PI: David Falconer/NASA Marshall Space Flight Center
Title: Development of Empirical Tools for Forecasting Safe or Dangerous Space Weather from Magnetograms
Abstract:
The overall objective is to further develop and evaluate empirical tools for forecasting from magnetograms whether an active region will or will not produce a coronal mass ejection (CME) in the next few days, and, as a byproduct, gain insight to the magnetic conditions that cause CMEs. The proposed investigation builds directly on results that we obtained with previous LWS TR&T funding. In particular, we found an empirical measure of whole-active-region nonpotentiality that can be measured from a line-of-sight magnetogram of the active region and is strongly correlated with the CME productivity of active regions. This allows us in the proposed work to (1) use the MDI full-disk line-of-sight magnetograms to obtain large sets of separate-day magnetograms (~200) of active regions, and (2) use the good sensitivity of these magnetograms to assess, for spotless active regions as well as for sunspot active regions, the accuracy of the nonpotentiality measure as a predictor of All Clear space weather (no strong CMEs) or dangerous space weather (strong CMEs likely). In addition, using the ~200 magnetograms of sunspot active regions, we will carry out a bivariate analysis of the dependence of CME productivity on the nonpotentiality and size of active regions. The results will contribute directly to the development of operational CME forecasting methods that can be applied to and further developed and tested by the active-region vector magnetograms from Solar-B and the full-disk vector magnetograms from SDO. Our results, in combination with other observations from SOHO, Solar-B, and SDO, will yield better understanding of the magnetic conditions that cause CME explosions. Thus, in addition, to advancing the LWS TR&T goal of developing empirical tools for CME forecasting, the proposed investigation will enhance the science payoff from SOHO, Solar-B, and SDO. The requested funding is for half-time support of the PI and half-time support of a graduate student research assistant.