



## **Mars Paleomagnetic Field as the Result of a Single-Hemisphere Dynamo**

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One of the most dramatic results from the Mars Global Surveyor mission is that Mars possesses remanent crustal magnetic fields from a dynamo that was operational for a short time in Mars' early history. Several characteristics of the crustal field are not well understood, such as the field's intensity, concentration in the southern hemisphere, and lack of correlation with any surface features except for the hemispheric crustal dichotomy. Formation mechanisms for the hemispheric dichotomy, both endogenic and exogenic, can result in significant hemispheric thermal heterogeneity at Mars' core-mantle boundary (CMB). If the dynamo was active during formation of the crustal dichotomy, the heat flux variability at Mars could have a significant effect on Mars' dynamo.

Here we use the Kuang-Bloxham numerical dynamo model to demonstrate that degree-one lateral variations in CMB heat flux can result in a single-hemisphere dynamo. This dynamo produces strong magnetic fields in only the southern hemisphere. The resulting magnetic field morphology can explain why Mars' crustal magnetic field intensities are significantly stronger in the southern hemisphere without relying on any post-dynamo mechanisms. It can also remedy contradictions in paleomagnetic studies with rotational stability studies, as well as the incompatible requirement that significant atmospheric loss occur during the same period as strong magnetic field generation.