[초SO-01] Analyses of Magnetic Cloud Geometries: Fundamentals and Problems

K. Marubashi
Korea Astronomy and Space Science Institute

An interplanetary magnetic cloud (MC) has been an attractive research subject since its discovery by Burlaga et al. (1981) for two reasons. One is that MCs carry strong southward magnetic fields in the solar wind, in many cases, and thus cause strong geomagnetic storms. Another reason is that they are considered to be occupying the whole body or a significant part of plasma clouds which were ejected by CMEs, and thus can provide crucial information about the CME launching mechanisms. We need to determine the geometry of MCs for studying either of their effects on the magnetosphere and their relationships with CMEs. Earlier studies found that the directions of MCs generally coincide with the directions of inversion lines of magnetic field polarity on the Sun in the source regions of CMEs. Those findings are consistent with the present CME models, and it seemed that they suggested a possibility that we may get a key for predicting geomagnetic storms based on the solar observations. Recently, however, there appeared papers which argue against the straightforward relationship between the MC structures and the coronal magnetic field structures. After analyzing a number of problematic MCs for which the geometrical relationship was doubted, a conclusion has been obtained that such doubt is mostly due to inappropriate analysis of MCs, and that the straightforward relationship found in earlier studies still holds true in most cases. In this presentation, I start with the discovery of MCs, and go on to present a brief review on the progress in the analyses of MC geometries, with special attention paid to problems in MC analyses and to how the difficulties can be overcome by using better MC models

[구SO-02] Reassessment of MC geometries for better understanding of relations between MCs and solar filaments

S.-K. Sung, K. Marubashi, and K.-S. Cho
Korea Astronomy and Space Science Institute

It is widely accepted that the projection of the axis of a magnetic cloud (MC) on the plane of sky should roughly parallel with the long axis of the associated filament (or neutral line) prior to eruption. However, there are exceptional cases that the axial orientation of flux rope did not agree with that of the associated filaments. It is caused by the different fitting result because the orientations of MCs are completely different depending on the fitting models. When the filament is significantly curved, it is hard to compare the its geometries with MC axis by using only the straight cylindrical model. In this study, we reassess three filament-associated MC events of Wang et al. (2006) using a torus-shaped flux rope model with the curvature effects in addition to a straight cylindrical flux rope model. We also compare the results from two models (torus and cylinder) and discuss use of the torus model as a new tool for examining the relations between the MC axis orientation and the solar filaments.