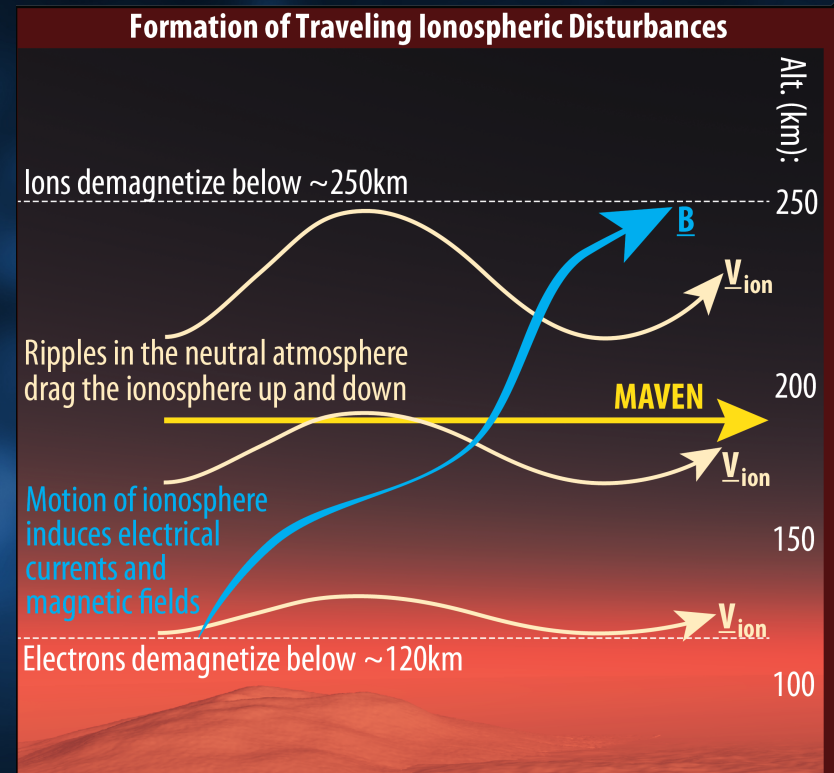


# MAVEN Discovers Traveling Ionospheric Disturbances at Mars

The ionosphere is the region of Mars' upper atmosphere that contains charged particles. How is the ionosphere affected by atmospheric waves generated in the neutral lower atmosphere of Mars?

- MAVEN has made the first detection of Traveling Ionospheric Disturbances (TIDs) at a planet other than Earth. These measurements provide direct observations of coupling between the lower and upper atmosphere of Mars.
- Like ripples in a pond, density waves form in the neutral lower atmosphere and propagate upwards. MAVEN data show that these large waves (100 km) drag the ionosphere around to create TIDs. This dragging motion occurs in the region of the atmosphere where the ions are demagnetized, meaning they are no longer tied to the magnetic field and can move freely.
- TIDs are observed at Earth using remote sensing observations, but the thinner atmosphere of Mars makes it much easier to study with *in situ* measurements because this region is accessible to spacecraft given the lesser degree of atmospheric drag.
- The discovery of TIDs at Mars allows us to better understand a fundamental ionospheric phenomenon that is also occurring at Earth.



Collinson et al. (2019), *GRL*