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## PILEUP ACCIDENT HYPOTHESIS OF MAGNETIC STORM ON 2015 MARCH 17

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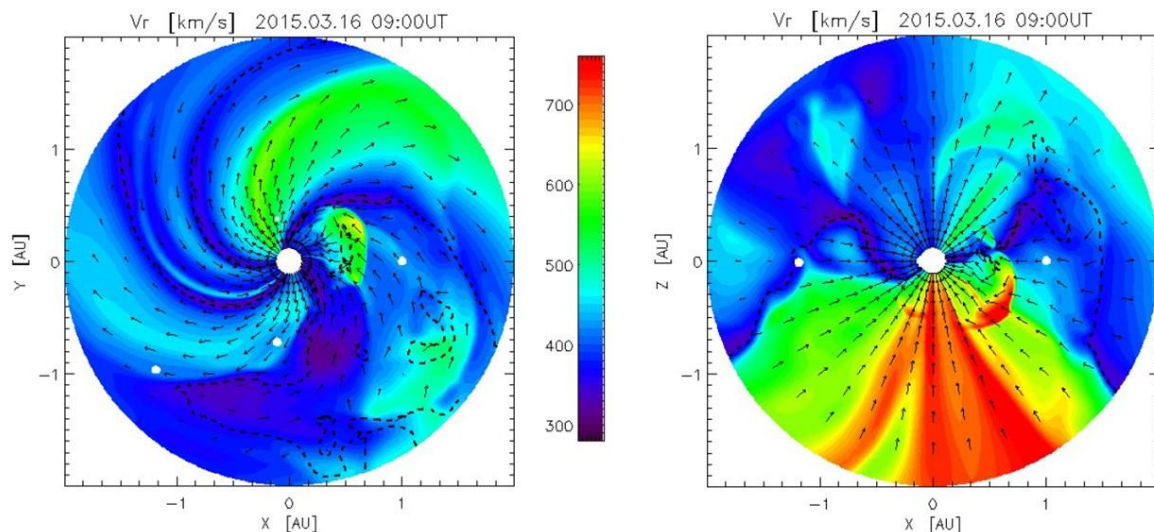
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We propose a “pileup accident” hypothesis, based on the solar wind data analysis and magnetohydrodynamics (MHD) modeling, to explain unexpectedly geoeffective solar wind structure which caused the largest magnetic storm so far during the solar cycle 24 on 17 March 2015: First, a fast coronal mass ejection with strong southward magnetic fields both in the sheath and in the ejecta was followed by a high-speed stream from a nearby coronal hole. This combination resulted in less adiabatic expansion than usual to keep the high speed, strong magnetic field, and high density within the coronal mass ejection. Second, preceding slow and high-density solar wind was piled up ahead of the coronal mass ejection just before the arrival at the Earth to further enhance its magnetic field and density. Finally, the enhanced solar wind speed, magnetic field, and density worked all together to drive the major magnetic storm.



**Figure 1.** Solar wind speed (color) and magnetic field directions (arrows) as reproduced by the MHD simulation.

## REFERENCES

Kataoka, R., D. Shiota, K. Emilia, and K. Keika (2015), Pileup accident hypothesis of magnetic storm on 2015 March 17, *Geophys. Res. Lett.*, doi:10.1002/2015GL064816.