Zhurong rover detects extremely weak magnetic fields on surface of Mars' Utopia Basin

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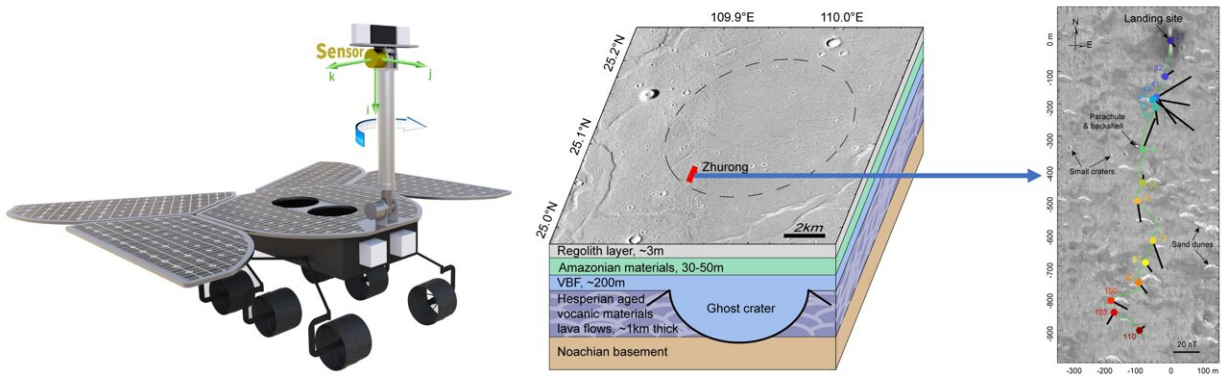

Zhurong rover and its magnetometers (left); Zhurong's landing area and the relevant geologic context (middle); Measured crustal magnetic field along Zhurong's traverse (right). Credit: Prof. Du Aimin's group

A joint research team led by Prof. Du Aimin from the Institute of Geology and Geophysics of the Chinese Academy of Sciences (IGGCAS) has found extremely weak magnetic fields during the Zhurong rover's first 1-km traverse on Mars. This indicates no detectable magnetization anomalies below Zhurong's landing site. The work was published in *Nature Astronomy* on June 19.

The researchers utilized two fluxgate magnetometers aboard the Zhurong

rover to conduct the first magnetic field survey in the Utopia Basin on the Martian surface. "The intensity of the magnetic field was surprisingly weak in the Utopia Basin," said Prof. Du Aimin, first and corresponding author of the study.

Results from NASA's Mars' lander InSight, which landed about 2,000 km southeast of Zhurong, have revealed that the crustal magnetic field at InSight's landing site was an order stronger than that inferred from orbital measurement. Measurements from Zhurong, however, revealed the opposite result, with the average intensity an order less than that inferred from orbit.

How to obtain highly precise planetary surface magnetic measurements is a great challenge in planetary exploration. Zhurong is the first rover equipped with magnetometers. The researchers conducted along-track calibration to separate the Martian magnetic field and rover interference field using rover rotations and mast rotations. The accuracy of multi-point in-situ measurement of the Martian surface has reached the order of nanoteslas.

The extremely weak magnetic fields detected by Zhurong imply that either the crust beneath Utopia Basin may have remained unmagnetized since its formation about 4 billion years ago or it was demagnetized by a later sizable impact in the early Hesperian. This new constraint on the timeline of the Martian dynamo sheds further light on the interconnected magnetic, climatic, and interior history of early Mars.

More information: Aimin Du et al, Ground magnetic survey on Mars from the Zhurong rover, *Nature Astronomy* (2023). DOI: 10.1038/s41550-023-02008-7

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