



## **Reconstruction of the 22 May 2007 magnetic cloud: How much can we trust the flux-rope geometry of CMEs?**

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Coronal mass ejections (CMEs) are often assumed to be a magnetic flux rope, but direct proof has been lacking. A key feature, resulting from the translational symmetry of a flux rope, is that the total transverse pressure as well as the axial magnetic field has the same functional form over the vector potential along any crossing of the flux rope. We test the flux-rope structure by reconstructing the 22 May 2007 magnetic cloud (MC) observed at STEREO B, Wind/ACE and possibly STEREO A with the Grad-Shafranov (GS) method, taking advantage of this feature. The model output from reconstruction at STEREO B agrees fairly well with the magnetic field and thermal pressure observed at ACE/Wind; the separation between STEREO B and ACE/Wind is about 0.05 AU in the cross section ( $1/3 - 1/2$  of the MC radial width) and about 0.04 AU along the axis. For the first time, we reproduce observations at one spacecraft with data from another well-separated spacecraft, which provides compelling evidence for the flux-rope geometry and is of importance for understanding CME initiation and propagation. We also discuss the global configuration of the MC at different spacecraft based on the reconstruction results.