Contribution ID : **716** Type : **Poster**

Determination of ICME Geometry and Orientation from Ground Based Observations of Galactic Cosmic Rays

Wednesday, 4 July 2007 14:45 (0:00)

Abstract content

We have developed a method for determining ICME (Interplanetary coronal mass ejection) geometry from galactic cosmic ray data recorded by the ground- based muon detector network. The cosmic ray density depression inside the ICME, which is the cause of a Forbush decrease, is represented as an expanding cylinder based on a theoretical model of the cosmic ray particle diffusion. ICME geometry and orientation are deduced from observed time variations of density and density gradient, and are compared with that deduced from a magnetic flux rope model. From March 2001 to May 2005, 11 ICME events that produced Forbush decreases >2% were observed, and clear variations of the density gradient due to ICME passage were observed in 8 of 11 events. In 3 of these 8 events, clear signatures of magnetic flux rope structure (large, smooth rotation of magnetic field) were also seen, and the ICME geometry and orientation deduced from the two methods were very similar. This suggests that the cosmic ray-based method may provide a more robust method for deducing ICME geometry than the flux rope method for events where a large Forbush decrease is observed.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 1 (SH), pages 335-338

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Session Classification : Posters 1 + Coffee

Track Classification : SH.2.1