

**Topic:** Jets in the Solar Atmosphere and their Effects in the Heliosphere

**Project Title:**

Investigation of the Production and Evolution of Chromospheric, EUV, and X-Ray Jets using Observations from Hinode, STEREO, and SDO

**PI Name:** Alphonse Sterling

**PI Email:** asterling@solar.stanford.edu

**Affiliation:** NASA/MSFC/NSSTC

**CO-I(s):**

- Ronald L. Moore (MSFC/NSSTC)

**Project Information:**

We propose a four-year program in response to the Living With a Star (LWS)

Targeted Research and Technology (TR&T) solicitation, a Targeted Investigation

under Focused Science Topic 1.2.1.(c): "Jets in the Solar Atmosphere and

their Effects in the Heliosphere." We will study solar jets, using data

primarily from the Hinode, SDO, and STEREO satellites. The solar jets include

chromospheric spicules, especially type II spicules; EUV (transition region)

jets; and X-ray (coronal) jets. We will use data from all three Hinode

instruments: SOT, EIS, and XRT; from AIA and HMI on SDO, from SECCHI on STEREO;

and we will also use data from other sources, such as SOHO/LASCO. Our study

will focus on four main study topics: (1) the origin and evolution of spicules

on and just inside the limb, using SOT/Ca ii data and image processing

techniques; (2) the location of polar spicules (and other jets when possible)

relative to the magnetic network, using mainly SOT/Ca ii data with SOT

spectropolarimeter (SP) and HMI vector magnetograms; (3) the connection between

jets and features at chromospheric, EUV, and soft X-ray (SXR) wavelengths; and

(4) the detailed nature of the X-ray jet mechanism and the implications for the

same mechanism occurring on the size scale of chromospheric spicules, and also

the connection between X-ray jets (and other jets) and coronal outflows into

the heliosphere visible in coronagraph images. Most of our projects can be

completed with already-identified or readily-available data sets. New

observations from Hinode may be requested but are not required for the success

of the project. Both the P.I. and Co-I have extensive experience with the type

of data sets to be used, and a worker at the postdoc level will be supported.

This work will address the Targeted Investigation objectives by increasing our

understanding of jet origins, development, manifestations in different

wavelength regimes, and connections to the coronal outflows at the base of the

heliosphere. This work is relevant to NASA in that it will result in scientific output from several NASA-related satellites, and in that--in studying solar jets--this work will yield new insights into a likely major source of the solar wind, which is an important component of ``space weather."

**ROSES ID:** NNH10ZDA001N

**Duration:**

**Selection Year:** 2011

**Program Element:** Focused Science Topic

---

**Citations:**

**Summary:** no summary

**Citation:** Moore, Ronald L.; Sterling, Alphonse C.; Cirtain, Jonathan W.; Falconer, David A.; (2011), Solar X-ray Jets, Type-II Spicules, Granule-size Emerging Bipoles, and the Genesis of the Heliosphere, The Astrophysical Journal Letters, Volume 731, Issue 1, article id. L18, 5 pp, doi: 10.1088/2041-8205/731/1/L18

---

**Summary:** no summary

**Citation:** Moore, Ronald L.; Sterling, Alphonse C.; Gary, G. Allen; Cirtain, Jonathan W.; Falconer, David A.; (2011), Observed Aspects of Reconnection in Solar Eruptions, Space Science Reviews, Volume 160, Issue 1-4, pp. 73-94, doi: 10.1007/s11214-011-9758-z

---

**Summary:** no summary

**Citation:** Moore, Ronald L.; Sterling, Alphonse C.; Falconer, David A.; Robe, Dominic; (2013), The Cool Component and the Dichotomy, Lateral Expansion, and Axial Rotation of Solar X-Ray Jets, The Astrophysical Journal, Volume 769, Issue 2, article id. 134, 19 pp, doi: 10.1088/0004-637X/769/2/134

---

**Summary:** no summary

**Citation:** Moore, Ronald L.; Sterling, Alphonse C.; Falconer, David A.; (2015), Magnetic Untwisting in Solar Jets that Go into the Outer Corona in Polar Coronal Holes, The Astrophysical Journal, Volume 806, Issue 1, article id. 11, 20 pp; doi: 10.1088/0004-637X/806/1/11

---

**Summary:** no summary

**Citation:** Sterling, Alphonse C.; Moore, Ronald L.; Falconer, David A.; Adams, Mitzi; (2015), Small-scale filament eruptions as the driver of X-ray jets in solar coronal holes, *Nature*, Volume 523, Issue 7561, pp. 437-440, doi: 10.1038/nature14556

---

**Summary:** no summary

**Citation:**

Sterling, Alphonse C.; Moore, Ronald L.; Falconer, David A.; Panesar, Navdeep K.; Akiyama, Sachiko; Yashiro, Seiji; Gopalswamy, Nat; (2016), Minifilament Eruptions that Drive Coronal Jets in a Solar Active Region, *The Astrophysical Journal*, Volume 821, Issue 2, article id. 100, 17 pp, doi: 10.3847/0004-637X/821/2/100

---