DASH/IHDEA 2026

Sunday, 4 October 2026 - Friday, 9 October 2026

Session Overview

DASH Sessions

Agentic AI and LLM Applications in Heliophysics

Organisers: Shawn Polson

This session invites contributions exploring how Large Language Models (LLMs) and AI agents are being applied to scientific software development and research workflows in Heliophysics. Submissions on any LLM-based application are welcome, with particular interest in the rapid shift toward agentic systems capable of planning and executing multi-step tasks. Topics of interest include agentic coding tools (such as Claude Code and Codex); multi-agent orchestration; the Model Context Protocol (MCP) and other emerging standards for connecting AI to scientific data and tools; Retrieval-Augmented Generation (RAG); evaluation and benchmarking of LLMs and agents on domain-specific tasks; trust, verification, and reproducibility of AI-generated results; and case studies of LLM-based systems applied to Heliophysics problems—such as metadata curation, literature synthesis, and automated data analysis.

Developing Heliophysics Standards and Best Practices for Modeling Software

Organisers: Daniel Welling, Eric Winter, Rebecca Ringuette, Julie Barnum

Modeling software faces more challenges in their movement towards Open Science due to the greater software complexity, computational specialization (e.g., HPC and Fortran), and lack of data archival infrastructure. In previous discussions, the most highly ranked best practices and standards prioritize increased transparency, re-usability, open sharing, collaboration, and data publication (see Table 2 in the linked report). We invite presentations and posters from modelling software developers, model software users, and operational users of model describing their own attempts (and pitfalls encountered) in adopting Open Science practices in modeling software, what best practices or standards they would find useful, and/or what is missing from existing supporting infrastructure. This session continues the discussions for software standards and best practices for Heliophysics modeling software begun at a NASA-funded workshop in 2025 (Ringuette et al. 2025, https://doi.org/10.5281/zenodo.17613136).

Ground-Based Heliophysics Data: Distribution, Discovery, and Science Enablement

Organisers: Emma Spanswick, Darren Chaddock, Pietro Zucca

Ground-based instrument networks – riometers, all-sky imagers, incoherent scatter and HF radars, GNSS receivers, magnetometers. neutron monitors, solar telescopes, and radio arrays – produce a substantial fraction of the data utilized in heliophysics research. As the community moves toward multi-instrument, multi-network science and tighter integration with space-based assets, the systems that curate, describe, and distribute this data face growing expectations: researchers want seamless discovery across heterogeneous networks, reproducible access to both quick-look and science-grade products, and tooling that supports campaign-style analysis. This session will focus on the data-system layer that makes ground-based observations usable – how datasets are organized, described, served, and ultimately combined in research workflows.

We invite contributions on topics including (but not limited to): archival architectures and the cloud-versus-on-premise trade space; FAIR-aligned metadata and discovery services; cross-network interoperability and alignment with community standards and tooling (SPASE, HAPI, IHDEA, INTERMAGNET, VSO, SunPy and related open-source ecosystems); quick-look and science-grade product generation; APIs, query interfaces, and user-facing tooling; and software that enables multi-instrument campaigns and conjunctions with space-based missions. We especially welcome perspectives from data users on what is – and isn't – working, and contributions from early-career research software engineers.

The session will combine short presentations with a moderated panel discussion to surface shared challenges and identify concrete opportunities for cross-network collaboration. At least one session lead will attend in person in Dublin.

Instrumentation for Data Services: Logging, Metrics, and Observatory Design

Organisers: Umer Salman

Scientific data services power modern heliophysics research, yet we often have only a partial view of how they are actually used. This session explores practical ways to capture metrics across APIs, GUIs, and archives to understand usage patterns, key datasets, and system demand. We will discuss identifying different users such as researchers, pipelines, bots, and AI systems, and linking usage to downstream science outcomes like publications and mission impact. The goal is to make infrastructure usage visible and useful for guiding development and supporting funding.

Open Source Software Health and Maintenance

Organisers: Daragh Hollman, Herman le Roux

Open source software projects are a big contributor to heliophysics research. We aim to showcase progress on current issues, highlight new ones, and discuss broader best practices. This session is meant to be a platform for communication and collaboration between open source projects. It will feature a collection of short presentations with slides, or interactive notebooks, with time for questions. We welcome talks showing specific examples, or broader overviews and comparisons. We also welcome the showcase of any new or ongoing open source projects.

Suggested topics for discussion include, but are not limited to:
How to efficiently manage open source projects? CI/CD, testing, managing issues, etc.
Keeping the community involved: Monitoring usage, getting feedback, reaching new users, and making contributing accessible.
Interoperability. Communication and collaboration between projects.
How to curate a good user experience? End products (containers, packages, others), effective documentation, etc.
Improvements to data access and pipelines.

Science and Mission Planning Tools for Space Weather and Human Exploration

Organisers: Douglas Rodgers, Katie Hancock

The 2026 NASA Heliophysics Division (HPD) Strategic Implementation and R&A Reorganization [1] envisions Heliophysics as “the science of space weather and human exploration.” This realignment seeks ways for Heliophysics to solidly support human exploration through better science foundations that lead to concrete advances in space weather and even the larger space economy. Given a shift in philosophy to doing less science with less money, efficiency becomes paramount in coordinating, planning, and executing numerous smaller missions. Planning tools must adapt to exploit larger story arcs, such as cross-mission knowledge.

This session seeks presentations in areas such as:
Science planning across multiple observatories, constellations, low-earth orbit (LEO), space weather, or planetary missions
Software architecture useful for rapid mission design and application of existing instrumentation
Tools that facilitate coordinated analysis of existing data for application to future missions

The session will comprise 10-to-15-minute talks with a panel discussion at the end.

[1] https://www.nationalacademies.org/cdn/materials/a163181e-1925-4b99-a138-6728004eb902

Shadow Workflows: Bridging Scientific Practice and Formal Systems

Organisers: Umer Salman

Official pipelines and tools often differ from what scientists use day to day. This session explores the gap between supported systems and informal workflows such as scripts, notebooks, versioned files instead of Git, local hacks, and emerging AI-assisted development. Participants will discuss why these shadow workflows emerge and what they reveal about unmet needs in research software support. The goal is to bridge this gap by integrating robust software engineering practices without disrupting how scientists actually work.

Support Systems and Best Practices for Happy Research Software Engineers

Organisers: Tori Marbois

As scientific software developers, we are faced with a unique set of challenges that can make it difficult to ‘keep our heads above water’. Whether it’s meeting strict project requirements, accommodating last-minute change requests, navigating conflicting priorities, or frequent context switching, there are many aspects of our work that can knock us off balance. This impacts our ability to contribute high-quality work and maintain a desired work-life balance.

The goal of this session is to provide an opportunity to share systems and practices that help us navigate the specific challenges in the scientific software engineering field. Attendees will walk away having learned new techniques or tools that can assist their growth as engineers, teammates, and managers with the capacity to gracefully traverse and thrive in science and mission work. Topics could be drawn from four different tiers of impact:
Individual Impact: How you organize tasks, a favorite tool or practice for problem solving, personal workflows for supporting yourself

Team Impact: Approaches to pair programming, lessons learned from mentoring relationships, sharing knowledge and building community
Manager Support: Stakeholder relationships, minimizing burnout, navigating deadlines with successful project management, running productive meetings, adapting Agile methods for mission work
Organizational Impact: Advocating for better processes, setting best practices and standards, fostering belonging.

Under the Hood: Lessons Learned in Mission Data Systems

Organisers: Bryan Harter

Across the Heliophysics community, institutions often independently design, build, and operate Mission Science Data Systems (SDS). While each mission has unique constraints, the lack of a shared architectural language often obscures the commonalities between our systems. This inevitably leads to duplicated effort, bespoke pipelines, and isolated problem-solving.

This session focuses on peering ""under the hood"" of existing Mission Science Data Systems. We aim to share practical lessons learned from developing or reusing software, highlighting specific technologies and orchestration workflows that can benefit the broader community.

Presenters are invited to share approximately 15-minute case studies of their mission’s SDS. To facilitate cross-mission comparison, we encourage speakers to use the standardized ""Mission Science Data Systems"" template (https://zenodo.org/records/17316944) to frame their talks.

By taking an honest look at operational realities, technical debt, migration challenges, and the successful implementation of reusable tools, we aim to highlight opportunities for shared software development and spark collaborations that streamline future missions.

DASH Birds of a Feather (BOFs)

A birds of a feather session is a relaxed, informal discussion for conference attendees who share a common interest. Browse the sessions below and join whichever appeal to you.

Creating common and reusable mission pipeline software

Organisers: Marcus Hughes, Bryan Harter, Jon Niehof, Julie Barnum, Rebecca Ringuette

Imagine a hypothetical scenario where your funding agency tells you that moving forward only open-source, reusable software can be used for mission pipelines. This birds of a feather session will promote discussion surrounding creating common and reusable mission pipeline software. What capabilities must be kept? What needs changing? What will be expunged from your design with limited funding resources in mind? What must remain unique to the mission? There will be specific discussion surrounding design abstraction for existing missions to maximize reusability. During this session, we will co-create a shared document capturing the ideas shared. We encourage different mission representatives to come with initial answers to these questions but will prioritize an open discussion of the necessary steps required to create such open-source pipeline software.

The Impact of AI and LLM Crawlers on ESDC Data Metrics and Access: One Year On

Organisers: Jonathan Cook, Arnaud Masson

Since our previous session one year ago, AI and LLM-driven crawlers have continued to reshape traffic to our scientific data archives, further complicating the interpretation of usage metrics requested by decision makers as a Key Performance Indicator (KPI). At The ESDC, we have seen a sustained rise in automated access, making it increasingly difficult to distinguish real community engagement from large-scale non-scientific machine-powered accesses.

Over the past year, we have continued to investigate different ways to improve traffic classification, refined log analysis, and explored mitigation strategies such as imposing login to access and download our data in addition to IP classification and rate limiting. While these steps provide better visibility and insight, challenges remain accurately reporting key indicators across all missions.

This Birds of Feather session will briefly present our latest findings at The ESDC and focus on open discussion: how are other data centers adapting, what measures are proving effective, and are we moving toward stricter access controls such as authentication for open data?

DASH General

This open session welcomes contributions across the full breadth of data analysis and research software in heliophysics that don't fall neatly within the other sessions, or that span several of them. We invite presentations and posters on new tools, libraries, and pipelines; novel analysis methods applied to solar, heliospheric, magnetospheric, ionospheric, or ground-based datasets; data access, processing, and visualisation; and reproducibility and open science practices. Contributions at any stage of maturity are welcome, from early prototypes to mature, widely used software. We especially encourage submissions from early-career researchers and research software engineers. If your work concerns data or software in heliophysics and you're unsure where it fits, this is the session for it.

IHDEA

The goal of the International Heliophysics Data Environment Alliance (IHDEA, ihdea.net) is to encourage the use of common standards and services in order to enable sharing of data and to enhance science. IHDEA also aims at bridging the gap between different communities such as GNSS and Earth observations communities in the context of a global Heliophysics information architecture.

Updates from space agencies, institutions serving heliophysics data, and IHDEA working groups are solicited. Contributions from the wider community that cover the goals of IHDEA are also welcomed.