

Mapping the global magnetic field in the solar corona through magnetoseismology

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Magnetoseismology, a technique of magnetic field diagnostics based on observations of magnetohydrodynamic (MHD) waves, has been widely used to estimate the field strengths of oscillating structures in the solar corona. However, previously magnetoseismology was mostly applied to occasionally occurring oscillation events, providing an estimate of only the average field strength or one-dimensional distribution of field strength along an oscillating structure. This restriction could be eliminated if we apply magnetoseismology to the pervasive propagating transverse MHD waves discovered with the Coronal Multi-channel Polarimeter (CoMP). Using several CoMP observations of the Fe XIII 1074.7 nm and 1079.8 nm spectral lines, we obtained maps of the plasma density and wave phase speed in the corona, which allow us to map both the strength and direction of the coronal magnetic field in the plane of sky. Such measurements could provide critical information to advance our understanding of the Sun's magnetism and the magnetic coupling of the whole solar atmosphere.

References

- [1] Z.-H. Yang, C. Bethge, H. Tian, S. Tomczyk, R. Morton, G. Del Zanna, S. W. McIntosh, B. Binay Karak, S. Gibson, T. Samanta, J.-S. He, Y.-J. Chen, L.-H. Wang, Global maps of the magnetic field in the solar corona, *Science*, 369, 694 (2020).
- [2] Z.-H. Yang, H. Tian, S. Tomczyk, R. Morton, X.-Y. Bai, T. Samanta, Y.-J. Chen, Mapping the magnetic field in the solar corona through magnetoseismology, *Sci China Tech Sci*, 63, 2357 (2020).

Figure 1: A map of the coronal magnetic field strength (left) and direction (right) superimposed on a coronal image taken by the AIA instrument on the Solar Dynamics Observatory

