

Formation of extraterrestrial oceans: Cradles of life

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As one of research groups on "Astrobiology in the Solar System" (a proposal submitted to MEXT), our group will study the origin of icy satellites around giant planets, and the origin and evolution of the interior ocean(s) of those icy bodies and their universality. Outside the so-called snowline of H₂O, the mass of protoplanets could be large enough to collect surrounding gas rapidly to form massive gaseous giant planets. Icy satellites would have been formed or trapped by the circumplanetary gas disks around giant planets. In multisatellite cases, orbital resonances may stabilize satellite migration and tidal dissipation would provide heat for sustaining interior oceans. Even when surface temperature is lower at a further distance from the sun, additional ice component (NH₃, CH₄, CO, etc.) would decrease the melting temperature. As a result, the more extended condition for presence of liquid water can be considered in comparison with the conventional habitable zone (with surface water).

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