

Origin and evolution of Moon

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The ABEL model, newly proposed to discuss the history of the Moon. The core of this new model is characterized by two steps: (1) a Dry-Earth Moon system formed at 4.53 Ga, and (2) ABEL Bombardment, which delivered volatiles to the Moon's interior and atmospheric and oceanic components to the Earth at 4.37-4.20 Ga with the minor bombardment continuing up to 3.9 Ga. During the ABEL Bombardment, asteroids bombarded the nearside of the Moon, selectively causing frictional mantle heating down to the deep mantle. The largest impact at around 4.37 Ga resulted in such effect even at Aitken on the opposite side of the Moon through mantle to the surface, which included the transferal of volatiles into the deep mantle and lowering the viscosity of the hydrated mantle. About 200 million years after the bombardment, the mantle rebounded upwards to generate a series of basalts within the craters. This kind of rebound did not occur on the farside because bombardment was less on the farside.

A new model of the history of the Moon includes the following seven major events: (1) giant impact to form the Moon-Earth system; (2) formation of a magma ocean and its consolidation; (3) injection of water into the Moon through 4.37-4.20 Ga ABEL Bombardment; (4) widespread isostatic-rebound magmatism over the Procellarum KREEP Terrane (PKT) on the nearside Moon (extension on the nearside caused compression on the farside by thrusting); (5) strong magnetism; (6) Copernican bombardment; and (7) gaseous eruption combined with Moonquakes up to now.

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