Unusual enhancement of ~30 MeV proton flux in an ICME sheath region

*Takahiro Obara[1], Mitsuo Oka[2], Nariaki V Nitta[3], Seiji Yashiro[4], Daikou Shiota[5], Kiyoshi Ichimoto[6]

1. Planetary Plasma and Atmospheric Research Center,Tohoku University, 2. University of California Berkeley, 3. Lockheed Martin Solar and Astrophysics Laboratory, 4. The Catholic University of America, 5. National Institute of Information and Communications Technology, 6. Kyoto University

In gradual Solar Energetic Particle (SEP) events, shock waves driven by coronal mass ejections (CMEs) play a major role in accelerating particles, and the energetic particle flux enhances substantially when the shock front passes by the observer. Such enhancements are historically referred to as Energetic Storm Particle (ESP) events, but it remains unclear why ESP time profiles vary significantly from event to event. In some cases, energetic protons are not even clearly associated with shocks. Here we report an unusual, short-duration proton event detected on 5 June 2011 in the compressed sheath region bounded by an interplanetary shock and the leading-edge of the interplanetary CME (or ICME) that was driving the shock. While <10 MeV protons were detected already at the shock front, the higher-energy (>30 MeV) protons were detected about four hours after the shock arrival, apparently correlated with a turbulent magnetic cavity embedded in the ICME sheath region.

Keywords: SEP, shock, acceleration

