
Terrestrial Planet Atmospheres are Connected to Their Interiors

Laura Schaefer (Stanford University)

Volatiles like H, C, and N appear to be concentrated in the atmospheres and hydrospheres of terrestrial planets, but a surprising fraction of these elements can be found locked in different phases throughout the planet's crust and interior. In the hydrosphere and crust, volatiles are found in liquid form, dissolved in solvents, and locked in low temperature minerals. Within the interior, these elements are found dissolved in solid and liquid silicate phases and may also be sequestered in metallic and sulfide phases in the planet's core. Exchange of volatiles between these different reservoirs occurs throughout a planet's evolution, from magma oceans during planet formation to deep volatile cycles throughout the planet's geologic lifetime. Fluxes of volatiles into and out of the mantle play a key role in the stability of habitable conditions at the surface on geological timescales. In this talk, I will review atmosphere-interior volatile exchange on Earth, Venus, and Mars and recent applications to exoplanets, from rocky planets to sub-Neptunes.