What CME parameters control goemagnetic storms ?

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Solar and Space Weather group in KASI is examining the physcial characteristics of geoeffective CMEs that produced geomagnetic storms. First, we have investigated the CME geoeffectiveness depending on its solar surface location and speed using front-side SOHO/LASCO halo CMEs from 1997 to 2003. Second, we have examined the relationship between several CME physical parameters (e.g., direction, density, mass) and geomagnetic activity for very fast halo CMEs. In particular, we suggest a new direction parameter that is directly observable from coronagraph observations. Third, we have examined the relationship between the field orientation in a CME source region and a geomagnetic storm using a coronal flux rope model as well as its dependence on ICME classification (magnetic cloud or ejecta). Major results are as follows. (1) The most probable areas whose geoeffectiveness fraction is larger than the mean probability (0.4), are $0°<L<30°$ for slower speed CMEs (<800km/s), and $-30°<L<60°$ for faster CMEs (>800 km/s). (2) The CME direction and its column density have much better correlations with the Dst index than other parameters for very fast halo CMEs. (3) The relationship between the field orientation and the geomagnetic storm for magnetic cloud is much better than that for ejecta, implying that the field orientation of the magnetic clouds is well conserved through the heliosphere.