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Formation and stability of habitable moons around extrasolar giant planets

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Since the discovery of planets in other systems, the question of whether these extrasolar planets are habitable has become relevant and addressable. However, it has been observationally difficult to catch an Earth-sized planet in the habitable zone. On the other hand, RV observations have shown large amount of giant planets exist in the habitable zone. In this paper, we focus on the exomoons around these extrasolar gas giants.

Williams et al. (1997) estimated the lower limit of satellite's mass to be habitable as 0.1-0.2 Earth masses. We examine the formation and orbital stability of satellites that has these masses around gas giants in the habitable zone. We showed the satellites tend to be rocky ones because of the high temperature profile of circum-planetary disks for massive gas giants. We also showed the orbits of these satellites are stable against type II migration of central planets and long-term tidal effect from the planets. Therefore, extrasolar giant planets in the habitable zone have a high probability of bringing "habitable moon" with.

Keywords: habitable moon, exoplanet, exomoon, satellite formation, orbital stability