SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 1 (2A)

Author: Prof. Qiongying Ren
CSSAR, China

Prof. hua Zhao
China
Dr. Kun Li
National Space Science Center (NSSC), Chinese Academy of Sciences, China
Mr. peng Gao
China
Prof. Chi Wang
China
Prof. Ji Wu
CSSAR/CAS, China
Prof. Henri Reme
France
Prof. Ziyuan Ouyang
BAO/CAS, China

UPSTREAM SOLAR WIND DECELERATION OBSERVED BY CE-2 LUNAR SPACECRAFT ABOVE LOW LATITUDE LUNAR MAGNETIC ANOMALY

Abstract

Solar Wind Ion Detector (SWID) on Chinese "Chang'E-1" and "Chang'E-2" lunar exploration satellite operated on the lunar polar circular orbit with altitude of 200km and 100km, respectively. These instruments detected lunar space plasma and upstream solar wind ion flux with energy and angular identification covered large range of lunar longitude with very small solar zenith angle. At this kind positions, SWID instruments measured the solar wind velocity, solar wind ion temperature and density which compared with the time-shifted solar wind parameters observed at L1 point by ACE, or WIND spacecraft. SWID instrument measured the un-shocked solar wind velocity and other parameters, when Chang'E spacecraft operated in the dayside polar circular orbit segment. Preliminary analysis of CE's data of the solar wind velocity showed that it is likely the first time to observe the solar wind deceleration effect at 100km altitude by lunar equatorial, weak intensity, and large scale magnetic anomaly cluster, which is located at the Lunar Imbrium Antipode Region. Solar wind velocity observations by the identical SWID on Chang'E-1, which operated on 200km altitude orbit, could not present the deceleration effect, even the instrument was over the same lunar magnetic anomaly region, and similar solar zenith angle. In this paper, the relationship of solar wind deceleration effect with upstream solar wind dynamic pressure, interplanetary magnetic field magnitude and orientation would be deeply investigated to find the possible mechanisms, which contribute to the efficient dissipation of solar wind kinetic energy caused by solar wind ions interaction with multiple magnetic dipoles.Large observational data set of Chang'E mission would be carefully sorted to find the observational evidences of existence of shock-like structure in front of lunar mini-magnetosphere, which has been predicted by some numerical simulations under some specific solar wind conditions. It is proposed that solar wind ion inertial length is comparable with multiple magnetic dipole anomaly cluster scale, and higher order moments of the magnetic anomaly cluster lead the ion mov-

ing trajectories to stochastic, and ions are not frozen to the magnetic field lines. The stochastic trajectory characteristics of solar wind ions in the large scale multiple magnetic dipoles generates efficient dissipation of solar wind kinetic energy to plasma instabilities and in turn decelerate solar wind velocity;and another possibility explanation would be given in this paper.