

Spectral Fingerprints of a Habitable Planet. Siddharth Hegde^{1,2}, Lisa Kaltenegger¹, and Lynn Rothschild³, ¹Carl Sagan Institute, Cornell University, Ithaca, NY 14853, shegade@astro.cornell.edu, lkaltenegger@astro.cornell.edu; ²Cornell Center for Astrophysics and Planetary Science, Cornell University, Ithaca, NY 14853; ³NASA Ames Research Center, Moffett Field, CA 94035, lynn.j.rothschild@nasa.gov

Abstract: We explore the spectroscopic signatures of Earth-like planets by modeling the observable spectra of a rocky planet for a diverse range of surface features for a present-day Earth atmosphere. This work builds upon previous studies [1] by considering atmospheric characteristics whose spectral features can be used to imply habitability or the presence of life. In addition, we include a diverse range of surface characteristics that are indicative of life, a dataset that was recently added to the literature, in our analysis [2], as well as surface features that are reminiscent of environmental conditions that support extreme forms of life on Earth. Our results will be useful to not only help identify potentially detectable biosignatures on different planet types but will, in addition, help quantify the detectability of life on a wide range of worlds, which can be used to prioritize time-intensive follow-up observations. Such results will be useful to both optimize our search strategy for life on exoplanets as well as to guide the design of near-future proposed instruments.

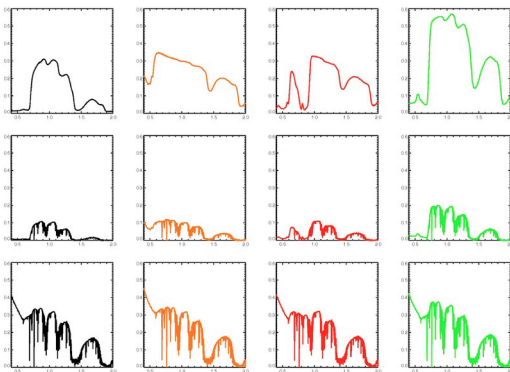


Fig. 1: Some sample reflectance spectra for four sample organisms, (top) surface only [2], (middle) with present-day atmosphere, (bottom) with 60% cloud-coverage like Earth [3].

References:

- [1] Kaltenegger, L., Traub, W. A., & Jucks, K. W. (2007), *ApJ*, vol. 658, no. 1, pp. 598-616.
- [2] Hegde, S., Paulino-Lima, I. G., Kent, R., Kaltenegger, L., & Rothschild, L. (2015), *Proc Natl Acad Sci*, 112, 3886
- [3] Hegde, S., Kaltenegger, L., & Rothschild, L. (2017), in prep.