HOW MASSIVE IS THE PROXIMA CENTAURI PLANET? S.R. Kane[1], D.M. Gelino[2], M.C. Turnbull[3]
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Abstract: Exoplanet discoveries have increasingly focused on terrestrial planets as detection capabilities continue to improve. For example, the planet yield from the Kepler mission that are of primary interest are those terrestrial planets that lie in the Habitable Zone (HZ) of their host stars [1]. For non-transiting planets, the radial velocity (RV) method continues to be the primary method to detect terrestrial planets suitable for follow-up characterization.

The closest exoplanet to the Solar System was recently identified orbiting the closest star, Proxima Centauri [2]. The discovery presents numerous opportunities for studying a Super-Earth within our own stellar backyard. The associated planet was detected through a long-term RV campaign and found to have an orbital period of 11.186 days, a semi-major axis of 0.0485 AU, and a minimum mass ~30% larger than the Earth.

One of the remaining ambiguities of the discovery is the true mass of the planet since the RV detection does not reveal the orbital inclination. In this presentation we describe the effect of orbital inclination on the Proxima Centauri planet, in terms of mass, radius, atmosphere, and albedo. We provide calculations of the astrometric, angular separation, and reflected light properties of the planet including the effects of orbital eccentricity. We further provide dynamical simulations that show how the presence of additional terrestrial planets within the Habitable Zone varies as a function of inclination. Finally, we discuss these effects in the context of future space-based photometry and imaging missions that could potentially detect the planetary signature and resolve the inclination and mass ambiguity of the planet.

References:

[1] Kane, S.R., Hill, M.L., Kasting, J.F., et al. 2016, ApJ, 830, 1

[2] Anglada-Escude, G., Amado, P.J., Barnes, J., et al. 2016, Nature, 536, 437

[3] Kane, S.R., Gelino, D.M., Turnbull, M.C. 2017, AJ, 153, 52