Super-Earths & Life Group

L. Kaltenegger^{1,2} arvard-Smithsonian Center for Astrophysics, Cambridge, USA @cfa.harvard.edu, kaltenegger@mpia.de ¹ MPIA, Heidelberg, Germany, also ² Harvard-lkaltenegger@cfa.harv

Postdocs: Y. Miguel¹, A. Zsoms

PhDs: S. Hedge¹, S. Rugheimer²



Different evolution state / age / mass / etc.

THE TEST: GRID of Spectra of different planets Exoplore underlying physics Unique? - Detectable? - Inst. requirements - Retrieval from data?

OVERVIEW

Scope: of the Research EN Group lead by Lisa Kaltenegger based at the MPIA, is focused on the characterizing extrasolar planets, with a strongly interdisciplinary component. Its focus is to model habitable rocky exoplanets atmospheres and detectable spectral features ranging in mass from several Earth masses (Super-Earths) to Earths.

Tools: We use and expanding an established, self consistent 1D climate, atmospheric and radiative transfer codes as a powerful tool to explore the underlying physics of the atmosphere of rocky exoplanets.

Goal: Atmospheric characterization of such Super-Earths, will allow us to explore the condition on the first detectable rocky exoplanets and potentially characterize the first detectable Habitable Exoplanet.

FUTURE GROUND- & SPACE-BASED OBSERVATIONS

Transmission and emergent spectra of terrestrial exoplanets may be obtained in the near future with the same techniques that have successfully provided spectra of Earth and extrasolar giant planets (EGP).

Emergent spectra of rocky planets in the HZ are dominated by reflected starlight in the visible to near-IR and thermal emission from the planet in the mid-infrared, while transmission spectra result from starlight that is filtered through the planet's atmosphere. Such spectroscopy provides molecular band strengths of multiple transitions (in absorption or emission) of a few abundant molecules in the planetary atmosphere.

Spectra of Super-Earths like GI581d which can characterize a planet and explore indicators of biological activities in the planet's atmosphere may be observed by future ground- and space-based telescopes such as the Extremely Large Telescope (E-ELT) and the James Webb Space Telescope (JWST) in the near future.





Fig. Some recent results (left lower corner: artist impression of the HZ indicating the planets in our Solar System as well as in the GI581d system)





Contact: Lisa Kaltenegger, MPIA, Koenigstuhl 17, Heidelberg, D 69117, Germany e-mail: lkaltenegger@cfa.harvard.edu, kaltenegger@mpia.de, Tel: +49-6221-528-446 also CfA, MS-20, 60 Garden Street, Cambridge, MA 02138, USA Tel: +1-617-495-7158 webpage: http://cfa-www.harvard.edu/~lkaltenegger

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