

Formation of Earth-Moon system and Moon's effect on Earth's obliquity

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Formation of Earth-Moon system in the course of solar system formation is reviewed. Probability of Moon formation and dynamical effects of Moon on obliquity of terrestrial spin are also discussed.

Earth is formed by coagulation between protoplanets that are formed through runaway growth. Kokubo and Ida (1998, 2000, Icarus) showed that protoplanets have masses of Mars (0.1 Earth mass). The protoplanets become isolated when they acquire such masses. They, however, start orbital crossing and mutual collisions

when nebula gas is depleted to some extent (Kominami and Ida 2002, Icarus). As a result, Earth is formed. Moon formation is a by-product of a collision between protoplanets (giant impact hypothesis). Giant impacts do occur, but they do not necessarily produce a large satellite like Moon. The probability of forming a large satellite like Moon is discussed.

Moon's gravity precess terrestrial spin axis. The precession may control evolution of obliquity of Earth (Laskar et al. 1993, Nature). The obliquity should affect global climate of Earth. Obliquity change of Earth according to tidal orbital evolution of Moon is discussed.