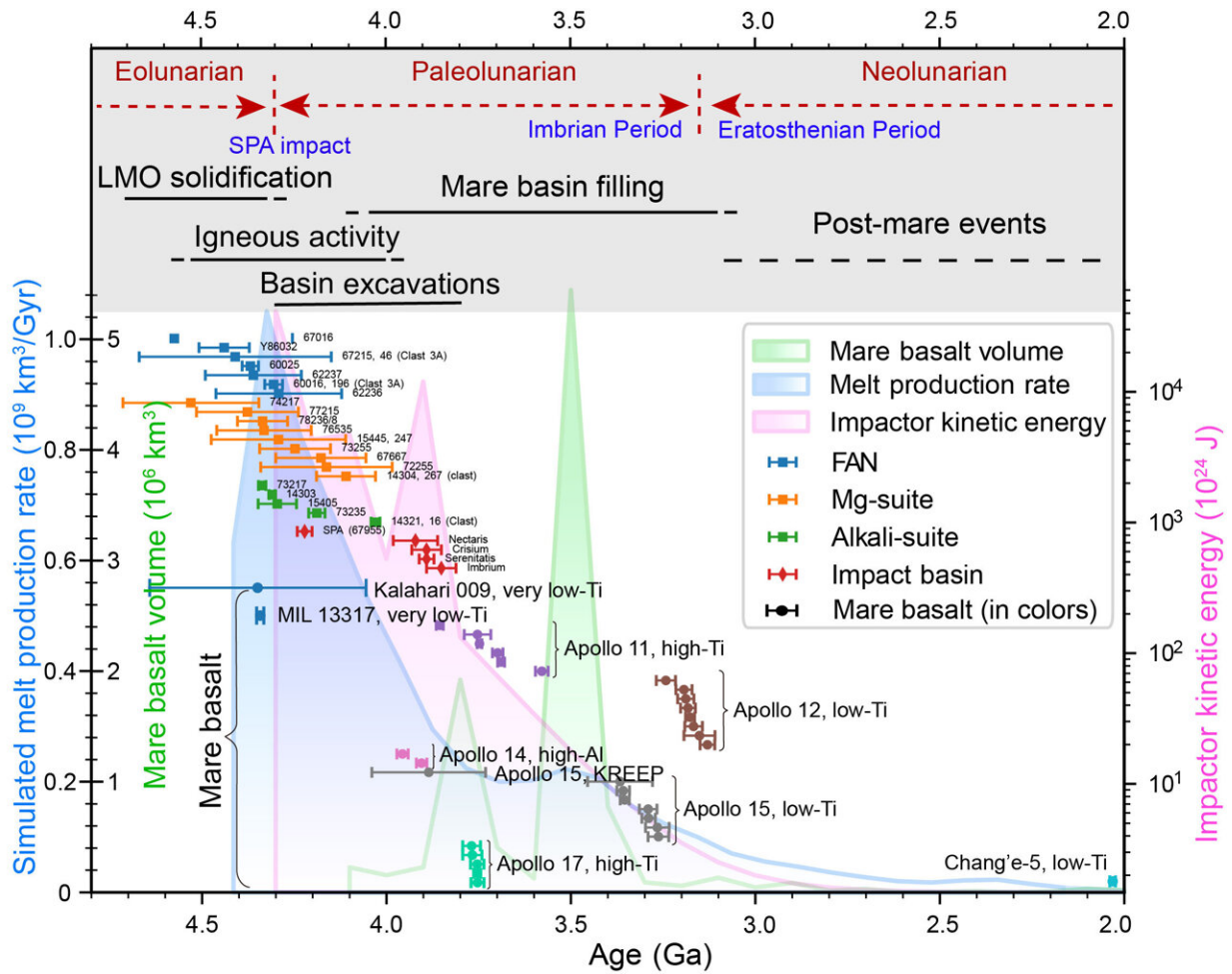


# Scientists propose an updated time scale scheme of the Earth's moon

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Evolution of endogenic processes is indicated by simulated melt production rate and mare basalt volume. Evolution of exogenic process is indicated by impactor kinetic energy. The points represent ages of lunar samples produced from different geologic processes. The three evolution phases are designated as Eolunarian, Paleolunarian, and Neolunarian from old to young. Credit: Science

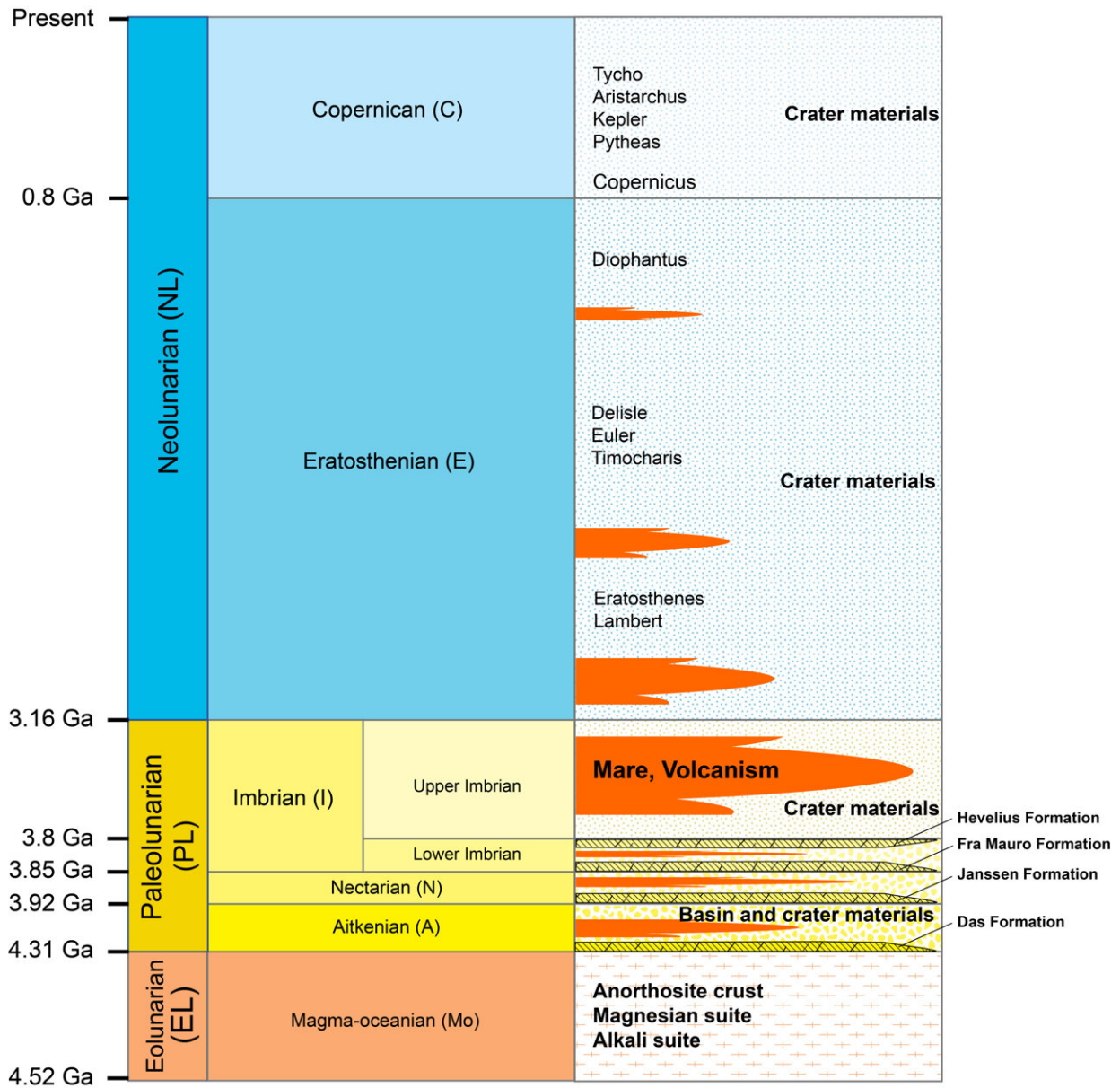
The moon's evolutionary history is divided into three distinct phases based on the temporal interplay of exogenic and endogenic processes in altering the moon. These phases are defined as Eon-level time scale units, which provide insights into the temporal dynamics of lunar evolution:

1. The Eolunarian Eon (4.52–4.31 Ga), refers to magma ocean formation, differentiation and the solidification of the primary crust, a phase of evolution that largely involved endogenic forces and processes.
2. The Paleolunarian Eon (4.31–3.16 Ga), characterized by comparable effects of endogenic and exogenic processes, including great impact events and significant volcanic activities.
3. The Neolunarian Eon (3.16 Ga–present), represents the era dominated by exogenic processes, characterized by reduced volcanic activities and the prevalence of impact events in modifying the [lunar surface](#).

A study led by Dr. Dijun Guo (National Space Science Center, Chinese Academy of Sciences), Dr. Jianzhong Liu (Institute of Geochemistry, Chinese Academy of Sciences), and Dr. James W Head (Brown University), has identified the ejecta stratum of the South Pole-Aitken Basin and named it "Das Formation." The work is [published](#) in the journal *Science China Earth Sciences*.

As the oldest stratum resulting from exogenic processes within the lunar crust, the Das Formation serves as the boundary between the Eolunarian and Paleolunarian Eons. By utilizing the Das Formation as a marker, the previously defined Pre-Nectarian Period is further divided into two

distinct periods: the early Magma-oceanian Period and the relatively later Aitkenian Period.



The stratigraphic column of the moon corresponding to the new time scale.  
Credit: Science China Press

The newly proposed lunar time scale scheme, consisting of three Eons and six Periods units, offers a systematic framework for describing the evolutionary history of the moon. This scheme effectively illustrates the advantages of expressing the progression, development, and transformation of both endogenic and exogenic processes that have taken place on the moon.

The scheme has been applied in the 1:2.5 million-scale lunar global geologic map compiled by the same group, and it holds significant implications for studying the geological evolution of other terrestrial planets.

**More information:** Dijun Guo et al, A lunar time scale from the perspective of the Moon's dynamic evolution, *Science China Earth Sciences* (2023). [DOI: 10.1007/s11430-022-1183-4](https://doi.org/10.1007/s11430-022-1183-4)

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