

# IS ANYONE? HOME?

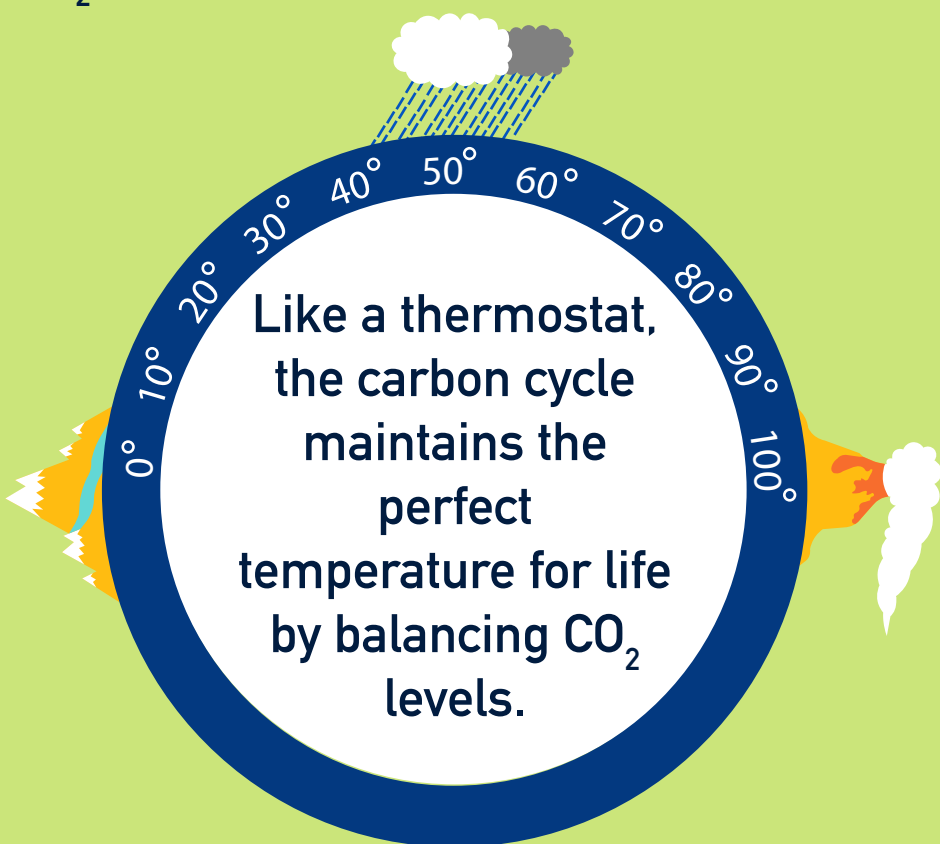
Your guide to exoplanet habitability  
(for life as we know it)



## SURFACE

### CARBON CYCLE FEEDBACK

This process, which involves volcanoes, oceans, atmosphere, geology and other factors, **controls how much carbon dioxide (CO<sub>2</sub>)** is in the atmosphere.



As a **greenhouse gas**, it directly affects how much of the star's heat the atmosphere retains.

### PLATE TECTONICS

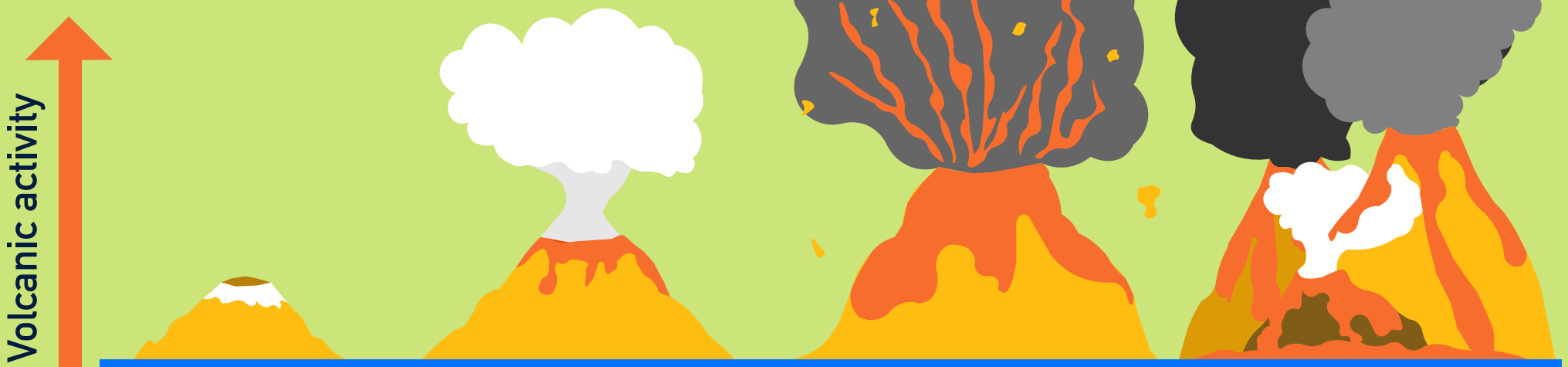
As the plates move into the planet's interior, they carry important **elements** that have **settled on the seafloor**.



These elements are then **brought back to the surface** by volcanic activity and the creation of new plates.

### VOLCANISM

Volcanoes bring important elements like CO<sub>2</sub>, nitrogen and water from deep within a planet to the surface in a process called **mantle outgassing**. Not only are these **elements important for life**, but as a greenhouse gas CO<sub>2</sub> also helps the atmosphere retain heat.



Without volcanic activity putting CO<sub>2</sub> in a planet's atmosphere, it will likely be **too cold for life**.

The **right level** of volcanic activity **supports life** by delivering important elements to the surface.

With **too much ash** in an atmosphere, **sunlight could be blocked** from the surface, affecting life.

At 1-10 million times Earth's current volcanic activity, **lakes of lava** may form on the surface.

### SOURCES

Based on "Impact of Space Weather on Climate and Habitability of Terrestrial Type of Exoplanets," Airapetian et al. (2019).  
Specific contributions from Ravi Kumar Kopparapu, Wade Henning and Joshua Schlieder.

