Geophysical Research Abstracts
Vol. 12, EGU2010-985-1, 2010
EGU General Assembly 2010

Characterizing the First Potentially Habitable Super-Earths

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We present models for rocky Super-Earth atmospheres and derive detectable features in transmission and emergent spectra for future space- and ground based telescopes like the James Webb Space Telescope and ELT, explore the effects of tidal locking and discuss the importance of geological cycles. The observational features of the planet are used to derive observable quantities to examine if our concept of habitability is correct.

We present visible/infrared spectral fingerprints of Earth-like planets in the Habitable Zone, using coupled 1-D photochemical climate calculations and account for the existence and evolution of chromospheric and coronal activity. As a specific example, we show under which condition the recently discovered M-dwarf planet Gl581 d is potentially habitable (Kaltenegger, Segura & Mohanty).

While many uncertainties remain (as will be discussed), our calculations attest to the potential for the habitability of, and detection of biosignatures on super-Earths, and rocky planets around very low mass stars.