



S³PARK WORKSHOP

**Synergy between Spacecraft observations and
Simulations of Particle Acceleration, Reconnection,
& Kinetic processes in turbulent plasmas**

14-18 September 2026

4th floor, CCE1 Building
City Campus East
Northumbria University
Newcastle upon Tyne, UK

Link to payment form for social dinner and excursion

<https://store.northumbria.ac.uk/conferences-and-events/engineering-and-environment/academic-workshops/s3park-workshop-2026>

Day 1- Monday 14 September: State of the art of s/c observations

Registration, breakfast, and welcome 08:30 – 09:30

Time	Topic	
08:30 – 09:15	Registration & breakfast	Welcome desk
09:15 – 09:30	Welcome	Luca Franci

Session 1: Multi-spacecraft missions I

Time	Topic	Speaker
09:30 – 10:30	MMS – Goals, key results, instruments & data	Julia Stawarz
10:30 – 11:00	HelioSwarm – Overview of mission & instruments	Lorenzo Matteini

Coffee break 11:00 – 11:30

Session 2: Multi-spacecraft missions II

Time	Topic	Speaker
11:30 – 12:00	Plasma Observatory – Overview of mission & instruments	Julia Stawarz

Session 3: Single-spacecraft missions I

Time	Topic	Speaker
12:00 – 13:00	Solar Orbiter – Goals, key results, instruments & data	Stephanie Yardley

Lunch 13:00 – 14:00

Session 4: Single-spacecraft missions II

Time	Topic	Speaker
14:00 – 15:00	PSP – Goals, key results, instruments & data	Stuart Bale
15:00 – 15:30	Overview of other missions (Wind, ACE, Cluster)	Zubair Shaikh

Coffee break 15:30 – 16:00

Session 5: Simulation studies interpreting/comparing to spacecraft data

Time	Topic	Speaker
16:00 – 16:15	<i>Connecting hybrid plasma simulations of collisionless shockwaves to in situ observations with machine learning</i>	Imogen Gingell (Southampton)
16:15 – 16:30	<i>Plasma stability in turbulent magnetic islands downstream of collisionless shocks: relation to the observed low-$\beta_{\parallel}$ boundary in $\beta_{\parallel}$-$T_{\perp}/T_{\parallel}$ distributions</i>	Laura Vuorinen (QMUL)
16:30 – 16:45	<i>Bridging in Situ Satellite Measurements and Simulations of Magnetic Reconnection Using Recurrent Neural Networks</i>	Cara Waters (QMUL)
16:45 – 17:00	<i>Observationally-Inspired Kinetic Simulations of Magnetotail Reconnection: Particle Energization in 2D and 3D</i>	Nadja Reisinger (KU Leuven)
17:00 – 17:15	<i>A transient-oriented clustering-based solar wind classification across solar cycle 23, 24, and 25</i>	Francesco Carella (KU Leuven)
17:15 – 17:30	<i>SWEPT: an interactive web application for solar wind lineup identification</i>	Simone Benella (INAF - IAPS)

Group picture 17:30

Poster session with drinks reception 17:30 – 19:00

See the list of posters later.

Note that posters will be display during the whole workshop.

Day 2 - Tuesday 15 September: State of the art of numerical modelling

Breakfast 09:00 – 09:30

Session 1: Modelling across scales – ion scales and above

Time	Topic	Speaker
09:30 – 10:15	Fluid simulations (MHD, Hall-MHD, 2-fluid) – review	Emanuele Papini
10:15 – 11:00	Local and Global hybrid models – review	Lorenzo Matteini

Coffee break 11:00 – 11:30

Session 2: Modelling across scales – below the ion scales and back up

Time	Topic	Speaker
11:30 – 12:30	Fully kinetic models – review	Kevin Schoeffler
12:30 – 13:00	Comparing/combining MHD, hybrid, kinetic, incl. Box-in-Box	Luca Franci

Lunch 13:00 – 14:00

Session 3: Simulation studies using innovative methods

Time	Topic	Speaker
14:00 – 14:15	<i>BiB solar wind simulations: modelling spectra, intermittency, and energy transfer over 4 decades</i>	Emanuele Papini (UniFi)
14:15 – 14:30	<i>Anomalous electric fields in the turbulent Earth's magnetosheath: insights from 3D hybrid simulations</i>	Jeffersson Agudelo (Northumbria)
14:30 – 14:45	<i>The muphyll framework</i>	Simon Lautenbach (RUB Bochum)

Session 4: Simulation studies using machine learning

Time	Topic	Speaker
14:45 – 15:00	<i>Machine learning closure in for magnetic reconnection</i>	George Miloshevich (Northumbria)
15:00 – 15:15	<i>Machine learning based closure for two-dimensional plasma turbulence</i>	Pietro Dazzi (KU Leuven)
15:15 – 15:30	<i>Ten-moment fluid simulations with ML closures in the case of Landau damping</i>	Emanuel Jeß (RUB Bochum)

Coffee break 15:30 – 16:00

Session 5: Numerical or observational studies seeking synergy/collaborations

Time	Topic	Speaker
16:00 – 16:15	<i>Scalings for Current Sheets in Plasma Turbulence: Solar Wind Perspective</i>	Zubair Shaikh (Northumbria)
16:15 – 16:30	<i>Current sheet properties and their dependence on the plasma conditions in hybrid turbulence simulations</i>	Devesh Dhole (Northumbria)
16:30 – 16:45	<i>Distinct Strong and Weak Shear Regimes of Self-Generated Turbulent Magnetic Reconnection</i>	Qihui Ming (Univ of St Andrews)
16:45 – 17:00	<i>Electron Energization in Kinetic Kelvin–Helmholtz Dynamics at Earth's Magnetopause</i>	Silvia Ferro (KU Leuven)
17:00 – 17:15	<i>Investigating turbulent properties of small-scale structures in the Earth's magnetosheath using MMS observations</i>	Paulina Pilapana (Northumbria)
17:15 – 17:30	<i>Electron heating and Debye-scale electrostatic turbulence at quasi-perpendicular collisionless shocks</i>	Ahmad Lalti (Northumbria)

Conference dinner at Blackfriars – 19:00

Day 3 - Wednesday 16 September: Extracting knowledge from data (and from the ground)

Breakfast 09:00 – 09:30

Session 1: Analysing traditional simulation data

Time	Topic	Speaker
09:30 – 10:00	Diagnostics for plasma turbulence	Petr Hellinger
10:00 – 10:30	Diagnostics for magnetic reconnection	Emanuele Papini
10:30 – 11:00	Diagnostics for shocks	Imogen Gingell

Coffee break 11:00 – 11:30

Session 2: Analysing virtual s/c data

Time	Topic	Speaker
11:30 – 12:00	Multipoint investigation of space plasma turbulence connecting gradients, topological structures, cascade rate, and energy dissipation	Simone Benella

Lunch 12:00 – 12:30

“Outdoor session”: Hadrian’s Wall Half Day Guided Excursion

Time	
12:30	Depart Northumbria University
13:30	Arrival at Cawfields for a tour of Hadrian's Wall
15:00	Depart for Vindolanda for a site tour of the Roman Fort, free time in the museum
17:15	Depart for Northumbria University
18:30	Back at Northumbria University

For the half-day guided excursion to Hadrian's Wall and Vindolanda, **please come prepared for outdoor walking in variable Northumberland weather**. We recommend comfortable footwear with good grip, as the terrain along the Wall is uneven and can be muddy or slippery, especially if it has rained recently. **Please also bring a waterproof jacket or coat**, as well as a small umbrella if you prefer, since the weather in this part of the country can change quickly and there is little shelter along the route. **Warm layers are advisable even in September, as it can be considerably cooler and windier on the Wall than in Newcastle itself**. Finally, we suggest bringing a bottle of water and, if you wish, a small backpack to keep your hands free while walking.

Day 4 - Thursday 17 September 2026: Stirring & mixing the community

Breakfast 09:00 – 09:30

Session 1: Simulation showcase and data archives

Time	Topic	Chair
09:30 – 10:40	Flash talks – showcase of available simulation data archives from individual people/groups, 10 x 5+2 min	Any volunteers?
10:40 – 11:00	Joint (offline/online) database & data sharing	

Coffee break 11:00 – 11:30

Session 1: Initiating and strengthening collaborations II

Time	Topic	Chair
11:30 – 12:00	Turbulent Dissipation Challenge 2.0	
12:00 – 12:15	Joint funding calls and proposals (e.g., COST action, Horizon Europe, ISSI teams)	
12:15 – 12:25	Training network for early-career researchers (e.g., short/long visits, co-supervision, job adverts...)	
12:25 – 12:45	Theme issue: contributions to papers/reviews	

Feedback survey

Time	Topic	
12:45 – 13:00	Feedback survey for the “main workshop”	Luca Franci

Lunch 13:00 – 14:00

Optional parallel activities and/or group discussions

We will have three big rooms available so we can easily split up into parallel sessions

Time	Topic	Chair
14:00 – 14:15	Checking accounts and access to HPC for Friday	Pranab Deka
14:15 – 15:30	Suggestions for topics to be discussed are very welcome!	Any volunteers?

Coffee break 15:30 – 16:00

Possible second poster session 16:00 – 17:00

Day 5 - Friday 18 September 2026

Hands-on training on simulations and s/c data for ECRs

Breakfast 09:00 – 09:30

Session 1: Basics of HPC

Time	Topic	Speaker
09:30 – 10:00	Introduction to HPC (parallel computing, compilers, modules, scheduler)	Emanuele Papini
10:00 – 10:30	How to get HPC resources and EuroHPC	Pranab Deka
10:30 – 11:00	DiRAC facilities, resources, and training for UK scientists	Luca Franci

Coffee break 11:00 – 11:30

Session 2: Hands-on training on fully kinetic simulations (iPIC3D)

Time	Topic	Speaker
11:30 – 13:00	iPIC3D Tutorial: compiling/running on CPUs and GPUs	Pranab Deka

Lunch 13:00 – 14:00

Session 3: Hands-on training on fully kinetic simulations (iPIC3D)

Time	Topic	Speaker
14:00 – 14:15	iPIC3D tutorial: data visualisation	Pranab Deka

Session 4: Hands-on training on spacecraft observations (Solar Orbiter)

Time	Topic	Speaker
14:15 – 14:45	S/c data retrieval and visualisation with Matlab	Zubair Shaikh
14:45 – 15:00	S/c data retrieval and visualisation with Python	Utsav Panchal
15:00 – 15:15	Other tools: Solar-MACH, Magnetic Connectivity Tool, JHelioviewer	Luca Franci

Coffee break 15:30 – 16:00

Session 4: Hands-on training on some specific tools for s/c observations

Time	Topic	Speaker
16:00 – 16:20	A Python toolkit for Decomposing and Analysing Ion VDFs from Solar Orbiter SWA/PAS	Hao Ran
16:20 – 16:40	A Python toolkit for fitting the 3-component electron VDF from Solar Orbiter SWA-EAS	Xiangyu Wu

Closing remarks and goodbye

Time	Topic	
16:40 – 17:00	Feedback survey for hands-on training and Closing remarks	Luca Franci

Saturday 19 September 2026

Extra social activity for those still in town and interested

Time	
06:00 – 08:00	Sunrise at Tynemouth Castle and Priory – free entrance

List of attendees (in alphabetical order)

Ahmad Lalti, he/him, Northumbria University (UK)
Devesh Dhole, he/him, Northumbria University (UK)
Eilidh Hall, she/they, Northumbria University (UK)
Emanuel Jeß, he/him, Ruhr University Bochum (DE)
Emanuele Papini, he/him, University of Florence (IT)
Francesco Carella, he/him, KU Leuven (BE) & University of Turin (IT)
Gabriel Luiz Ferreira Santos, he/him, INPE (BR) & ASU-CAS (CZ)
George Miloshevich, he/him, Northumbria University (UK)
Hao Ran, he/him, Mullard Space Science Lab-UCL (UK)
Imogen Gingell, she/her, University of Southampton (UK)
Jack Parker, he/him, Northumbria University (UK)
Jeffersson Agudelo Rueda, he/him, Northumbria University (UK)
Julia Stawarz, she/her, Northumbria University (UK)
Kevin Michael Schoeffler, he/him, Ruhr University Bochum (DE)
Laura Vuorinen, she/her, Queen Mary University (UK)
Lorenzo Matteini, he/him, Imperial College (UK)
Luca Franci, he/him, Northumbria University (UK)
Mattia Sangalli, he/him, University of Florence (IT)
Nadia Imtiaz, she/her, University of Southampton (UK)
Nadja Reisinger, she/her, KU Leuven (BE)
Paulina Quijia Pilapana, she/her, Northumbria University (UK)
Petr Hellinger, he/him, Astronomical Institute-CAS, (CZ)
Pietro Dazzi, he/him, CMPA, KU Leuven (BE)
Pranab J Deka, he/him, KU Leuven (BE)
Qihui Ming, he/him, University of St Andrews (UK)
Sam Kay, he/him, Durham University (UK)
Silvia Ferro, she/her, KU Leuven (BE)
Simon Lautenbach, he/him, Ruhr University Bochum (DE)
Simone Benella, he/him, INAF-IAPS (IT)
Stephanie Yardley, she/her, Northumbria University (UK)
Stuart D. Bale, he/him, UC Berkeley (US) & Imperial College (UK)
Utsav Panchal, he/him, Northumbria University (UK)
Xiangyu Wu, he/him, Mullard Space Science Lab-UCL (UK)
Zubair Ibrahim Shaikh, he/him, Northumbria University (UK)

List of posters

1. Gabriel Luiz Ferreira Santos, *Unveiling a New β Scaling of the Tearing Instability in Weakly Collisional Plasmas*
2. Pietro Dazzi, *Using electric antennas to measure electrons: Mutual Impedance and Quasi-Thermal Noise*
3. Luca Franci, *Modelling the particle dynamics in turbulent plasmas using the innovative multi-scale Box-in-Box (BiB) approach*
4. Eric Calvet (George Miloshevich), *Identifying an electron heat flux closure for the 1D Weibel instability via explainable AI and equation discovery*
5. Nadia Imtiaz, *Role of Shock Criticality on Wave Evolution and Ion Energization in interacting Collisionless Shocks at 1AU: From Subcritical to Supercritical*
6. Eilidh Hall, *Investigating the diagnostic potential of type III burst bandwidths*
7. Zubair Shaikh, *Broadband Electrostatic Waves within Hot Flow Anomalies at Earth's Bow-Shock*
8. Hao Ran, *The Damping and Instability of Ion-acoustic Waves in the Solar Wind: Solar Orbiter Observations*
9. Xiangyu Wu, *Coronal Source Signatures in Solar-Wind Electron Temperatures at 0.5 au*
10. Mattia Sangalli, *Evolution of magnetic cloud signatures in the turbulent solar wind: virtual spacecraft analysis*
11. Utsav Panchal, *Analysing turbulent properties during radial alignments between Parker Solar Probe and Solar Orbiter*
12. Zubair Shaikh, *Scalings for Current Sheets in Plasma Turbulence: Solar Wind Perspective*
13. Sam Kay, *Analytic, axisymmetric solutions for magnetic switchbacks*
14. Emanuele Papini, *Detecting the Auroral Oval through Swarm ionospheric magnetic field measurements and CSES-01 electric field observations*