

# Solar cycle dependence of the interplanetary magnetic field at Mars

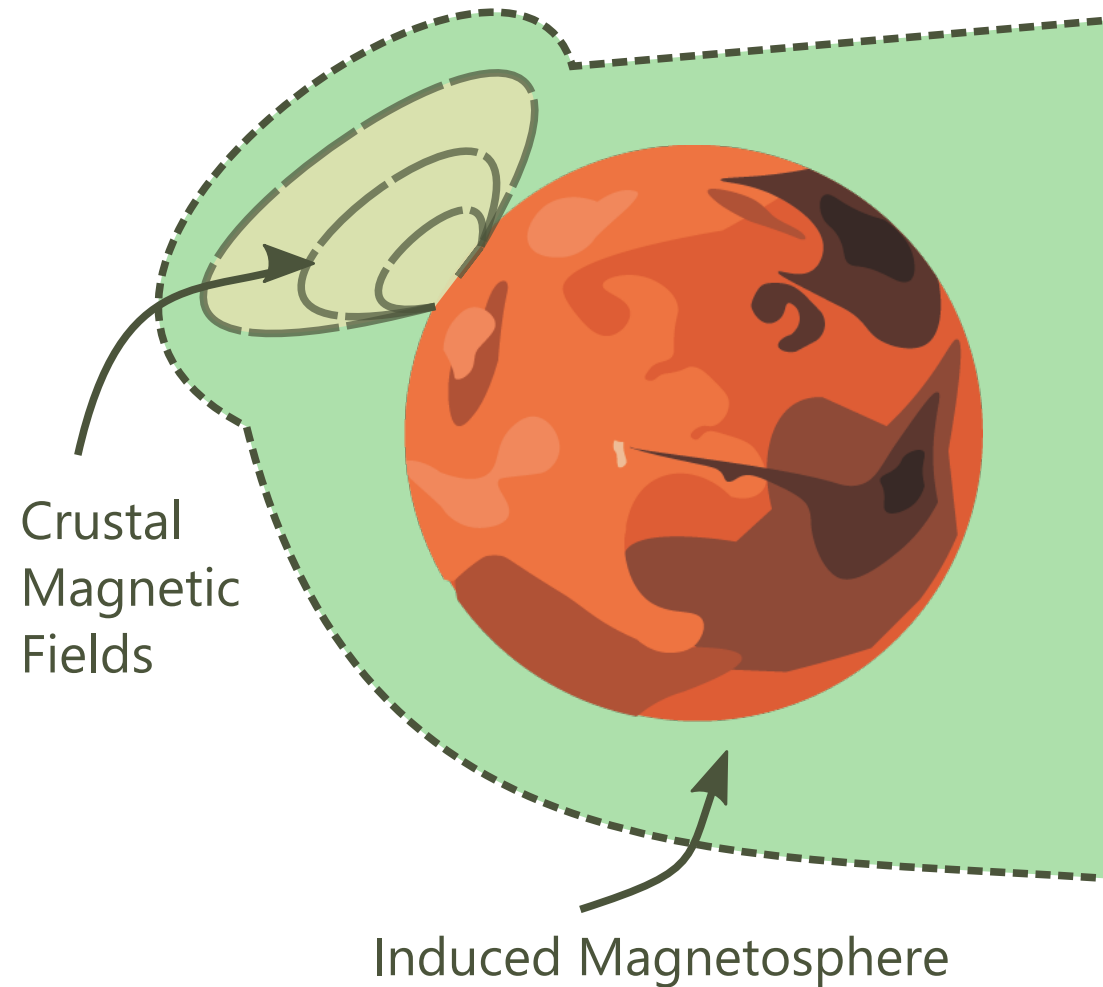
S. Durward<sup>1</sup>, J. A. Wild<sup>1</sup>, R. Lillis<sup>2</sup>

[1] Lancaster University, UK [2] University of California, Berkeley, CA, USA

The Martian magnetic field is unique within our solar system as the planet has **no intrinsic magnetic field**.

As such, it is **heavily influenced** by the solar wind and interplanetary magnetic field (IMF) conditions.

In-situ IMF measurements at Mars are infrequent, and so the **IMF variability is poorly studied**.



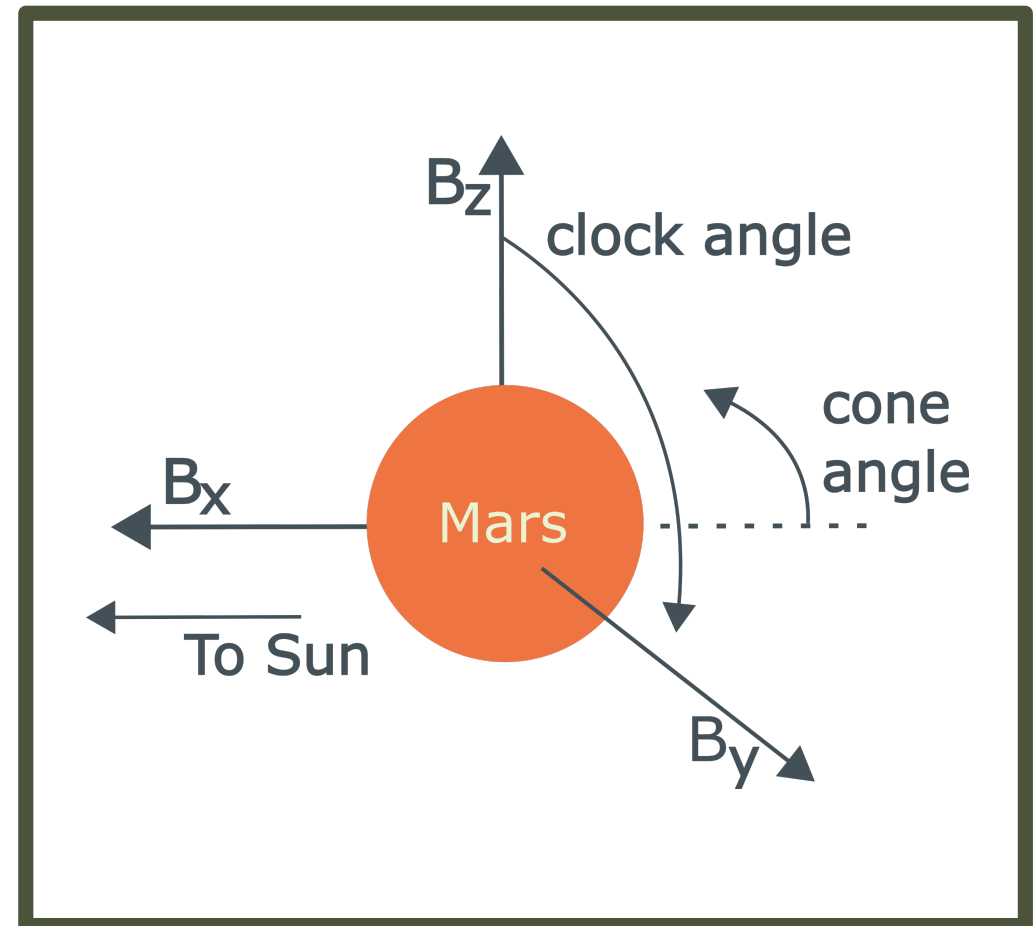
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To investigate the variability of the IMF we used measurements from the Mars Global Surveyor (MGS) and Mars Atmosphere and Volatile Evolution (MAVEN) spacecrafts, covering the periods from 1997-1999 and 2014-2017 respectively.

We looked at the IMF components in spherical coordinates, known as the IMF strength, clock angle and cone angle.



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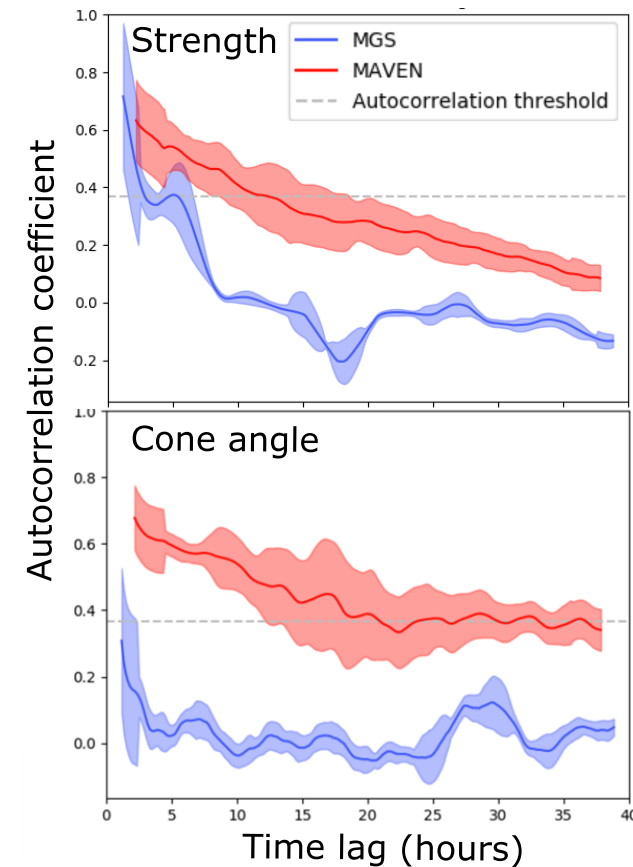
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To measure IMF variability, we used **autocorrelation functions**; a measure of how much a value changes at a range of time lags.

The IMF measurements taken by MGS were **much more variable in strength and cone angle** than measurements taken by MAVEN.

This suggests that the IMF is more **variable in the rising phase of the solar cycle**.

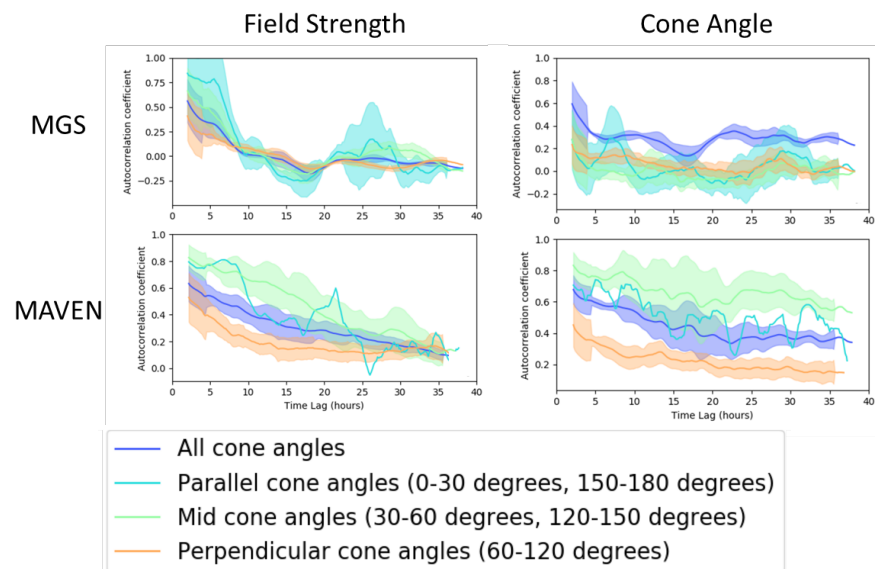


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We also found that the IMF was **more variable** when it was oriented near perpendicular to the ecliptic plane.



## Summary:

**The IMF was more variable in strength and cone angle during the rising phase of the solar cycle than the declining phase.**

**The clock angle was highly variable irrespective of solar cycle phase.**

**Periods of IMF that lied far out of the ecliptic plane were more variable.**