

Synestia

A **synestia** is a hypothesized rapidly spinning donut-shaped mass of vaporized rock. In computer simulations of giant impacts of rotating objects, a synestia can form if the total **angular momentum** is greater than the co-rotational limit.^[1] Beyond the co-rotational limit, the velocity at the equator of a body would exceed the orbital velocity.^[2] In a synestia, this results in an inner region rotating at a single rate with a loosely connected torus orbiting beyond it.^[3]

According to studies, synestia was an early-stage process for the formation of the **Earth** and **Moon** within the **giant-impact hypothesis**. In this model, a synestia formed following a collision with an object of high energy and high angular momentum. As the resulting synestia cooled, droplets formed in its outer layers and then rained inward. Mass remaining outside the **Roche limit** of the inner region accreted to form moonlets, and subsequently combined to form our moon. The Earth re-formed later, once the synestia had cooled sufficiently to fall within the co-rotational limit. By this model, the Moon's having formed within a cloud of vapor that originated from the Earth is why its isotopic ratios are similar to those of the Earth. The later formation of the Earth (after the synestia cooled) accounts for its having accreted more volatile elements than the Moon.^[4]

Notes and references

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