# Project Details

**ROSES ID:** NNH09ZDA001N
**Selection Year:** 2010
**Program Element:** Focused Science Topic

**Topic:** Origin and Nature of the Slow Solar Wind, Associated Interplanetary Structures, and SEP Transport

**Project Title:**
Characterizing relations between solar energetic particles and the associated slow wind source regions

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**Summary:**
In a recent exploratory study, we have carefully analyzed 12 gradual solar energetic particle (SEP) events from 2004-2006. We have discovered that the SEP elemental composition at 5-10 MeV/nuc falls clearly into two classes depending on whether the associated solar wind (SW) source (and hence the solar footpoint of the magnetic field line connecting the Sun to Earth) is from an active region or from a coronal hole. The events we have analyzed so far show no correlation between the elemental compositions of SEPs and SW thermal particles. But our results interestingly hint at a correlation between the elemental compositions of SEPs and suprathermals, using finer time resolution and a much broader energy range than has been employed in previous studies. These new results pose interesting and important questions and suggest possible avenues toward better understanding both SEPs and the slow solar wind. We propose to expand this initial investigation by utilizing the vast database of SEP, SW, and solar observations accumulated in Cycle 23 and (when solar activity begins) in Cycle 24, to confirm, clarify, and extend the apparent relationships between the properties of SEPs and the associated SW source region. We will investigate if other features of the SEP variability, such as intensity, temporal structure, or spectral hardness, can be organized by the nature of the associated SW source region. We will also attempt to understand the physical basis of the empirical relationships that we uncover through application of state-of-the-art SEP acceleration and transport models, which include both fully self-consistent treatments of Alfven wave growth and the entire SEP pitch-angle distribution. Finally, we will examine whether our results on the connections between SEPs and SW source regions can be ``turned around'', so that observed SEP characteristics can be used to improve the accuracy of solar-wind traceback from 3D coronal-field models. Thus, we anticipate that the proposed work will contribute to our understanding of both the production and transport of SEPs as well as of the origin of the slow solar wind.

# Publication References:

**Summary:** no summary

**Reference:** Ko, Yuan-Kuen; Muglach, Karin; Wang, Yi-Ming; Young, Peter R.; Lepri, Susan T.; (2014), Temporal Evolution of Solar Wind Ion Composition and their Source Coronal Holes during the Declining Phase of Cycle 23. I. Low-latitude Extension of Polar Coronal Holes, The Astrophysical Journal, Volume 787, Issue 2, article id. 121, 22 pp, doi: 10.1088/0004-637X/787/2/121