

# Researchers more precisely calculate how much faster time passes on the moon

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A team of physicists with NASA's Jet Propulsion Laboratory at the California Institute of Technology has calculated more precisely how much faster time passes on the moon than on the Earth. The paper

describing the math they used to make the calculations and their results has been [posted](#) to the *arXiv* preprint server.

Over the past decade, several entities have made clear their intentions to intensify [research](#) and [economic activities](#) on the [moon](#). Such activities have led many in the field to conclude that a standardized lunar time needs to be established—one that allows for synchronizing activities on the surface of the moon and also with those [space vehicles](#) that are in orbit around it and also in transit between the moon and the Earth.

As the research team points out, the reason such a standard needs to be created is that, as the [general theory of relativity](#) explains, time moves faster or slower depending on distortions in gravity.

The difference in size of the two bodies means that there is a difference in gravity and in the way time passes—it passes faster on the moon than on the Earth. Thus, to ensure that things like communications and docking and landing of craft that rely on high precision go off smoothly, a more precise measurement of the time differences between the Earth and the moon must be made.

The team in California has used math to calculate the difference in time passage between the Earth and moon, and also between both bodies and the solar system's barycenter.

In so doing, the team found that time on the moon ticks by at 0.0000575 seconds faster per day (57.50  $\mu\text{s}/\text{d}$ ) than it does on Earth. Based on that number, other calculations can be made—if a person were to live on the moon for 274 years, for example, they would be 5.76 seconds older than they would be had they lived on Earth all that time.

The work by the team is just the first step in establishing a standardized lunar time; meetings will have to be held between various entities to

develop agreements, ensuring that everyone involved in lunar activity is on the same timetable.

**More information:** Slava G. Turyshev et al, Time transformation between the solar system barycenter and the surfaces of the Earth and Moon, *arXiv* (2024). [DOI: 10.48550/arxiv.2406.16147](https://doi.org/10.48550/arxiv.2406.16147)

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