

**CSI 662/ASTR769 Spring 2007**  
**Introduction to Space Weather**

**Project: The Sequence of Sun-to-Earth Activities of Intense Geomagnetic Storms**

**Phase 2: Processes in the Interplanetary Space**

Assignment Date: Mar. 27, 2007

Due Date: Apr. 3, 2007

**Requirements**

**1. Identify and Study Interplanetary Coronal Mass Ejection (ICME)**

Super geomagnetic storms are directly driven by the strong and prolonged southward magnetic field embedded in the interplanetary CMEs, the counterpart of solar CME in the solar wind flow.

You are required to identify and study the ICME driver for the super storm you have chosen, based on ACE in-situ observations of plasma and magnetic field.

- Make solar wind plots (\*) for at least the following parameters: magnetic field, southward magnetic field, plasma density, plasma velocity and proton temperature. The plots should be made in a reasonable time window within which the storm was driven.
- Simply describe the features in the plot(s), such as shock or discontinuity, velocity change, magnetic field change and strength, etc.

**2. ICME Velocity and Transit Time**

- Identify the timing and velocity of the shock driven by the ICME.
- Find out the true transit time, which is the difference between the onset of CME on the surface of the Sun (from phase 1) to the shock arrival time.
- Calculate the average acceleration (deceleration ) of CME from the Sun to the Earth in the unit of  $m/s^2$ .

**Useful References**

\*For making solar wind plots with ACE data

(1) Using CDAWEB online tools. Go to [http://cdaweb.gsfc.nasa.gov/istp\\_public/](http://cdaweb.gsfc.nasa.gov/istp_public/). Select “ACE” (for source) and “Magnetic Fields” and “Plasma and Solar Wind” (for instrument type). Then follow the instructions to plot the data.

(2) or simple use the plots made by Dr. Richardson, available at <http://solar.gmu.edu/meetings/cdaw/data/cdaw1/Richardson/> (file name in this directory indicates the date, thus the event)