

Habitability of ice-covered ocean planets with high-pressure ices

*Takanori Sasaki¹, Shoji Ueta²

1. Department of Astronomy, Kyoto University, 2. Graduate School of Advanced Integrated Studies in Human Survivability, Kyoto University

Since the first discovery in 1995, over 3,700 exoplanets have been identified so far. Some of them are known to be located in the habitable zones around the central stars. Planets with plentiful water on the surface but outside the outer edge of the habitable zone would be globally covered with ice and no liquid water would exist on the surface. However, these “snowball planets” would have liquid water beneath the surface ice shell if sufficient geothermal heat flows up from the planetary interior to melt the interior ice. We discuss the conditions that must be satisfied for ice-covered ocean planets to have an internal ocean on the timescale of planetary evolution. We also investigate the structures of surface H₂O layers of snowball planets by considering the effects of high-pressure ices. We found high-pressure ice layers underlying the internal ocean are likely to affect the habitability of the planet.

Keywords: exoplanet, habitability, ocean, ice