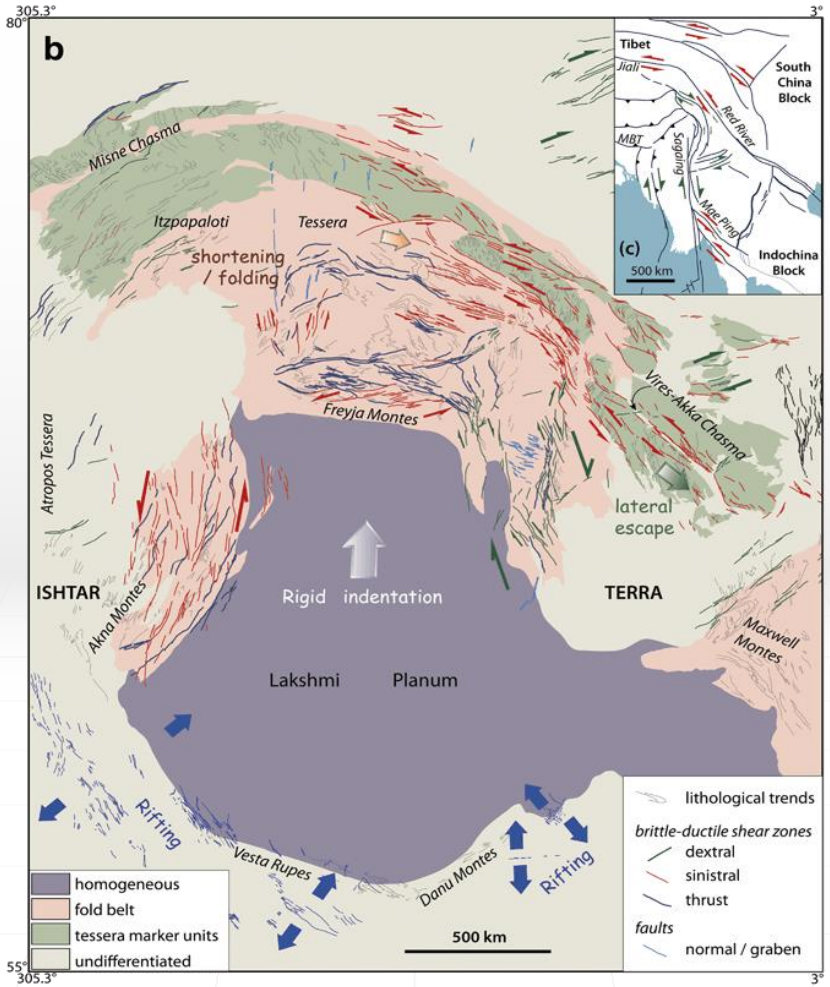
mantle stresses likely **exceed the strength** of the lower crust







such motion (though at a much larger scale) **is invoked elsewhere** on Venus

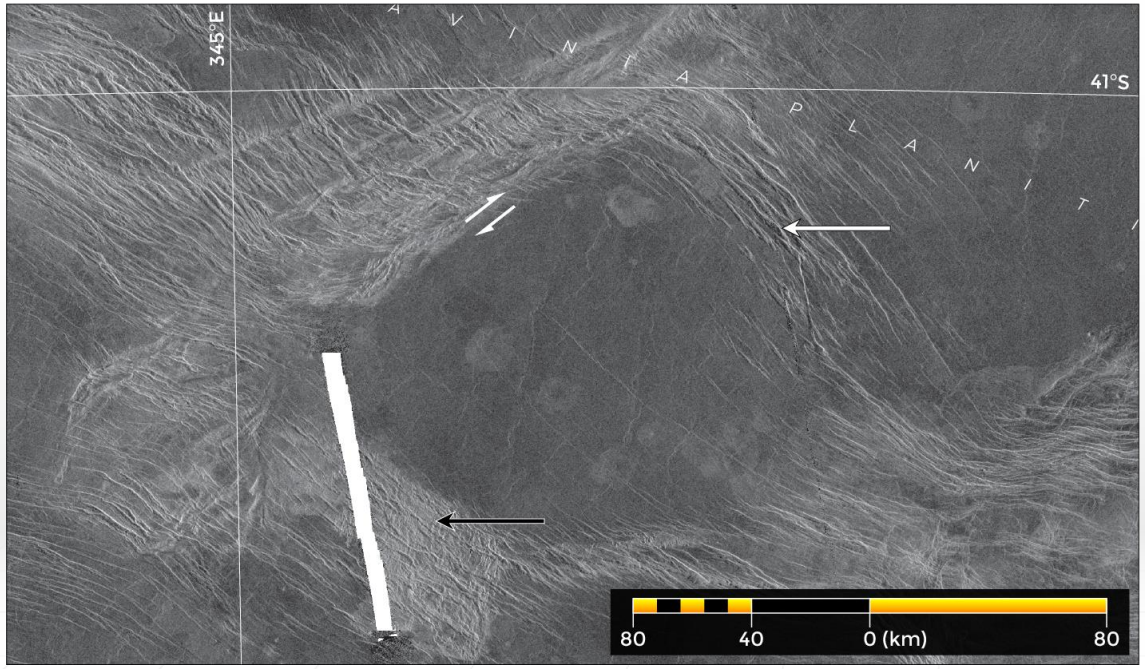


Harris & Bédard (2014) | *Dilek & Furnes* (eds.)

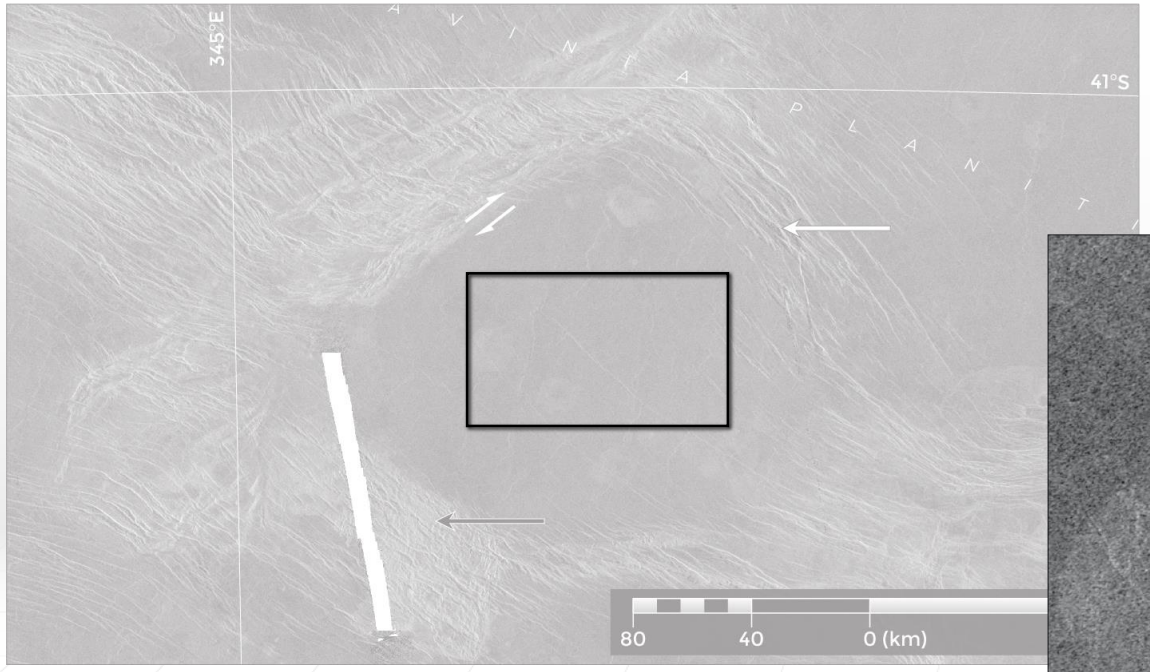
this phenomenon could be tested by **SAEVe lander(s)**

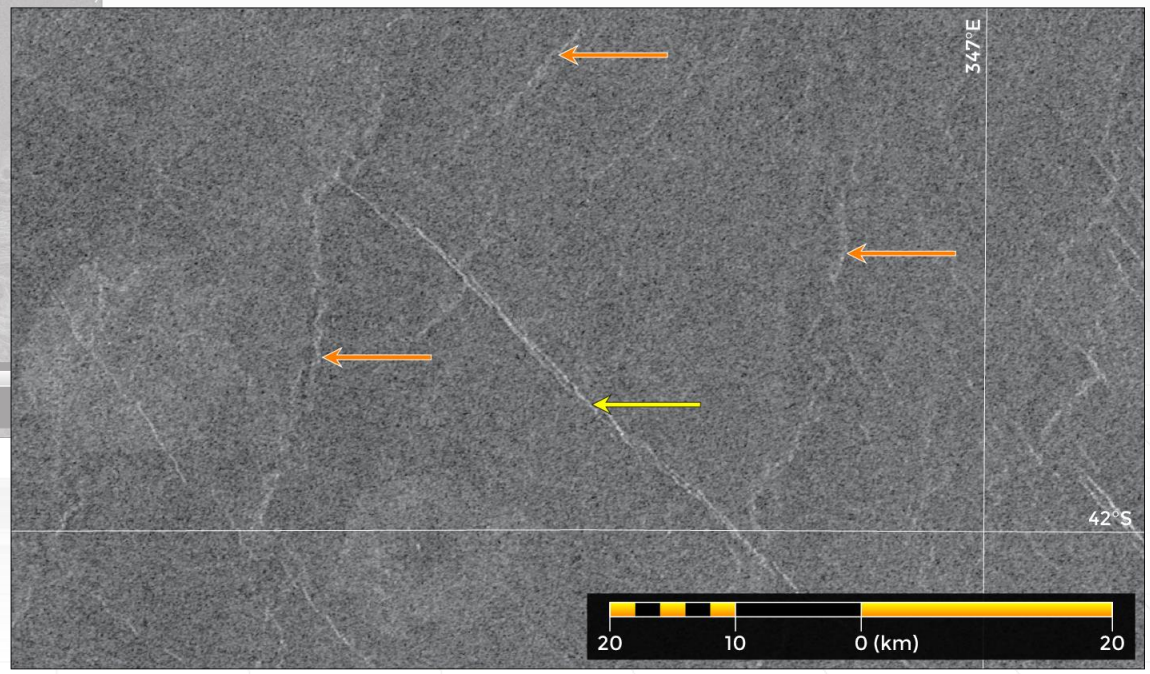
NASA Glenn

in places, this tectonic deformation **post-dates local plains** emplacement



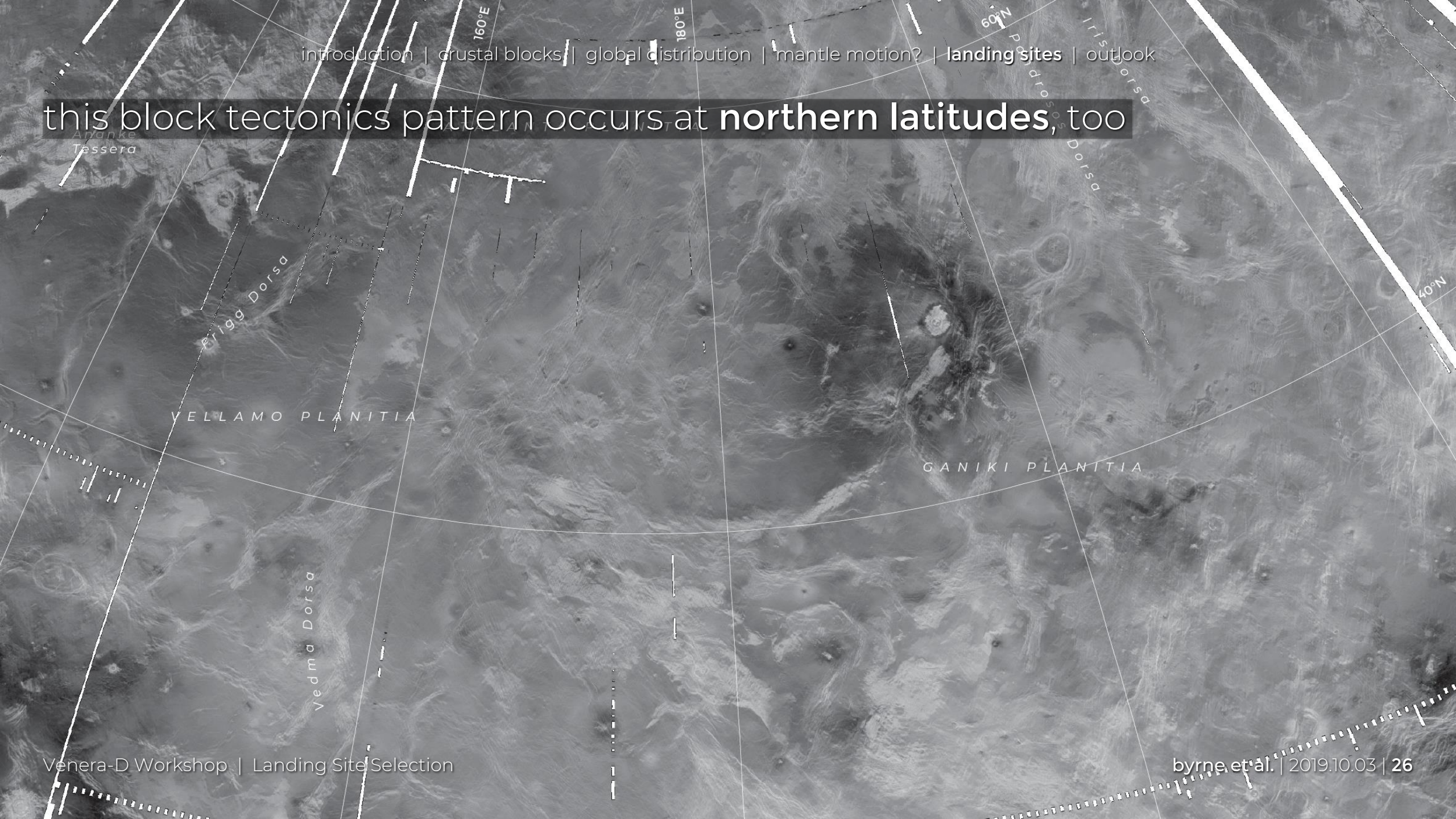
in places, this tectonic deformation **post-dates local plains** emplacement



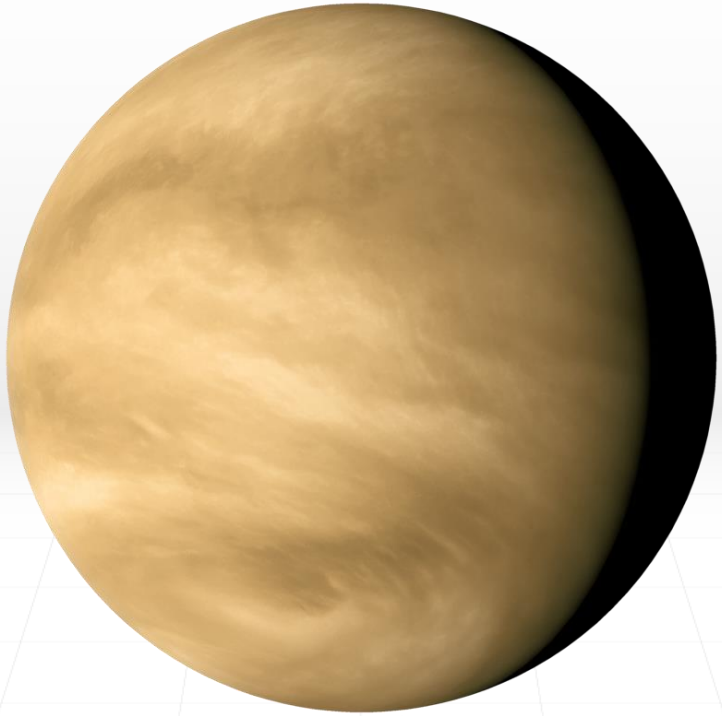


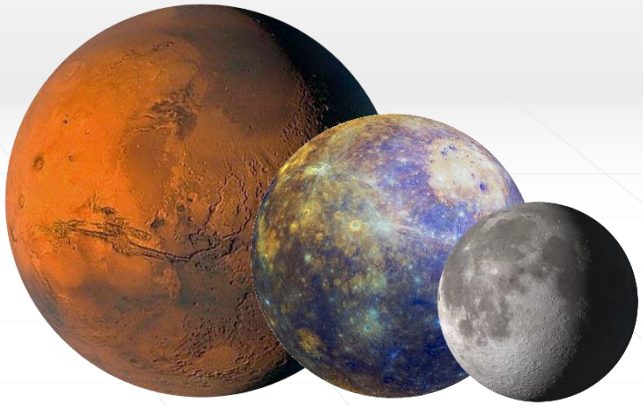
one or more SAEVes in **Lavinia Planitia** could search for **ongoing motion**

this block tectonics pattern occurs at **northern latitudes**, too

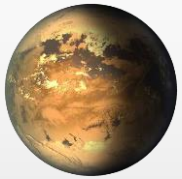


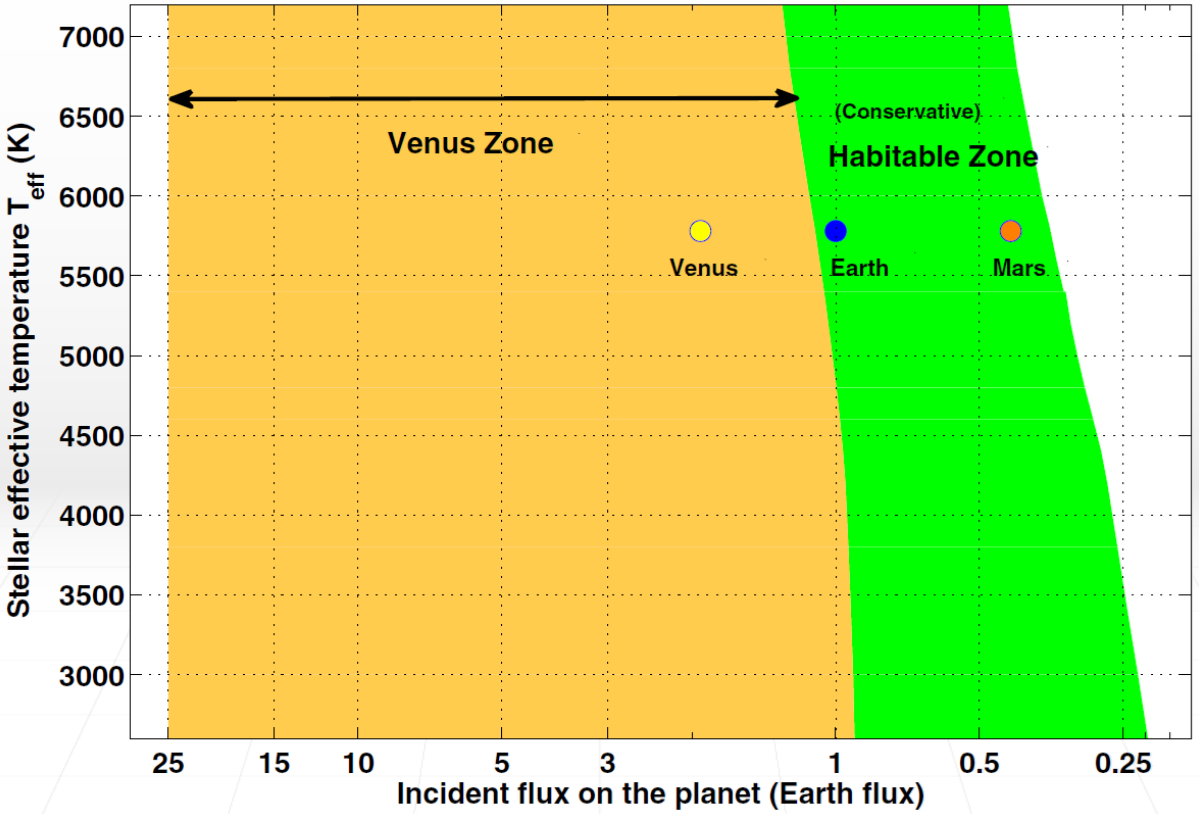
there is **more surface mobility** on Venus than has been recognized





our neighboring planet could also inform **exoplanetary studies**





Kane *et al.* (2014) | *Ap. J. Lett.*

some **concluding remarks:**

- the Venus lithosphere has broken into **discrete, mobile, crustal blocks**
- some of this deformation took place **after local plains emplacement**
- the deployment of one or more **SAEVes** could search for ongoing motion
- so too could a **seismometer-equipped main lander** if landed in the plains