

## Dr. Sean R. Brannon, Ph.D

Montana State University  
Bozeman, MT 59717  
Barnard Hall – 242  
Office: (406) 994 – 6319  
Cell: (406) 451 – 6417  
Email: sean.brannon1@montana.edu

### EDUCATION

**Ph.D. Physics** – Montana State University, Bozeman MT (05/2016)

Thesis: “Observations and Modeling of Plasma Flows Driven by Solar Flares”

Advisor: Prof. Dana W. Longcope

**M.S. Physics** – Montana State University, Bozeman MT (12/2010)

**B.S. Physics** – Dickinson College, Carlisle PA (05/2008)

### RESEARCH EXPERIENCE & INTERESTS

#### Driving scientific questions

- What are the mechanisms driving magnetic reconnection in the solar corona?
- What are the plasma processes that accelerate and transport particles in solar flares?
- How may we understand the origin and dynamic evolution of solar plasmas and magnetic fields?

#### Computational Modeling

- 1-D hydrodynamic simulations of chromospheric evaporation in flare loops, driven by reconnection shocks & thermal conduction
- Synthetic spectral line modeling with CHIANTI.

#### Data Analysis

- Imaging & spectral analysis of chromospheric & transition region plasma flows and reconnection instabilities using the *Interface Region Imaging Spectrograph (IRIS)*, the *Solar Dynamics Observatory (SDO) Atmospheric Imaging Assembly (AIA)*

#### Satellite Operations

- Calibration team member for *IRIS* (03/2016 to present) – process monthly spectrograph backgrounds and spectrograph & slit-jaw imager flat fields; track ongoing trends in calibration parameters
- Operations planner for *IRIS* (09/2016 to present) – provide targeting and observation planning for one-week terms 3-4 weeks/year

#### Sounding rocket design

- Team member for the *Full-sun Ultraviolet Rocket Spectrometer (FURST)* mission to obtain VUV spectroscopy of the Sun as a star
- currently constructing prototype optical layout to test conceptual design and observational tolerances

#### Programming Languages

- Extensive (8+ years) research experience with IDL and SolarSoft; one semester each in MATLAB and Java-based physics visualization; Python & SunPy research tools.

## TEACHING & MENTORING EXPERIENCE

### Teaching

- Instructor for ASTR-110 (Intro. to Astronomy, SP/FA 2018, SP 2019).
- Instructor for PHYS-206 (College Phys. II, Summer 2010).
- Substitute lecturer for PHYS-301 (Classical Mechanics), PHYS-566 (Mathematical Physics I), and PHYS-565 (Astrophysical Plasma Physics).
- Teaching assistant for PHYS-205/206 (College Phys. I/II) and PHYS-211 (Gen. & Mod. Phys. I).
- Grader for PHYS-506 (Quantum Mechanics I) & PHYS-565 (Astrophysical Plasma Physics).

### Mentoring

- Project mentor for MSU Solar Physics REU in 2012 (Heidi Dritschel, University of St. Andrews), 2013 (Filip Rozpedek, University of St. Andrews), & 2016 (Alissa Roegge, University of Massachusetts Amherst)

### Curriculum Development

- Asst. member of development committee for Astronomy minor at Montana State University (01/2018 to 03/2018)

## EMPLOYMENT

**MONTANA STATE UNIVERSITY** - Dept. of Physics, Bozeman, MT, 09/2008 to present

- **Asst. Teaching Professor**, 01/2018 to present, 06/2010 to 08/2010
- **Postdoctoral Research Assoc.**, 03/2016 to present
- **Early positions: Teaching Asst., Research Asst.**, 09/2008 to 02/2016

**LOS ALAMOS NATIONAL LABORATORY** - Los Alamos, NM, 06/2007 to 08/2007

- REU research intern

**DICKINSON COLLEGE** - Dept. of Physics, Carlisle PA, 2006 to 2008

- Teaching assistant

## FELLOWSHIPS & AWARDS

T. Metcalf AAS/SPD Travel Award (June 2012)

Montana Space Grant Consortium, Graduate Fellowship (Fall 2014)

## CONFERENCE PRESENTATIONS - ORAL

**Solar Physics Division (SPD), 2013**, Bozeman MT, “Modeling Properties Of Chromospheric Evaporation Driven By Thermal Conduction Fronts From Reconnection Shocks”, S.R. Brannon & D.W. Longcope

**SPD, 2014**, Boston MA, “Modeling Observable Effects Of Canopy Structure On Conduction-driven Evaporation From Impulsive Energy Release”, S.R. Brannon & D.W. Longcope

**Living With a Star (LWS), 2014**, Portland OR, “Using IRIS to Constrain Flare Loop Properties in Simulations of Impulsive Conduction-Driven Evaporation”, S.R. Brannon, D.W. Longcope, & J. Qiu

**Triennial Earth-Sun Summit (TESS), 2015**, Indianapolis IN, “Spectroscopic observations of evolving flare ribbon substructure suggesting origin in current sheet waves”, S.R. Brannon, D.W. Longcope, & J. Qiu

**IRIS-4, 2015**, Boulder CO, “Spectroscopic observations of evolving flare ribbon substructure suggesting origin in current sheet waves”, S.R. Brannon, D.W. Longcope, & J. Qiu

**SunDC, 2016**, Greenbelt MD, “Spectroscopic observations of evolving flare ribbon substructure suggesting origin in current sheet waves” (**invited talk**), S.R. Brannon, D.W. Longcope, & J. Qiu

**SPD, 2016**, Boulder CO, “Observations and analysis of ballistic downflows in an M-class flare with the Interface Region Imaging Spectrograph” (**dissertation talk**), S.R. Brannon, D.W. Longcope, & J. Qiu

**IRIS-8, 2017**, Seattle WA, “A solar space elevator: imaging and spectroscopic analysis of a series of jet eruptions observed by IRIS and SDO/AIA”, S.R. Brannon & C.C. Kankelborg

**SPD, 2017**, Portland OR, “Constraining reconnection region conditions using imaging and spectroscopic analysis of a coronal jet”, S.R. Brannon & C.C. Kankelborg

## CONFERENCE PRESENTATIONS - POSTERS

**SPD, 2010**, Miami FL, “Evaporation from Reconnection-driven Heat Fronts”, S.R. Brannon & D.W. Longcope

**SPD, 2011**, Las Cruces NM, “Response of a Model Chromosphere to Shock-generated Conduction Fronts”, S.R. Brannon & D.W. Longcope

**SPD, 2012**, Anchorage AK, “Modeling Observed Characteristics of Chromospheric Evaporation Driven by Thermal Conduction Fronts from Reconnection”, S.R. Brannon & D.W. Longcope

**TESS, 2018**, Leesburg VA, “Measuring Optical Thickness and Geometric Effects in Flare Ribbon Plasma with Si IV Spectral Lines as Observed by IRIS”, S.R. Brannon & C.C. Kankelborg

## PROFESSIONAL AFFILIATIONS

American Astronomical Society (AAS)  
 AAS Solar Physics Division  
 American Association of Physics Teachers (AAPT)  
 AAPT Physics Education Research Special Interest Group  
 Society of Physics Students (SPS)  
 Sigma Pi Sigma

## PUBLICATIONS

“Modeling properties of chromospheric evaporation driven by thermal conduction fronts from reconnection shocks”, S. Brannon & D. Longcope 2014, *The Astrophysical Journal*, 792, 50.

“Spectroscopic observations of evolving flare ribbon substructure suggesting origin in current sheet waves”, S.R. Brannon, D.W. Longcope, & J. Qiu 2015, *The Astrophysical Journal*, 810, 4.

“Observations and analysis of ballistic downflows in an M-class flare with the Interface Region Imaging Spectrograph”, S.R. Brannon 2016, *The Astrophysical Journal*, 833, 101.

“Instrument Calibration of the Interface Region Imaging Spectrograph Mission”, J-P. Wülser, S. Jaeggli, B. De Pontieu, et al. 2018 *Solar Physics*, 293, 149.

**FORTHCOMING PUBLICATIONS**

“Imaging and spectroscopic analysis of accelerating jet substructure suggesting origin in reconnection region”, S.R. Brannon & C.C. Kankelborg (2019)

“Measuring Optical Thickness and Geometric Effects in Flare Ribbon Plasma with Si iv Spectral Lines as Observed by IRIS”, S.R. Brannon & C.C. Kankelborg (2019)