Welcome to SHINE 2018!

Tremendous response to call for sessions this year —

*Working Sessions:*

1. What's Next for Solar & Heliospheric Physics?
2. Observational Signatures of Star-Planet Interactions (SPI)
3. Instabilities and Their Role in Modifying Turbulence Dynamics
4. Signatures of Time-dependent Heating in Active Regions and the Slow Solar Wind
5. Modern observation and simulation of the physics of kinetic cascade leading to production of internal energy: MMS and beyond
6. Revealing the Physics of the Inner Heliosphere
7. Connecting Slow Solar Wind Theories to Current and Future Observations(Year II)
8. Global implications of kinetic-scale particle acceleration throughout the heliosphere
9. Using PSP to Probe Magnetic Reconnection at the Sun
10. How does the solar atmosphere connect to the inner heliosphere?
11. Understanding the Magnetic Configuration of CMEs
12. Advances and Challenges in Data-Constrained Modeling of Solar Eruptions
13. Galactic cosmic ray transport in the heliosphere
14. Suprathermal ions and electrons in interplanetary space: Properties and Roles
15. Predicting solar energetic particles: community campaign
16. Is Understanding Magnetic Field Connectivity Crucial for Understanding Solar Energetic Particle (SEP) Events?
17. The return of CMEs - What are we assuming, what do we know, and how can we move forward?
18. Role of turbulence in dynamics of SEPs
19. Coupled heliospheric and solar energetic particle models
20. Are SEP Spectral Breaks due to Acceleration near the Sun or Transport in Interplanetary Space?
21. Observations and interpretations of coronal shock waves
22. Advancing Solar Activity Forecasts Through Observations, Data Assimilation and Machine Learning
23. Really, What is Turbulent Dissipation?
24. Ion and Electron Distributions in the Solar Wind: Kinetic Physics
25. How do small-scale effects feedback on reconnection global dynamics, and vice versa?
26. Insights into CMEs and Their Substructure(s)
27. Testing the Standard Model of solar eruptive events: the X8 limb flare of 10 September 2017

Most days have 4 parallel sessions
Three Town Hall Meetings

1. Future of Space and Heliospheric Physics : Monday 11:15 am
Organizers: Don Hassler, Sarah Gibson, Todd Hoeksema, Scott McIntosh, Jeff Newmark

But what is next -- after Solar Probe, Solar Orbiter, and IMAP? We are halfway between Decadal Surveys. The Space Studies Board of the National Academies is preparing to begin a mid-term assessment. Questions to address: What are the burning questions for understanding the solar & heliospheric system? What are the important unexplored places and domains of the Sun & heliosphere? What new technologies that enable exploration of these new domains can be exploited or need to be developed? How do we incorporate and prioritize the urgent practical goals of Space Weather in the community discussion, and how do we balance applied and pure science? What type of future missions should we be thinking about, and how should they be structured and organized?

2. NSF Discussion : Thursday 12:45 Lunch Break
Mike Wiltberger, Ilia Roussev, Carrie Black

3. Living with a Star Targeted Research and Technology : Friday 9:25 am
Joe Borovsky, LPAG Committee Member
Community input to Living with a Star Targeted Research and Technology (LWS TR&T) Focused Science Topics for ROSES 2019 and beyond. The main purpose of the Town Hall at SHINE would be to discuss and get comments on a new short list of about 15 LWS Targeted Research Topics. Some time after the SHINE Meeting, NASA will down-select from the short list to 4 or so Targeted Research Topics for the 2019 call for proposals.
A little about SHINE:
SHINE has a unique format that fosters an atmosphere of open discussion during the workshop sessions

Poster sessions — separate & dedicated opportunity to present individual research

Typical Schedule: morning working group “Progress and Prospects” reports (~5 min each) followed by plenary speaker, two 1/2-day sessions, & early evening poster sessions.

Internet: hhonors_meeting with code SHINE (& attwifi_meeting is open)

Questions?
Scientific Workshop: G. A. de Nolfo / SHINE Steering Committee Chair
Students/Travel: Umbe O. Cantu / SHINE Administrator
Logistics: Noé Lugaz / SHINE Workshop Coordinator
Presentations: Katie Whitman / Webmaster
Monday, July 24th (Chair: Georgia de Nolfo)
7:00 Breakfast
8:30 Opening Remarks: deNolfo & Lugaz
8:35 Student Day Summary
8:50 Agency Talks: Michael Wiltberger & Ilia Roussev (NSF)
9:40 30-sec Description of Sessions
10:00 Plenary Talk 1: Marco Velli
10:45 Coffee Break
11:15 Town Hall Session: Future of Space and Heliospheric Physics
12:30 Lunch Break
14:00 Working Group Sessions
   1. Is Understanding Magnetic Field Connectivity Crucial for Understanding SEP Events?
   2. Instabilities and Their Roles in Modifying Turbulence Dynamics
   3. Advances and Challenges in Data-Constrained Modeling of Solar Eruptions
   4. Revealing the Physics of the Inner Heliosphere
15:15 Coffee Break @ Sea Grapes
15:45 WG Sessions continue
17:00 Welcome reception and Posters
19:00 Adjourn

Have a fantastic week at Cocoa Beach!
Workshop Session Descriptions
KEY QUESTION

From our knowledge of the Sun-Earth interaction, what are the key observational characteristics we might expect from terrestrial exoplanets orbiting close-in to supra-solar activity stars?

Additional questions will center on:

- transient activity, feedback on the star from magnetic interactions with the planet, and specific planetary responses to enhanced stellar activity (large-, or multiple CME impacts, enhanced EUV emission, etc.)
Instabilities and Their Role in Modifying Turbulence Dynamics

**Organizers:** Jason TenBarge (Univ. of Maryland, College Park), James Juno (Univ. of Maryland, College Park), Vadim Roytershteyn (Space Science Institute)

1) What instabilities are relevant to turbulence dynamics? Which modes are present in the nonlinearly saturated states of some of the most common instabilities in the heliosphere, and at what scales are these wave modes generated?

2) How do we expect the presence of these modes to modify the turbulent cascade, e.g., do we expect a nontrivial amount of nonlocal energy transfer due to the generation of small scale modes via these instabilities, and will the dissipation of the new modes alter the predicted heating?

3) How efficient are these modes in inducing transport of particles, momentum, and energy? Since this transport bears some resemblance to collisional processes, what is the ultimate effective collisionality due to the excitement and saturation of these instabilities? How do we expect this effective transport to modify both the dynamics and the thermodynamics of the plasma system?

Scene Setting Speakers : Stuart Bale (UC Berkeley)
Signatures of Time-dependent Heating in Active Regions and the Slow Solar Wind

Tuesday, July 31st, 2-5 PM, Seaoats

Scene-setting Speakers: Vanessa Polito (LMSAL), Sue Lepri (Michigan)

Primary Questions:

- What role does the closed field in ARs play in the source and acceleration of the slow wind?
- Do signatures of AR heating persist in the slow wind and are they observable?
- How are AR loops topologically connected to solar wind streamers?
- What kinds of models are needed to understand the connection between closed AR loops and the slow wind?

Organizers: Stephen Bradshaw (Rice), Will Barnes (Rice), Nicki Viall (NASA/GSFC)
5. Observation and simulation of the physics of kinetic cascade leading to production of internal energy: MMS and beyond

Organizers: W. H. Matthaeus, M. A. Shay, T., N. Parashar
Scene setters: Alessando Retino, Paul Cassak

At a theoretical level, what quantities do we need to accurately measure (or simulate) to fully understand cascade and dissipation in weakly collisional plasmas? What are the roles of specific interactions such as J.E, wave-particle correlations, cyclotron resonance, Landau damping, pressure-stress, and collisions? What is the relationship of these to wave modes and instabilities?

At an empirical level, what have observations shown so far about these quantities in the most accessible turbulent space plasmas – the magnetosheath and the solar wind?

Heating or cooling? Chasapis et al, 2018

Hermite spectrogram and current structures: Pezzi et al, 2018
6. Revealing the Physics of the Inner Heliosphere

Organizers: W. H. Matthaeus, W. B. Manchester, G. Zank
Scene setters: Nicky Viall, Mel Goldstein

- What happens to MHD scale fluctuations near the Alfvén surface? What is the mechanism for the origin of the Alfvénic fluctuations that are seen in situ observations in the inner heliosphere?
- Are the heating mechanisms above the critical surface the same as those below the critical surface? Does cascade and heating “turn off” just above the critical surface?
- What is the origin of the “1/f noise” fluctuations seen at low frequencies in the solar wind? Where?
- Is the super-Alfvénic solar wind initially filamentary? Is this self-generated or related to jets, plumes, etc extending from the inner corona?

Structure: DeForest et al, 2018

Slow wind/Periodic blobs: Viall Vourlidas, 2015

Isotropization/β=1: Chhiber et al, 2018
Connecting Slow Solar Wind Theories to Current and Future Observations (Year II)

Organizers: Justin K. Edmondson and Liang Zhao (University of Michigan, Ann Arbor), Aleida Higginson (University of Michigan, Ann Arbor / NASA GSFC), Benjamin J. Lynch (UC Berkeley), Xudong Sun (University of Hawai‘i at Mānoa)

The origin of the slow solar wind has long been one of the major unsolved problems in solar and heliospheric physics.

Remote-Sensing:
• Do the elemental abundances observed by Solar Orbiter (SO) and Parker Solar Probe (PSP) change as a function of position across a coronal hole?
• How does the plasma variability as measured by SO and PSP change as a function of angle from the center of a helmet or pseudo streamer stalk?
• How do coronal hole boundaries measured by SO change over time? On what time scales?
• What are the signatures of S-Web arcs and how might we image them?
• Are S-Web structures observable in temperature maps and what are their scales?

In-situ:
• How does the magnetic field variability as measured by SO and PSP change as a function of angle from the HCS (particularly inside 20 Rs)?
• Can coherent small-scale structures within the slow wind be differentiated from turbulent fluctuations in wind composition, charge-state abundances, and entropy?
• Can we distinguish between helmet and pseudo streamer boundaries using in situ data?
• How does heat flux (e-strahl and halo) data, indicative of magnetic connectivity, change with solar source? What can this tell us about possible source region dynamics?
• Are global-scale source region structures observable in composition models and measurements? How are they affected by long-lived solar wind structures such as CIRs? Do these structures match S-Web predictions?
Session 8: *Global implications of kinetic-scale particle acceleration throughout the heliosphere*

Science Questions

- What role does *kinetic physics* play in particle acceleration processes?
- In what ways are turbulence, reconnection, and shock physics *intertwined* in the context of particle acceleration?
- What observational signatures can be used to distinguish and constrain kinetic acceleration mechanisms?
- What additional observations and models are needed to make progress on the problem of particle acceleration?

Scene-Setting Speakers:

Joel Dahlin (Theory), Lynn Wilson (Observations)

*Afternoon of Thursday, August 2\textsuperscript{nd}, Seaoats Room*
**Session 9:** Using PSP to Probe Magnetic Reconnection at the Sun

*Tuesday Morning (Seaoats)*

**Speakers:**
Jim Drake (Theory),
Nicki Viall (Observations)

**Science Questions:**

1. What magnetic reconnection events drive activity in the solar wind near the sun? What will be the signatures of these events?
2. What are PSP’s capabilities for observing signatures and properties of magnetic reconnection?
3. What theoretical predictions will PSP be well-poised to test?
4. How can reconnection theory & modeling prepare for PSP science?
5. How can we distinguish reconnection from other processes in observations of plasma heating and acceleration?
Session: How does the solar atmosphere connect to the inner heliosphere?
When: Thursday, Aug 2\textsuperscript{nd} 9:45 AM
Session Speakers: Aleida Higginson and Justin Kasper

Parker Solar Probe will provide the first direct measurements of the plasma and magnetic field properties of the corona and newly formed solar wind. We focus on connecting models and observations to assess the current state of knowledge of the ‘young’ solar wind conditions. We explore these and other questions:

\textit{How does the solar magnetic field connect from the photosphere through the corona to the inner heliosphere?}
\textit{How do the locations of the slow and fast solar wind map back to the Sun?}
\textit{How do the plasma conditions (e.g. composition, charge states) change with height and wind speed (e.g. below and above the Alfven critical point)}
\textit{What are the signatures (if any) of magnetic reconnection in the inner heliosphere in ambient wind and in transient events?}
\textit{At what height(s) is the Alfven critical point in slow and fast solar wind flows?}

Participants are encouraged to present current observations, models and discuss how these results can be tested/extended by Parker Solar Probe, Solar Orbiter and other observations.

Organizers: S. Antiochos, C. N. Arge, J. Burkepile, S. Cranmer, G. deToma, S. Gibson
Understanding the Magnetic Configuration of CMEs


- Tuesday 14:00-15:15 & 15:45-17:00.
- Scene setting talks by: Dr. Yuming Wang, Dr. Meng Jin.

Scientific Questions:
1. How can we classify the internal magnetic field configuration of the ICMEs?
2. Are the complex flux ropes made by evolutionary processes or by born?
3. Could bidirectional suprathermal electrons associated with large–and-incomplete magnetic field rotations be a signature of the crossing of ICME legs? Can they be reproduced by CME simulations?
4. What insight can we gain by studying the distribution of suprathermal electrons and heavy ion composition/charge states associated with CMEs?
Advances and Challenges in Data-Constrained Modeling of Solar Eruptions

Scene Setting Speakers: Brian Welsch (UWGB); Cooper Downs (PSI)
Organizers: X. Sun (IfA/UH); J. Leake (NASA GSFC); M. Kazachenko (CU & NSO)

What we have learned from data-constrained models? What we can do to improve them?

— Proper boundary condition & error estimate
— Constraints from new observations: DKIST, PSP, SO, etc.
— Model validation & prospective new insights
Galactic cosmic ray transport in the heliosphere

Thursday, August 2\textsuperscript{nd}, 9:45

\textbf{Scene-setting speakers:} J. Giacalone (UA/LPL), N. Schwadron (UNH)

\textbf{Conveners:} C. Corti, V. Bindi (UHM)

The goal of this session is to bring together people from various branches of heliospheric science to discuss what can we learn from solar modulation of GCRs (especially above 100 MeV/n) about the small-scale turbulence in the solar wind (diffusion coefficient), the large-scale structure of the solar wind/magnetic field, and how do solar wind disturbances affect GCRs.

Topics of interest are:

- Constraining the HMF turbulence from data beyond 1 AU (Ulysses, Voyagers, interplanetary scintillation, etc).
- Progress in magnetic turbulence theory for diffusion and drift processes in the heliosphere: analytical calculations, MHD & PIC simulations.
- In-situ measurements of disturbances (ICMEs, GMIRs, etc) throughout the heliosphere (SOHO, LASCO, MAVEN, New Horizons, Voyager 2, etc).
- Role of CMEs and GMIRs on short-term (days to weeks) and long-term (months) modulation of cosmic rays.
SHINE 2018 - Session # 14

Suprathermal ions and electrons in interplanetary space: Properties and Roles

- **Conveners:** M. A. Dayeh, R. Bucik, and C. Salem
- **Date & Time:** Wednesday, 01 Aug 2018, 10:20 am
- **Scene-setting speakers:** Mihir Desai (SwRI; ST ions). Linghua Wang (PKU; ST electrons)

**Science Questions:**

1. What are the properties of ST ions and electrons across the heliosphere?
2. What are the observational tracers that enable the identification of ST sources and acceleration processes?
3. How can our understanding of ST population in different space environments help us develop theoretical models to describe ST acceleration?
4. Are there systematic behaviors that characterize ST population? (e.g., function of solar activity; location in the IP medium; trends for particular events).
5. Is there a link between ST ions and ST electrons properties?
6. What is different about the ST population in 3He- and Fe-rich events?
7. What are the implications of understanding the ST population on space weather forecasting?
Predicting Solar Energetic Particles: Community Campaign
M. Leila Mays (NASA GSFC), Hazel Bain (UCB/NOAA SWPC), Ian Richardson (UMd/NASA GSFC)

Question
• There are ~20 physics-based or empirical SEP prediction models in the community, but how well do these models predict SEP events throughout the heliosphere?

We have invited the SEP modeling community to examine two case study campaign periods (July and September, 2017), briefly present their results in the session and answer the following:

- How did your optimized run results differ from the initial run?
- What aspects of the event does your model capture well?
- What aspects are more difficult to capture?
- What are the next steps for your modeling technique?

Schedule: Friday, 10am, Dunes

Scene-setting Speakers: Janet Luhmann (UC Berkeley); Marlon Nunez (U. of Malaga, Spain)
Is Understanding Magnetic Field Connectivity Crucial for Understanding Solar Energetic Particle Events?

H. M. Bain (University of Colorado, Boulder/NOAA), I. G. Richardson (University of Maryland/GSFC)

Questions

• How accurately do we need to know the connectivity, and how accurately can we infer it? What are the limitations due to observations (especially real-time) and models?
• Connectivity to what? Flare, CME-driven shock ...?
• Do global heliospheric models provide insight into connectivity to the Sun and shocks?
• To what extent does connectivity influence SEP properties, e.g., intensity-time profile, fluence, composition?
• Are cross field particle transport/diffusion processes sufficiently important that connectivity to the particle source is not critical for observing an SEP event?

Schedule: Today, after lunch! Dunes room

Scene-setting Speakers: David Lario (APL), Silvia Dalla (U. Central Lancashire, UK)
The Return of the CMEs

What are we assuming?

What do we know?

How can we move forward?

Christina Kay (NASA GSFC/CUA)

Horizons Room

Tuesday 9:50-12:45 am

Organizers: Nada Al-Haddad (CUA), Philip Hess (NRL)

THIS SESSION INTENDED TO BE DISCUSSION-BASED
WE WILL NOT BE ASKING FOR SLIDES
Role of turbulence in dynamics of SEPs

Recent years have seen emerging support for role of turbulent structure in SEP dynamics from observations as well as theory+simulations. This adds complexity to our understanding of SEP transport and energization. We aim to refine the following question: **What role does turbulence play in the dynamics of SEPs?**

The focus is on trying to find suitable questions that we can address as a community.
There have been efforts in the community to couple SEP models with heliospheric models, each with their own challenges and advantages. In this session we aim to gain a high-level understanding of SEP and heliospheric models that are available, understand how the members of the community are using them, and discuss what users have learned from their experiences thus far.

The session will address the following questions:

1) What are the main issues with coupling heliospheric and SEP models (including heliospheric model issues that affect the SEP model results)?

2) What have we already learned from attempts to couple heliospheric and SEP models, and what new information could/should we draw from them?
Large, gradual, SEP events are associated with CMEs.
- At energies below a few MeV, the peak SEP intensity is at the ICME-driven interplanetary shock.
- Above a few MeV, the peak intensity is before the shock.
- The event-integrated spectrum has a spectral break.

The causes of this are not clear, and will be explored in this session.

Does the spectral break provide information about
- Particle transport in the turbulent interplanetary magnetic field
- Or the nature of particle acceleration at near-sun CME shocks

When: Tuesday, AM

Scene-setting Talks:
- Dick Mewaldt, Caltech
- Ming Zhang, FIT
21: Observations and interpretations of coronal shock waves

Thursday, August 2nd 14:15-17:15

Organizers: Ryun Young Kwon (George Mason University), Philip Hess (Naval Research Lab), and Teresa Nieves-Chinchilla (Catholic University)

· Science Questions

1. What do remote sensing observations, e.g., H-alpha/EUV/X-ray, white light, and radio, indicate about the origin and nature? Are there features or observations that conflict with one another?

2. Are the properties of coronal shock waves inferred from remote sensing observations (speed, longitudinal extent, compression ratio, etc.) consistent with those seen in in-situ observations (including SEP observations) and numerical simulations? Can we infer a global shock wave morphology using all the current observations?

3. To what degree is the shock physically coupled to the eruption that initially causes it, and to what extent does it propagate as an independent feature?

· Agenda

· 14:15-15:30: General discussions with two invited scene-setting presentations.
  · Dr. Angelos Vourlidas (JHU/APL): Observations.
  · Dr. Meng Jin (LMSAL): Numerical simulations.

· 16:00-17:15: Applications of coronal shock observations to coronal seismology and studies of solar energetic particle accelerations.
Questions will be discussed:

1) What are the most critical observational data for characterization of multiscale properties of solar activity?

2) What are the observational and theoretical challenges for understanding and predicting the solar activity?

3) How can the data assimilation and machine learning approaches improve forecasting of solar activity on short and long time-scales?

Organizers: Irina Kitiashvili (NASA Ames & BAERI), Lisa Upton (HAO, NCAR)
SESSION 23: REALLY, WHAT IS TURBULENT DISSIPATION?

What is the relationship in turbulent dissipation between quasilinear processes (such as Landau damping) and fully nonlinear intermittent processes (such as the formation of current sheets)?

SHINE Workshop, 31 July 2018

Scene-Setting Presentations:
Robert T. Wicks: “Macroscale influences on turbulent dissipation”

Benjamin Chandran: “Plasma heating and the cascade of fluctuation energy in velocity space”
Ion and Electron Distributions in the Solar Wind: Kinetic Physics
Organizers: Kosta Horaites, Kris Klein, Daniel Verscharen

Key Science Question:
What physical effects shape solar wind VDFs?

Tuesday afternoon (2 pm – 5 pm), Sawgrass Room
Scene-setting Speakers: Chadi Salem, Peter Yoon
How do small-scale effects feedback on reconnection global dynamics, and vice versa?

Friday, 10:00am and 11:45am

- How do small-scale effects feedback on reconnection global dynamics, and vice versa?
- Do kinetic effects associated with reconnection have observational consequences on large scales?
- How do large-scale advections affect the conditions for reconnection?

**Scene-setting speakers:** Sabrina Savage and William Daughton

Organizers: Kathy Reeves (CfA), María Kazachenko (SSL), Lucas Tarr (George Mason University), Silvina Guidoni (NASA GSFC/American University)
Insights into CMEs and Their Substructure(s)
SHINE 2018 Session 26 (Wednesday 10:20)

Plenary speakers:
Nat Gopalswamy
Adam Szabo

We explore two key topics:

1) How well are remotely-sensed heliospheric CME substructures depicted in the overall CME imaging/reconstruction techniques (including when CMEs interact with each other), and how can their topologies be confirmed and/or resolved?

2) How accurate are in-situ measurements and how well are they extrapolated to remote-observations, particularly those of CME substructures; what do they really tell us about the plasma structure evolution and topologies?

Organizers: Bernard V. Jackson (University of California at San Diego), Mario M. Bisi, (Rutherford Appleton Laboratory)
Testing the Standard Model of solar eruptive events: the X8 limb flare of 10 September 2017

Organizers: Peter Young / NASA Goddard Space Flight Center, George Mason University

The focus of the session will be on testing the Solar eruptive events (SEE) Standard Model against limb SEE observations, and the key science questions are:

1. Can we diagnose the physics of the reconnection process using the measured thermal and non-thermal emission?
2. Is the magnetic field evolution and event morphology consistent with standard eruption scenarios (breakout, tether-cutting, torus/kink instability)?
3. What mechanism drives the plasma heating of the flare for over 24 hours?

The following types of contribution are encouraged for this session:

- Analyzes of observational data of the 10 September SEE.
- Studies of the magnetic field evolution of AR 12673 that led to the SEE.
- New modeling results of SEEs, including current sheet dynamics.
- Studies of other limb SEEs with similar characteristics to the 10 September event.
backup
To "Advance Solar Activity Forecasts Through Observations, Data Assimilation and Machine Learning" solar physicists need to apply knowledge and experience from other domains of science, in particular data analytics, a subdiscipline of computer science. It is naive of solar physicists to think they can become experts in this field by simply scavenging the literature that appears pertinent. After all, can we expect, say a chemist, to become an expert in solar flare prediction by browsing the relevant literature?

The way to make progress in combining data mining and solar activity prediction is a close collaboration between solar physicists and data mining experts -- unless, of course, one has the inclination to go for a second PhD in computer science. The latter is actually not a bad idea for students: we are developing a joint degree program for this purpose.

The solar-stellar informatics cluster at Georgia State University (GSU) is such an interdisciplinary effort between the departments of Physics & Astronomy and Computer Science. The first and major objective of this rapidly expanding group is the prediction of solar flares and closely related phenomena such as Solar Energetic Particles and Coronal Mass Ejections (CME's) using recently developed methods of data mining.

The primary requirement requirement for such an undertaking is developing a clean and balanced database. We are analyzing all available data and metadata produced during the Solar Dynamics Observatory (SDO) mission with the goal of developing a benchmark flare dataset, following the recommendation of the US National Science and Technology Council.

It is worth pointing out here that this undertaking is neither trivial nor effortless. SDO sends down of the order of 100,000 images per day, and from those images we produce metadata on various solar phenomena (e.g. sunspots, active regions, sigmoids, CME's) with automated feature recognition modules (Martens et al. 2012). One cannot review all these images and metadata by hand, so again automated methods had to be developed to accomplish this task. Examples of features that are not useful for flare prediction are sunspot or active region coordinates off the disk, image data gaps for various reasons (explained or unexplained), gaps in metadata caused for example by the relevant module being off-line, etc. It is obvious that any flare prediction algorithm would be greatly confused, say about the relation between flares and sigmoids, when there are undeclared gaps in either sigmoid or flare coverage.

The second step in our program is to use this benchmark data set to test various classifiers to see which ones perform best for solar flares. Here we not only use a snapshot of solar images and metadata, but we also look at the evolution of various parameters. Already in our first cursory analysis we found a strong and rather surprising flare parameter that I will discuss in this introduction.
Dissipation in the Solar Wind: Waves and Turbulence

Session Organizers: S. Peter Gary (SSI), Tulasi Parashar (U Delaware), Chadi Salem (U California Berkeley), and Daniel Verscharen (UCL)

As the solar wind flows outward from the Sun, observations show ions are preferentially heated in directions perpendicular to the background magnetic field and suprathermal electrons are scattered toward isotropy. Theory and simulations indicate that these properties are due to several different but related plasma physics processes, including waves, turbulence, and the development of coherent structures such as reconnection and current sheet formation. The general science question of this session will be “What are the most important observed properties of solar wind ion and electron velocity distributions, and what dissipation processes are the most likely sources of these properties?” Specific questions include:

1) Dissipation processes in collisionless plasmas may typically be separated into two categories: linear/quasilinear processes which are often framed in terms of homogeneous plasmas, and intermittent processes which correspond to fundamentally inhomogeneous plasmas. Are these categories basically disparate, or may both yield similar dissipation rates in particular limits?

2) Various simulation models (gyrokinetic, Vlasov, hybrid PIC, full PIC) are available to address collisionless plasma dissipation. Which of these models are necessary and/or best suited to represent the dissipation physics of the solar wind?

3) Both two-dimensional (2D) and three-dimensional (3D) model simulations yield collisionless plasma dissipation. The latter model is more complete, but what are the conditions under which the former model yields useful physics?

4) Both collisionless (wave-particle) and collisional (particle-particle) processes contribute to solar wind dissipation. What are the relative contributions of these processes to electron and ion heating and entropy increases?

5) The Turbulent Dissipation Challenge [Parashar et al., J. Plasma Phys., Vol. 81, 905810513 (2015)] posed a series of simulations to address turbulent dissipation in collisionless plasmas such as the solar wind. What are the results and predictions so far of the Turbulent Dissipation Challenge simulations? How can TurboChallenge calculations be used to prepare for the approaching observations of Parker Solar Probe and Solar Orbiter?