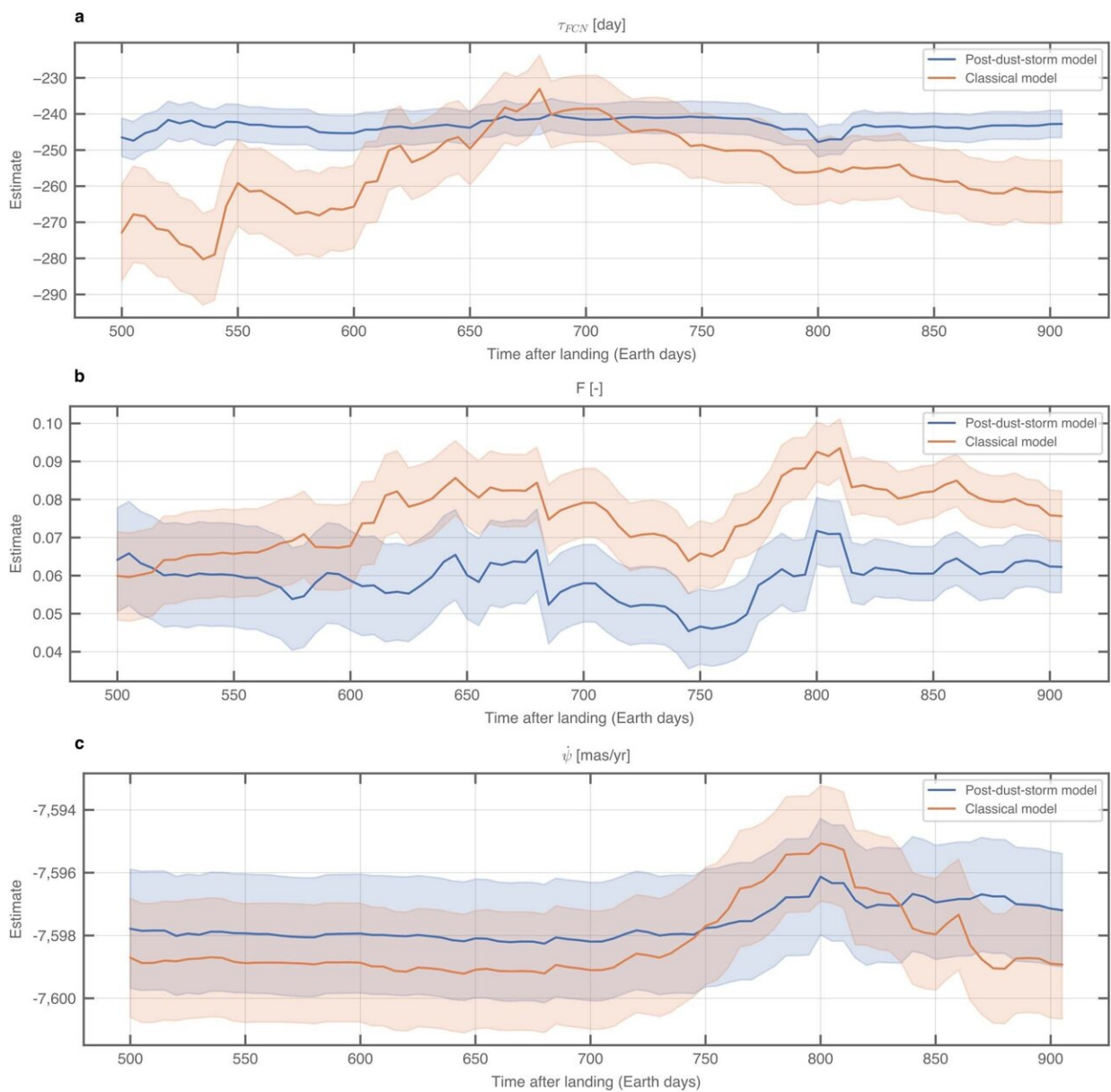


# Data from InSight suggests Mars has an all-liquid core and internal mass anomalies

June 16 2023, by Bob Yirka



Comparison between the classical model of rotation of Mars and the one proposed in this study. Temporal evolution of the 30-months solutions for the FCN period (**a**), the core amplification factor (**b**), and the precession rate (**c**), with the classical spin model (orange) and with the model with corrections on the rotation rate for the post-dust-storm period (blue). Shaded envelopes are  $1\sigma$  uncertainty bounds. Credit: *Nature* (2023). DOI: 10.1038/s41586-023-06150-0

A team of planetary scientists from Belgium, the U.S., France and Germany has found evidence from the InSight lander that suggests Mars has an all-liquid core and internal mass anomalies. In their paper published in the journal *Nature*, the group describes their analysis of data sent back to Earth from the lander.

As the research team notes, determining the interior characteristics of the solar system's [planets](#) is hindered by their inaccessibility. In this instance, they were referring to work by research teams attempting to determine the inner makeup of Mars. To date, no one has been able to show whether its core is solid or liquid, for example—a characteristic that could impact work exploring whether the planet ever harbored life.

In this new effort, the researchers focused their efforts on data from the InSight lander, which landed on Mars in 2018. It sent data from the day it landed until December 2022, when dust covered its [solar panels](#), preventing it from recharging. The researchers note that InSight had two main sensors, one that used a seismometer to measure marsquakes and other, called RISE, that sent [radio signals](#) from the lander back to Earth. Because they were able to site the [lander](#) so precisely, RISE's signals could be used to monitor the rotation of the red planet and its wobbles, both of which offered clues about the planet's interior.

The researchers found evidence in RISE DATA of what they describe as

"mass anomalies" beneath the surface of the planet. The anomalies were found to stretch from the top of the mantle to the bottom. They further note that Mars' gravity field and likely its overall shape is mainly determined by the rotation rate of the planet. But they suggest that the anomalies may have an impact, as well. More importantly, by studying data related to the core and characterizing it separately from data related to the mantle, the team found what they believe to be evidence showing that Mars' core is molten liquid—and they also found a slight increase in the planet's spin.

**More information:** Sébastien Le Maistre et al, Spin state and deep interior structure of Mars from InSight radio tracking, *Nature* (2023). DOI: [10.1038/s41586-023-06150-0](https://doi.org/10.1038/s41586-023-06150-0)

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