IAU Symposium 327:
Fine Structure and Dynamics of the Solar Atmosphere

Michael S. Kirk

Cartagena De Indias, Colombia – October 9-14 2016

Thomas R. Metcalf Travel Award Conference Summary

Relationships Between Sequential Chromospheric Brightening and the Corona

Invited Oral Presentation, Wednesday, October 10, in Session 10

Solar eruptions are complex processes most often characterized by their morphological features visible in the chromosphere and corona: flare ribbons, post-flare arcades, and coronal mass ejecta fronts. Sequential Chromospheric Brightenings (SCBs) are often observed in the immediate vicinity of erupting chromospheric flares but are distinctly coronal in their origin. Since their initial discovery in 2005, we have found SCBs to be closely related to CME release. We study 14 different eruptions with related SCBs resulting in over 4000 individual SCBs being tracked and characterized.

Over 77% of studied eruptions with SCBs have visible coronal mass ejections associated with them suggesting a possible link between SCBs and mass ejection. Using an automated detection and tracking algorithm, we characterize SCBs over a spectrum of solar flare intensities. After the algorithmic identification and a statistical analysis, we compare and find the following: SCBs are distinctly different from flare brightening in their temporal characteristics of intensity, Doppler structure, duration, and location properties. The substructure within the SCB appears to be dominantly unipolar. We conclude that SCBs originate in the lower corona, propagate away from the flare center at speeds $35 - 85$ km s^{-1}, and have peak photosphere magnetic intensities of 148 ± 2.9 G. The appearance of SCBs often precedes peak flare intensity. Given SCBs' distinctive nature compared to flares, we suggest a physical triggering mechanism relating to SCBs' origin, the associated flare, and coronal mass ejections through the destabilization of coronal loops overlying the flare.

Biography:

Michael Kirk is a Research Associate with Catholic University working at NASA's Goddard Space Flight Center. His scientific career began in 2007 at Goddard studying the evolution of polar coronal holes. He continued his solar physics research at New Mexico State University and received his PhD in Astronomy in 2013. He then returned to Goddard as a NASA Postdoctoral Program Fellow researching techniques of integrating contemporary image processing techniques into solar data. He continues to be interested in the evolution of coronal holes, sequential chromospheric brightenings, and helio-informatics techniques to better utilize the breadth of the solar data archive.

My experiences at this IAU Symposium will have ongoing benefits for my career in solar physics and my integration into the community. I am particularly grateful for the Metcalf Travel Award to provide the opportunity for me to attend this stimulating conference.