Exploring colors of extreme exo-Earths: Prioritizing rocky exoplanets for potential habitability. Siddharth Hegde[1,2] and Lisa Kaltenegger[2], [1]Max Planck Institute for Astronomy, [2]Institute for Pale Blue Dots, Department of Astronomy, Cornell University.

Abstract: Close to two thousand exoplanets has now been discovered and this number is expected to rise substantially over the coming years. Recent population studies suggest that the smaller planets are prevalent in our galaxy. The next generation of space- and ground-based instruments will provide the first opportunity to characterize rocky planets, but will have limited observation time available, and therefore it is critical to prioritize exoplanets for follow up characterization.

In this work, we use low-resolution broadband filter photometry in the visible to near-infrared portions of the electromagnetic spectrum to explore how color-color diagrams can help in prioritizing potentially habitable planets for detailed follow up. This work builds upon our previous study [1] by including a diverse range of 137 surface biota, a dataset that was recently added to the literature [2], to our analysis.

We show that color-color diagrams are a useful tool to differentiate types of planets as well as help prioritize exoplanets for spectroscopic characterization [3], and point out potential false positives based on the color of solar system planets.

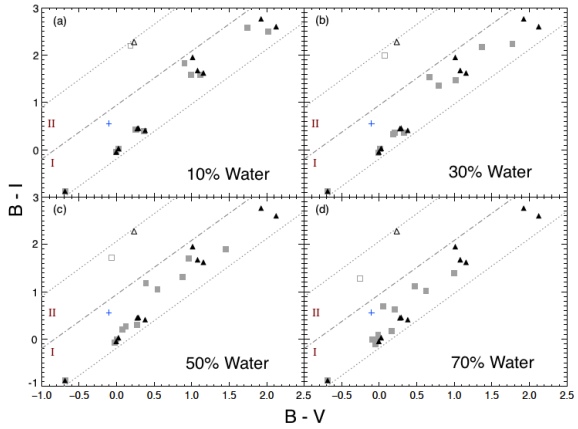

Fig. 1: Color-color diagrams and water. Filled triangles represent a planet completely covered by a particular surface. Filled squares denote the case when the planet is (a) 90%, (b) 70%, (c) 50%, and (d) 30% covered by a particular surface with the rest being liquid water. Trees are shown as unfilled triangles (complete coverage) and squares as reference to other vegetation red edge studies. The blue data point represents present-day Earth. Region I defines the area of extreme Earth surfaces; region II includes surface vegetation for non-extreme forms of life.

References: [1] Hegde S. and Kaltenegger L. (2013) *Astrobiology, 13,* 47-56. [2] Hegde S. et al. (2015) *Proc Natl Acad Sci USA,* in press. [3] Hegde S. and Kaltenegger L. (2015) *ApJL,* in prep.