

## Project Details

**ROSES ID:** NNH10ZDA001N

**Selection Year:** 2011

**Program Element:** Focused Science Topic

**Topic:** Incorporating Plasma Waves in Models of the Radiation Belts and Ring Current

**Project Title:**

Intensity Variation of Large Solar Energetic Particle Events: Source and Environmental Factors

**PI Name:** Natchimuthuk Gopalswamy

**PI Email:** nat.gopalswamy@nasa.gov

**Affiliation:** Goddard Space Flight Center

**Project Member(s):**

- Yashiro, Seiji ; Co-I; Catholic Univ.
- Makela, Pertti ; Co-I; Nasa/GSFC
- Xie, Hong ; Co-I; null

**Summary:**

The scientific objective of this proposal is to identify the key source and environmental properties that determine the efficiency of acceleration of solar energetic particles (SEPs). Coronal mass ejection (CME) kinematics and flare properties derived using the Solar and Heliospheric Observatory (SOHO) and GOES data will be considered. In particular, the acceleration profiles of CMEs will be considered, which determines the heliocentric distance at which the shock is formed or becomes supercritical. Another property of importance is the CME and flare recurrence rates in the source active regions, for a higher rate would imply more CME interaction. The presence of intervening coronal holes (known to affect the CME trajectory), preceding CMEs, and Alfvén speed variability in the corona, are the primary environmental factors that will be considered. The effect of coronal holes on CMEs is the trajectory change of CMEs and shocks, which can make a well-connected eruption to a poorly connected eruption and vice versa.

This proposal is highly relevant to the scientific objectives of the Focused Topic: "1.2.1. (b) Factors that Control the Highly Variable Intensity and Evolution of Solar Particle Events" because it addresses the source and environmental factors that affect the SEP intensity. Specifically, the proposal is relevant to the first two types of investigation:

- Studies of the effect of preconditioning of the interplanetary medium on the characteristics of an ensuing SEP event (particularly multipoint studies), and
- Studies of the solar source and CME characteristics of large SEP events to identify key properties governing the efficiency of SEP acceleration.

The results of this investigation will be useful for other types of investigations pertaining to this FST. The extensive list developed as part of the proposed investigation will be made available to the modeling efforts and theoretical studies.

## Publication References:

**Summary:** no summary

**Reference:** Chandra, R.; Gopalswamy, N.; Mäkelä, P.; Xie, H.; Yashiro, S.; Akiyama, S.; Uddin, W.; Srivastava, A. K.; Joshi, N. C.; Jain, R.; Awasthi, A. K.; Manoharan, P. K.; Mahalakshmi, K.; Dwivedi, V. C.; Choudhary, D. P.; Nitta, N. V.; (2013), Solar energetic particle events during the rise phases of solar cycles 23 and 24, *Advances in Space Research*, Volume 52, Issue 12, p. 2102-2111, doi: 10.1016/j.asr.2013.09.006