WE NEED TO CHANGE HOW WE DISCUSS EXOPLANET METRICS. Elizabeth Tasker[1] , Joshua Tan[2], Kevin Heng[3], Stephen Kane[4] and David Spiegel[5], [1]Institute of Space and Astronomical Science, Japan Aerospace Exploration Agency, Yoshinodai 3-1-1, Sagamihara, Kanagawa, Japan, mail:elizabeth.tasker@jaxa.jp, [2]Instituto de Astrofísica, Pontificia Universidad Católica de Chile, Santiago, Chile, [3]University of Bern, Center for Space and Habitability, Sidlerstrasse 5, CH-3012, Bern, Switzerland, [4]Department of Physics & Astronomy, San Francisco State University, 1600 Holloway Avenue, San Francisco, California 94132, [5]Analytics & Algorithms, Stitch Fix, San Francisco, California 94103.

The discovery of extrasolar planets with similar radii and mass to the Earth has opened the door to scientific debate about the likelihood that such worlds could be habitable. This has recently resulted in the formulation of metrics to rank planets most likely to have conditions suitable for life. Such quantitative assessment has been proposed for target selection, to ensure the best use of the limited resources available for further observations. However, the results from these metrics are frequently over-extended, both by the popular media and even in scientific literature.

Discussions regarding the `most habitable' planet or `Earth's twin' in combination with the result from such a metric, have made repeated headlines in the last few years. However, the reality is that we have no way to quantitatively assess a planet's ability to support life. The conditions relevant to detectable biological activity are those on the planet's surface. Unfortunately, observing the surface is beyond even the most ambitious future missions, and may even be perpetually blocked from view by the planet's atmosphere. Instead, we must estimate surface conditions based on the properties we can observe at this one point in time. For the majority of exoplanet discoveries, this consists of only two independent measurements: the incident flux from the star and either the planet's radius or minimum mass. Our own Solar System is a warning against such simplicity: Earth and Venus differ in size by only 5% and the incident radiation from the Sun is within a factor of two. Extrapolation from the Earth would suggest a Venusian surface temperature of around 315 K, rather than the reality of a lead-melting 462 K. The available information is therefore both sparse and not linearly related to habitability.

Claims that metrics can measure the comparative habitability of planets are potentially extremely harmful to the field. By implying that we are able to measure the degree to which a planet is able to support life, we undermine future projects to explore factors such as atmospheric conditions. Public apathy in such areas could result in funding for these missions being ever harder to achieve and research efforts getting steadily less recognition. The way discussions of habitability are presented both in scientific journals and articles for a general audience is therefore deserving of serious recognition by the scientific community.

This talk overviews the main factors that can be potentially observed and likely have a baring on habitability, along with their limitations. Three metrics commonly used in the literature –[1] the circumstellar habitable zone, [2] the habitability index for transiting explants and [3] the Earth scalability index—will be described. Finally, we propose that a change in language might make the purpose of such metrics better understood and suggest that it is the detectability of life, rather than the probability of life itself, that needs to be the focus of any target selection scheme[4].

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