



# How Solar Storms Affect the Moon's Magnetic Wake

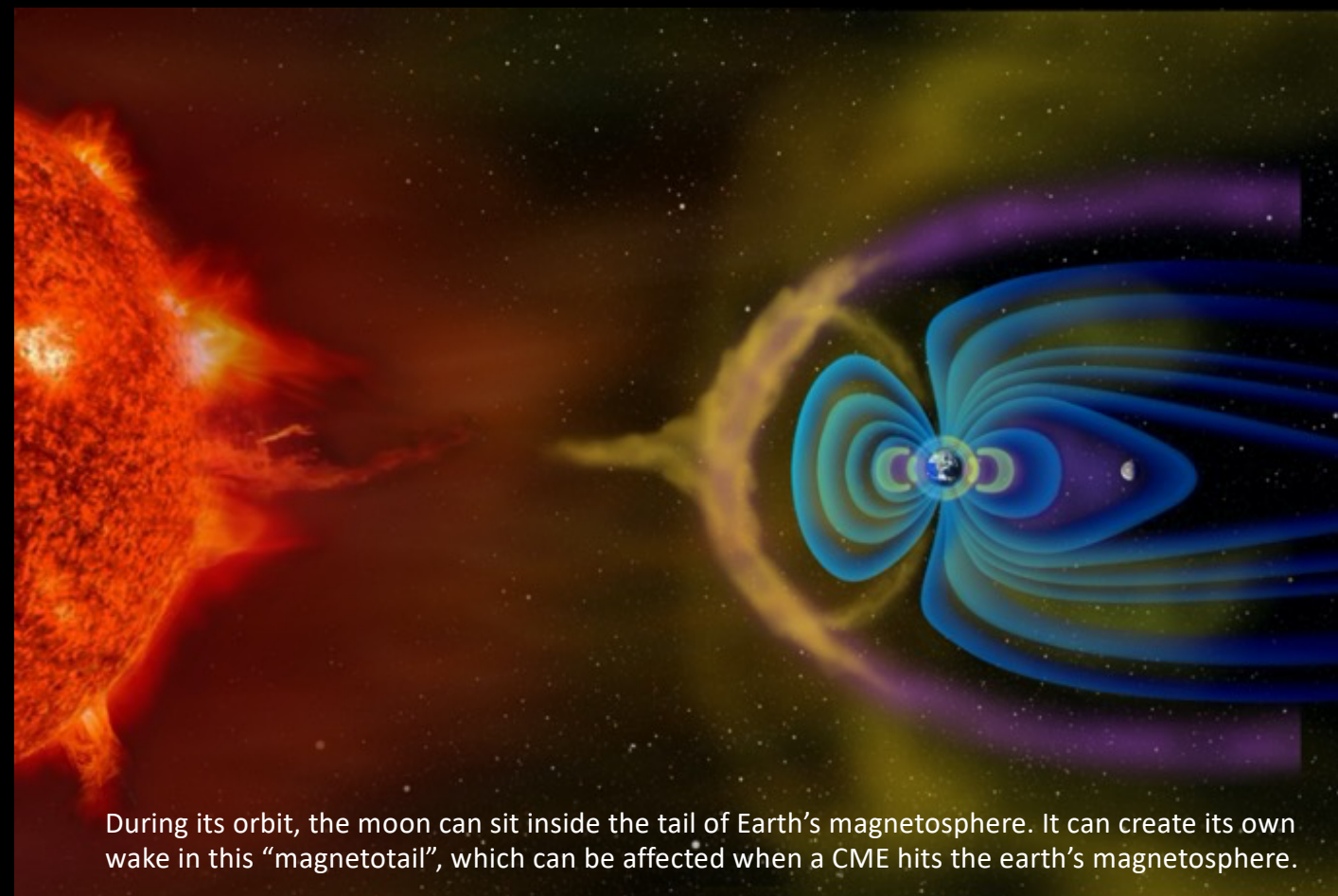


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Our planet is enveloped in a bubble of magnetism, called the magnetosphere. The solar wind presses against this bubble and stretches it, creating a long “magnetotail” behind the earth. As the moon passes through this tail, it leaves a wake in the plasma, like a boat moving through water. On March 8, 2012, a coronal mass ejection (CME) arrived at earth at the same time the moon was passing through our magnetotail. Using observations from the THEMIS-ARTEMIS and Wind spacecrafts, we modeled the impact of these events on our magnetosphere.

When the CME arrived at Earth, it distorted the magnetotail enough to move it away from the moon, leaving the lunar surface exposed to the solar wind. We also found that the CME created dynamic magnetic structures in the magnetotail near the moon, sharply altering the surrounding magnetic field in a short period of time. The moon's wake was also significantly shortened.

While the Earth's magnetosphere is often regarded as a protective shield against space weather effects, this study demonstrates that the lunar surface and surrounding environment are susceptible to the impacts of a CME while inside the magnetotail. This is especially important as NASA prepares to return to the Moon, and the safety of those astronauts and technology.



During its orbit, the moon can sit inside the tail of Earth's magnetosphere. It can create its own wake in this “magnetotail”, which can be affected when a CME hits the earth's magnetosphere.

Rasca, A. P. (695), Fatemi, S., Farrell, W. M. (695), Poppe, A. R. (NASA Ames), Zheng, Y. (674), 2020: “A Double Disturbed Lunar Plasma Wake,” *Journal of Geophysical Research: Space Physics*