

ORIGIN OF THE MOON: ICY IMPACTOR MODEL (IIM)

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Introduction: Of the prominent hypothesis regarding the origin of the Moon the ‘Giant Impact’ model in which a Mars like planetesimal impacts a young proto-Earth forming the Moon is generally accepted as the most plausible [1],[2]. The model readily explains the nearly identical petrology of the Earth and the Moon, with one key problem; what happened to the Impactor [2]? Computer simulations indicate that the Moon should be enriched with residual isotopic signatures of the impactor, and should not be so identical with the Earth [3].

What we term the ‘Icy Impactor Model’ or IIM resolves the missing oxygen isotope anomaly and will firmly establish the Impact Model as the creation mechanism for the Moon, as well as being the source of water on our planet. The impacting planetesimal is an icy body, one with an iron-nickel core (12%) surrounded by an icy-rocky outer core (38%) and with a predominantly icy mantle (up to 50% of the mass). During the impact most of the Impactor’s core would settle and merge with the Earth’s core which is consistent with current computer models [3]. The smaller fraction of rocky material and its proximity to the Impactors core easily explains the absence of the Impactor’s signature in the lunar samples.

An object of this type would have originated beyond the ‘frost line’ of the Solar System, somewhere near Jupiter. Given this location the Impactor would have substantially more kinetic energy than the current computer models use. The large fraction of ice in the Impactor would have a ‘quenching effect’ during the collision, being capable of removing up to a third of the kinetic energy through the conversion of ice to steam. The volume of steam (some 80,000 times our current atmosphere) would outgas generating a massive coma around the Earth. The drag on the proto Moon through this coma would damp the eccentricity of the orbiting particles stabilizing the Moons orbit into the nearly circular one that we observe today. The loss of Impactor mass to outgassing allows the proto-Earth to be more massive and the Impactor to have more initial kinetic energy than the models now use.

The IIM also provides the answer to the mystery of the origin of water on the Earth [4]. The Earth’s water is the residual signature of the Impactor. The Icy Impactor delivers in one blow nearly 300 times the mass of water that is currently in all of our oceans. The Icy Impactor with all of its destructive energy leaves the Earth with a Moon and its oceans.

References: [1] Hartmann, and Davis,(1975) Satellite sized planetesimals and lunar origin. *Icarus*, 24, April 1975. [2] Taylor, (2001) *Solar System evolution, a new perspective, an inquiry into the chemical composition, origin and formation of the solar system*. Cambridge University Press. 1998, 2001. [3] Cameron, (1988) Giant impact theory origin of the moon. *Planetary Geosciences* 1988. [4] Morbidelli, et al, (2000) *MaPS*, 35, 2000, S. 1309.