UIFCW 2023

A UFS Collaboration Powered by EPIC

Unifying Innovations in Forecasting Capabilities Workshop (UIFCW) 2023 Report

A UFS Collaboration Powered by EPIC

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https://doi.org/10.25923/0nma-bf19

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PREFACE

On behalf of the entire organizing committee, we extend our gratitude to everyone who made the Unifying Innovations in Forecasting Capabilities Workshop (UIFCW) 2023 a success.

A special acknowledgment goes to all those who volunteered their time and energy in planning and executing the event. Your dedication and hard work were instrumental in creating a seamless experience for all participants.

To those who attended in person or joined us over the internet, we appreciate your participation and enthusiasm. Your presence and engagement contributed to the discussions and exchanges that took place.

We are particularly grateful to all the presenters, speakers, and individuals who submitted posters. Your valuable insights and expertise truly elevated the content and discourse of the workshop. Without your contributions, UIFCW 2023 could not have been the success it was. The information and ideas shared have set new benchmarks and have paved the way for future collaborations and innovations. We look forward to building upon this momentum and hope to see you all at UIFCW 2024.

EXECUTIVE SUMMARY

The second annual Unifying Innovations in Forecasting Capabilities Workshop (UIFCW) was hosted by the Earth Prediction Innovation Center (EPIC) and the Unified Forecast System (UFS) at the National Center for Atmospheric Research / University Corporation for Atmospheric Research (NCAR/UCAR) facility located at 3090 Center Green Dr, Boulder, CO 80301. The 2023 event built off of the 2022 event, leveraging feedback from the previous year that was utilized in planning and executing the event.

Held over five days at the NCAR & UCAR Center Green Campus, the workshop was also accessible online, reaching full in-person registration capacity of 200 people and allowing for broader online participation. UIFCW's primary objective was to foster understanding of how academia, industry, and operations can work collaboratively to enhance the Unified Forecast System. This year's theme, "Innovation and Community," proved successful, encouraging the exchange of innovative ideas and fostering a sense of community among participants.

Among the achievements, the workshop received over 120 abstracts for presentations and in-person and online poster sessions. The venue at NCAR/UCAR was pivotal to the event's success, offering advanced IT infrastructure and facilities for live streaming, multiple parallel sessions, side meetings, and workshops, thus contributing to a considerable improvement over the previous year.

Key areas for improvement identified in the previous UIFCW were addressed in the 2023 event. This included enhancements in the video streaming quality, with the introduction of a dedicated camera for live streaming to YouTube. Slido was also implemented with mixed reviews as the main platform for live chat during streaming sessions. Based on previous feedback, the abstract review process was made more efficient by using a single form for Session Chairs to grade. UFS demonstrations and short training courses were also introduced, per previous event recommendations, which helped to boost engagement and involvement.

There were areas identified for further improvement, including the need for more detailed agendas for session chairs, additional preparation for Master of Ceremonies (MC), and strategies to ensure key roles are fulfilled in-person due to the challenges of virtual roles.

In short, the insightful feedback from UIFCW 2022 led to a significant improvement in planning and execution for UIFCW 2023. This cycle of continuous improvement, rooted in participant feedback, underscores our commitment to delivering an increasingly successful UIFCW in the coming years.

EVENT OVERVIEW

UIFCW was an intensive five-day event with a rich agenda of presentations, workshops, and panel discussions. These sessions were aimed at sharing research findings, updates on the UFS, challenges, and successes, as well as perspectives on future progress. Each day had a unique focus, with sessions designed to facilitate an open exchange of ideas and collaboration among participants.

The workshop featured numerous sessions that were hosted in the main auditorium or split into three spaces for parallel sessions; additional workshops and events were held in other meeting rooms, and participants benefited from in-person and online poster sessions.

Beyond the educational and interactive sessions, there were opportunities for networking and collaboration during breaks and after hours to foster a sense of community among attendees. The event was widely praised for its organization, the quality of its content, and the ample opportunities it provided for interaction and collaboration among attendees.

In conclusion, UIFCW was a success, with significant improvements over the previous year, particularly in terms of participant engagement and logistics of the event venue. However, feedback also highlighted areas where further improvements can be made, offering valuable insights for the planning and execution of future workshops.

DURING THE EVENT

The in-person and virtual coordination were executed effectively with support from staff members from EPIC/NOAA and NCAR/UCAR. The utilization of digital tools like Google Sheets and Google Forms streamlined administrative processes, while the NCAR/UCAR provided a run of show agenda template to coordinate presentations. They played essential roles in moderating sessions, monitoring chats, and contributing to the event's success.

Sessions

UIFCW comprised a robust agenda that spanned five days, from Monday, July 24th to Friday, July 28th. The schedule included a diverse range of sessions, panel discussions, hands-on workshops, and keynote speeches. The following table outlines the specific activities and content covered each day, reflecting the collaboration and innovation that characterized this event. To view the presentation slides for each presentation, visit the UIFCW 2023 event page.

Monday, July 24th
 	
Click here for the video recording
	• Welcome & Kickoff
	• Opening Remarks by Dr. Michael Morgan, Assistant Secretary of Commerce for Environmental Observation and Prediction
	• Remarks from Dorothy Koch, Weather Program Office (WPO) Director, and Stephan Smith, Director of the Office of Science and Technology Integration (OSTI)
	• Overview: State of the Science of UFS
	• Inclusion in Community Modeling Followed by a Panel Discussion on the Importance and Need for Diversity & Inclusion
	• Welcome Event for New WINGS Dissertation Fellows
	• Hands-on Workshops:
	  ○ Contributing to UFS/EPIC GitHub Repositories
	  ○ Running UFS Land Data Assimilation (DA) System v1.1.0 in the Cloud
	  ○ Detecting Deforestation and Forest Degradation | Post Workshop Q&A

Tuesday, July 25th Click below for the appropriate video recording: North Bay Center Bay South Bay	• Parallel Sessions with Updates on & Challenges of UFS Applications: SRW/RRFS, MRW/S2S, and HAFS • Community Discussion: Insights from Industry and Academia • Panel Discussion on Use Cases & Needs of UFS Applications by New Professionals, Professors & Industry • Parallel Sessions with Cross-Cutting Concepts: Physics, Verification and Validation, System Architecture, and Dynamics and Nesting • Hands-on Workshop: ○ Running the Short-Range Weather (SRW) Application v2.1.0 Containers in Azure with Post-Workshop | Q & A
Wednesday, July 26th Click here for the video recording	• Roundtable Discussion on Community Modeling • Open Discussion from the Roundtable event • Social & Behavioral Science Professional Talk • EPIC Support for the UFS • EPIC Infrastructure Update • Panel Discussion on JCSDA, EPIC, and Community DA Development

	• Data Management, Optimization, Compression • Poster Session (Slack channel to view virtual posters)
Thursday, July 27th Click below for the appropriate video recording: North Bay Center Bay South Bay	• Unified Model Practices • Research to Operations (R2O) and Operations to Research (O2R) Process With Q&A • Keynote: Seeking Portability and Productivity for Numerical Weather Prediction Model Code (Given by Dr. Christian Kühnlein, ECMWF) • Panel Discussion on Open Computing & Shaping the Future of Computing for Modeling • Parallel Sessions with Emerging Applications: Coastal and Marine, Space Weather, and Air Quality • UFS as a Decision Tool: A Private Industry Perspective • Emerging Technologies: AI and Cloud Computing • Science Spotlight on Hierarchical System Development
Friday, July 28th Click here for the video recording	• Updates & Challenges of UFS Applications: S2S/GEFS/SFS • Live Demo Running the UFS SRW Application in the Cloud • Making the Unified Forecast System Cool (given by students) • Debrief: Findings, Recommendations & Closing Statements

ATTENDANCE

UIFCW 2023 experienced strong attendance both in-person and virtually over its five-day span, and the event reached full in-person registration capacity of 200 people. This was a reflection of the significant interest and engagement within the Weather Enterprise. However, our calculation of in-person capacity had some limitations. These were mainly due to the fact that several people registered more than once and were counted as duplicate entries. Most registrants also noted that they never received confirmation of registration. Both of these limitations could be improved upon through use of Smartsheets next year to help simplify the registration process.
We also noted that even though attendees registered for in-person attendance for all five days, it did not accurately account for daily fluctuations in attendance. As a result, the actual daily attendance was below maximum capacity on individual days, suggesting that we may have been able to accommodate more in-person attendees.

A considerable number of participants also joined virtually, demonstrating the reach and accessibility of UIFCW. This wide geographical reach was made possible through high-quality live streaming services through Vimeo (which was embedded on the EPIC Community Portal), allowing those who could not be physically present to actively participate and contribute to the workshop.

The attendee demographics represented a diverse mix of roles from the academic, private, federal and government sectors, leading to the exchange of a variety of perspectives and ideas during the event. This broad participation reinforced the inclusive approach of UIFCW, bringing together a wide range of stakeholders to collaborate and innovate.

KEY OUTCOMES AND ACHIEVEMENTS

UIFCW's successful execution marks a pivotal step in achieving EPIC's Strategic Plan and creating a sense of community around the UFS. Dr. Michael Morgan's opening remarks, as Assistant Secretary of Commerce for Environmental Observation and Prediction, resonated with EPIC's core strategic outcomes. He underscored the transformation and unification of NOAA's forecast systems, emphasized the role of EPIC in managing cloud-ready code, and highlighted the transition to innovative technological platforms like the JEDI system for Data Assimilation.

Through his vision for collaboration and community modeling, Dr. Morgan reinforced EPIC's mission and its commitment to building an inclusive community around the UFS, advancing technology, and fostering innovation. His insights set the stage for UIFCW to serve as an engaging platform for the UFS community, aligning the workshop's aims with EPIC's objectives.

Foundation is the bedrock of EPIC's mission and refers to the development of sound standards, governance principles, and software engineering practices. These principles establish a framework that encourages the exchange of ideas and innovation within the community. At UIFCW, this was evident in the organization of the workshop, where experts shared knowledge, exchanged ideas, and provided insights into the methodologies and standards that support the UFS. The workshop's agenda focused on these principles, fostering understanding of the foundational aspects of weather forecasting and laying the groundwork for ongoing and future advancements in the field.

Community is key to both EPIC's Strategic Plan and to UIFCW. EPIC aims to support a diverse and inclusive modeling community, not only through collaboration among scientists but also by building an ecosystem that includes public, academic, government, and private partnerships. UIFCW supported this community-oriented approach, bringing together various stakeholders to facilitate discussions, planning, and innovation. This work continued organically during the breaks and after hours as attendees continued the conversations with colleagues around the ideas that inspired them. The interactions during the workshop led participants closer to achieving EPIC's mission and aligned with EPIC's mantra: "partnering with the community for the benefit of the nation."

Infrastructure forms the technological backbone of EPIC's strategic pursuits. The development of publicly accessible, cloud-based testing environments and continuous integration and deployment pipelines is essential for research and innovation. UIFCW played a role in showcasing this infrastructure, providing attendees with an understanding of the tools and platforms shaping the future of forecasting. Demonstrations and sessions allowed participants to experience the advancements in technology that power the UFS, bridging the gap between strategy and implementation.

Innovation drives EPIC's success in improving UFS performance. By providing support, engaging the community, and implementing performance metrics, EPIC advances technology and enhances forecasting skills. UIFCW served as a platform for innovation, where ideas were presented and explored. Researchers, developers, and industry experts came together to transform concepts into practical solutions and to generate additional ideas based on their colleagues' latest innovations.

UIFCW is a vital part of EPIC's Strategic Plan, reflecting the outcomes of Foundation, Community, Infrastructure, and Innovation. The event mirrored EPIC's ambitions, offering a space for the UFS community to collaborate and learn. By aligning the workshop's goals with the strategic objectives, UIFCW contributed to a unified approach to meteorological science, impacting current infrastructure and inspiring further work in the field. It was more than an event; it was a reflection of EPIC's vision and collaboration within the meteorological community.

Roundtable Discussion on Community Modeling

John Ten Hoeve and Jennifer Vogt hosted a roundtable discussion session, engaging participants in a collaborative exploration of pressing issues related to the UFS. Tables were assigned a specific question, and participants had 25 minutes to discuss the topic before moving to a new table, fostering a natural randomization that contributed to diverse conversations. The format ensured fresh perspectives on each question and facilitated a dynamic exchange of ideas. Below are summaries of the key questions and insights gathered from these discussions.

For a full summary and key takeaways from the Roundtable Discussions, click here.

How can we diversify and incentivize participation across sectors, disciplines, and demographics in the UFS, including early career individuals?

To diversify and incentivize participation across various sectors, disciplines, and demographics in the UFS, suggestions included capturing undergraduate student perspectives, offering career fairs and early training

opportunities (including at conferences), providing education and internship opportunities, considering salary constraints and costs, especially for entry-level positions, and reaching out to students outside of meteorology (e.g, computer science, engineering majors). Incentives, expanded opportunities for training with code and modeling, and catering training and tutorials to new users were also emphasized.

How can we overcome challenges with rapid code releases and various code management policies and practices across the UFS?

Overcoming challenges with rapid code releases and various code management policies in the UFS necessitates addressing the challenges of efficient testing, communication between various stakeholders, code standards, and training on GitHub repository usage. Concerns about bloated code, readiness for release, and documentation were also identified, with a desire for more frequent releases and transparent contribution requirements.

How can the community better communicate the value of its code contributions and innovations? What metrics should we be using?

To enhance the community's communication of the value of its code contributions and innovations, it is important to understand the community, use representation through publication, employ standardized evaluation tools, and make metrics more inclusive. The discussions also pointed to the importance of understanding readiness levels and making transition plans for advanced UFS users.

How can we enhance knowledge transfer and collaboration across UFS contributors? What mechanisms should we use to accelerate R2O?

The discussions highlighted strategies to improve knowledge transfer and collaboration among UFS contributors. These involved collaborative publications, UFS Journals, and webinars for effective technical knowledge sharing. Suggestions also included accredited online courses and communication of R2O prerequisites prior to contributing. The importance of transparency, comprehensive documentation, robust testing, and bolstered support resources was also underscored. Participants emphasized university projects, accessible data assimilation, community-oriented leadership, clear EPIC R2O communication, and streamlined UFS code processes to accelerate progress.

What are the biggest science challenges we should be working on as a UFS community?

The UFS community identified several science challenges for the UFS community, although perspectives varied on which challenges were the “biggest.” Depending on the participants’ work, the most pressing science challenges included modularity and flexibility of UFS code, hurricane prediction in a changing climate, integration of social science and engineering, value versus skill assessment, and infrastructure flexibility and compatibility concerns.

What are the primary ways (use, develop, analyze, forecast/postprocess, validate/verify) you and your colleagues would like to work with the UFS?

The primary ways the community wants to work with the UFS include involving users in development, analyzing operational systems, providing a “toolbox” and repository for contributions, and prioritizing and understanding the UFS. Collaborative efforts, liaisons, and cultural development were also highlighted.

NOTABLE ATTENDEES AND KEYNOTE SPEAKERS

Dr. Michael Morgan, Assistant Secretary of Commerce for Environmental Observation and Prediction

Dr. Michael Morgan, Assistant Secretary of Commerce for Environmental Observation and Prediction, delivered a presentation focused on transforming and unifying NOAA's operational forecast systems. He highlighted the simplification of 21 standalone operational forecast systems to eight UFS applications as part of the organization's vision to enable the most accurate and reliable operational numerical forecast model in the world. Dr. Morgan detailed EPIC's role as a virtual community model development environment and how it will manage cloud-ready code, provide community access to tools, and support research transitions. The talk also touched on NOAA's

transition to the JEDI system for data assimilation and their strategic direction, including a 10-year modeling and data assimilation strategy, cloud adaptation for various technological aspects, and opportunities to build the workforce. Dr. Morgan emphasized the improvement of HAFS v1 forecast skill over previous models, as well as the UFS vision for collaboration, public access to end-to-end testing, and UFS performance innovation.

Dorothy Koch, Weather Program Office (WPO) Director

Dr. Dorothy Koch, Weather Program Office (WPO) Director, provided updates related to the UFS, including HAFS v1 highlights, the new WPO Innovation Funding Opportunity, and EPIC's community engagement efforts. The presentation discussed EPIC/UFS Infrastructure Development, outlining strategies for continuous integration, model development, and collaboration between various teams. New UFS modeling initiatives were introduced, including projects focused on precipitation forecasting, an Atmospheric River forecast system, and WPO's Fire Weather program. She also highlighted the NOAA Modeling Team's activities, coordination efforts across NOAA's Line Offices, and long-term modeling and data assimilation strategies. Additionally, she explored community topics, such as the need to gauge support required for various aspects of UFS development, and she discussed potential partnerships with organizations like NCAR and NASA. She concluded by identifying challenges in UFS governance, code governance, data assimilation, and testbeds that need attention and planning.

Stephan Smith, Director of the Office of Science and Technology Integration (OSTI)

Dr. Stephan Smith, Director of the NWS Office of Science and Technology Integration (OSTI) focused on the transformation needed in the National Weather Service (NWS) to enhance the last critical mile of mission delivery. He emphasized the importance of adopting a robust and community-centric approach for disseminating life-saving information and noted the potential for exploiting cloud technology to enable a mobile and flexible workforce. He stressed the need for a whole-community engagement approach, blending social and behavioral science with outreach to create a Weather-Ready Nation. The talk also addressed the drawbacks of a "One-Size" service model and the need to invest in equitable services that consider the unique vulnerabilities of each community. To that end, he highlighted specific case studies on Hurricane Ian, tornadoes in Los Angeles and a flash flood emergency in Miami, Florida. He concluded by outlining the core assumptions for effective warnings and introduced the NSSL Warn on Forecast System (WoFS) for hyper-local modeling and probabilistic IDSS in the Last Critical Mile/Hour.

Dr. David Walters - Scientific Strategic Head of Research to Operations, UK Met Office

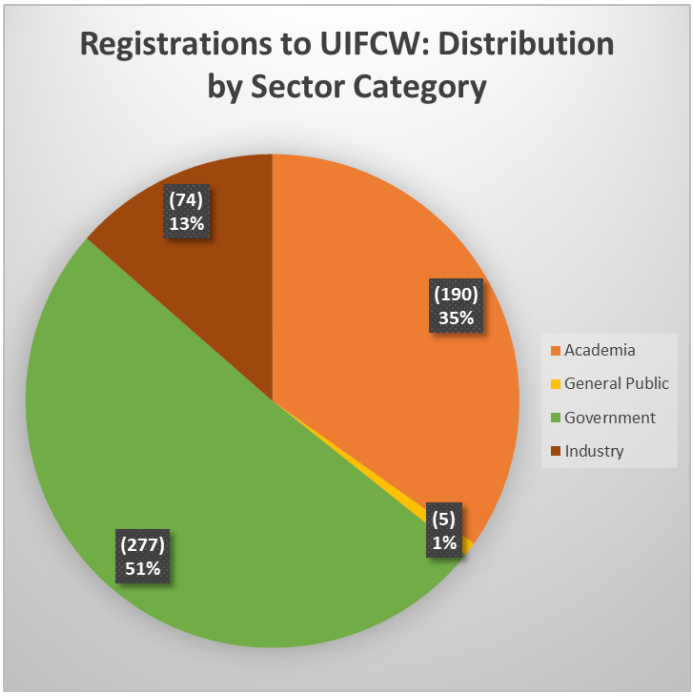
Dr. David Walters presented on Unified Modeling Practices that are used within the UK Met Office. The benefits of using a unified modeling practice include: good short-range forecast model climatology, opportunities for testing in many applications and domains, feedback (O2R) that informs all applications, and concentrated development on a small number of parameterizations. Dr. Walters emphasized that the benefits of unified model development (i.e., increased testing, traceable hierarchies) outweigh the cost, but it also requires a higher level of governance.

Dr. Christian Kühnlein - Senior Scientist in the Earth System Modelling Section, ECMWF

Dr. Kühnlein was invited as a keynote speaker and presented on "Seeking Portability and Productivity for NWP Model Code." His presentation detailed how ECMWF is developing tools to allow their code to become portable across software and compute platforms, while also increasing productivity. Dr. Kühnlein mentions that emerging technologies offer great potential for higher numerical resolution and energy efficiency but also face an increasingly diverse landscape of supercomputing architectures.

MEDIA AND PUBLICITY

UIFCW has experienced significant growth since its inception, a clear indication of its importance, quality, and the robustness of the community involved. In 2022, UIFCW had a total of 400 registered attendees, accounting for in-person, virtual, and hybrid attendance. UIFCW 2023 reached the in-person capacity registration max of 200, with a total of 546 registered. This represents approximately a 30% increase in registration from last year. Additionally, when comparing to UIFCW 2022, we saw an increase of 8% and 15% in registered industry and academic professionals, respectively.

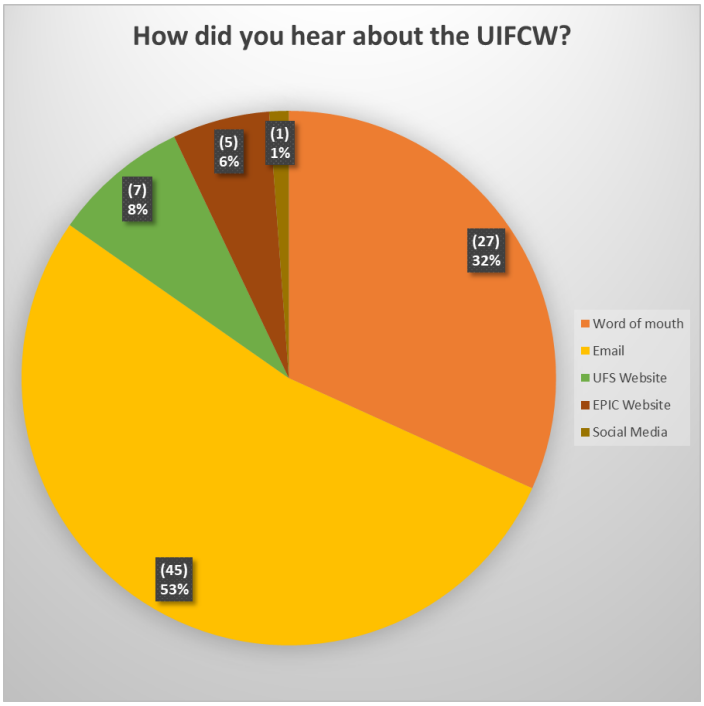


The total in-person count was 213, although this number does not account for individuals who skipped signing in at the event. Additionally, there were 9,095 total streams for virtual attendees, and they averaged 25 minutes of view time each. Virtual attendance did not require registration since the event was streamed live for free, and this clearly opened up the event to an audience many times the size of our registered attendee audience. Please note, that the total streams does not account for repeated views by the same person or individual.

No budget was spent on advertising; all attendance came from organic growth. Given this momentum and the positive feedback from attendees and stakeholders, there is a compelling case for allocating funds to advertising. Doing so could amplify our reach and further accelerate the event's growth and impact in the coming years.

Word of Mouth:

Data from the survey responses show that 53% of attendees heard about the event through word of mouth, which emphasizes previous attendees' genuine appreciation for the event's content, speakers, and structure. Such direct recommendations are one of the most credible forms of advertising and highlight the satisfaction of previous UIFCW participants.



Building on Organic Growth

The event's organic growth signifies a strong foundation, but it also indicates untapped potential. The strategies proposed below will further this growth:

- Set aside a budget for strategic advertising throughout the year to amplify the event's reach. This should especially target platforms where our audience is most active.
- Share success stories to help motivate and instill a sense of trust and confidence in the UFS Community's endeavors. They put a spotlight on real-world applications and the impact of the work EPIC does.
- Introduce an EPIC/UFS newsletter to help consolidate community engagement efforts. This channel can:
    - Keep the community updated with the latest developments.
    - Act as a repository for success stories, shining a spotlight on significant achievements.

Recommendations

Collaboration With Influencers: Given the significant reliance on word of mouth, consider engaging with influencers in the field. They could be seasoned professionals, researchers, or even students who have a wide network.

Collaboration With Communities That Have Larger Platforms: Consider engaging with communities that have larger platforms in the field. These could include groups of seasoned professionals, researchers, or even students who have a wide network to help spread the word and extend EPIC's reach.

Improved Digital Presence: Consider a refresh or redesign of UIFCW information on the EPIC website to make it more user-friendly and engaging.

Survey Integration in Newsletters: Use the UFS/EPIC newsletter to periodically survey the community about potential topics, speakers, or formats they'd like to see in future UIFCW events.

The organic growth of UIFCW has a clear path ahead for strategic, measured, and effective engagement including publicity efforts. The combination of traditional word-of-mouth marketing, bolstered by modern digital strategies, can take future UIFCWs to greater heights.

CHALLENGES AND AREAS FOR IMPROVEMENT

Overall, the data illustrates a multifaceted picture of a successful event but also has notable areas for enhancement. This section is based on UIFCW 2023 Debrief Notes obtained from the UIFCW planning committee, survey responses, and other forms of direct feedback. Respondents provided valuable insights that, if heeded, can lead to a more inclusive, well-organized, and engaging workshop in the future. Careful consideration of this feedback can ensure a more satisfying and productive experience for all participants, regardless of their career stage, expertise, or mode of participation.

Content and Presentation Style

Many participants found the workshop content difficult to comprehend, especially newcomers and students. There is a need for more basic content and a balanced approach that caters to all career levels. An emphasis on the inclusion of more scientific talks and technological discussions, such as those related to Artificial Intelligence (AI), was also identified as an area for improvement. This feedback indicates competing interests based on participants' backgrounds, which need to be considered when planning future events.

Scheduling and Organization

Feedback identified challenges with proper scheduling and session organization. Concerns included too broad of an agenda and overlapping sessions limiting one's ability to attend more talks. Participants frequently noted specific issues related to the placement of parallel sessions, duration of the workshop, and management of particular sessions. Suggestions for improvement included restructuring the event schedule and more detailed Q&A sessions.

Virtual Experience

The virtual aspect of the event was met with mixed feedback. While some aspects were appreciated, there were challenges with volume, connection, and engagement. Areas for improvement in this area included increasing interaction through the Slack platform, providing presentations online ahead of the event, offering virtual breakout rooms for enhanced virtual engagement, and improving technical quality.

Location and Facilities

Challenges were raised about the workshop's location, room size, and transportation, with calls to host the workshop in more accessible venues. Concerns also included the need for bigger rooms for breakout sessions and a more spacious area for poster sessions.

Engagement and Interaction

Feedback emphasized the need for more time for questions and discussions and more opportunities for interaction. Identified areas for improvement included longer breaks between sessions, more opportunities for side meetings, engaging Q&A sessions and interactive features such as round-table discussions. Suggestions also included, incorporating stronger session moderators, and organizing external social events conducive to networking.

Additional Considerations

Other constructive areas for improvement encompassed advertising and digital presence, with strategies to further the event's growth. Recommendations included more streamlined administrative processes, early overviews of relevant topics, and the incorporation of user-friendly platforms such as Slack for moderation.

Planning Committee

The size of the planning committee was identified as an area for improvement. To enhance the success of future workshops, there needs to be an effort to ensure representation from all backgrounds and across all sectors of the Weather Enterprise . Also, setting clear expectations early on, and ensuring representation across different expertise and backgrounds will foster a more robust and effective planning process.

VENUE DETAILS AND ACCOMMODATIONS

UIFCW 2023 took place at Center Green, a facility operated by UCAR Event Services. Center Green has a history of hosting many events similar to UIFCW. The staff was experienced, professional, and critical to the success of the latest UIFCW.

Facilities and Services Offered:

The venue at Center Green offered a comprehensive set of facilities and services to support the success of the event. Room reservations were made available for internal groups both in advance and on the day of the event. On-site technical support ensured seamless integration of audio-visual and virtual participation needs, utilizing services like YouTube and Slido for enhanced engagement. The main banquet room offered exceptional versatility, supporting parallel sessions and rapid configuration changes. Catering options, additional conference rooms equipped with modern collaboration tools, and convenient access to local accommodations further contributed to an environment that fostered productivity, flexibility, and attendee satisfaction.

Room & Resource Scheduler

Center Green provided room reservations that internal groups could utilize for side meetings and discussions.

Audio-Visual and Technical Support

The event benefited from on-site audio-visual equipment managed by the venue's technical team. They organized streaming services, provided the necessary links for hosting streams on the EPIC website, and conducted rehearsals with virtual speakers to troubleshoot potential issues. This ensured a seamless integration of in-person and virtual participation. Streaming was made possible through YouTube, while Slido enhanced attendee engagement with its live chat feature.

Meeting Facilities

The principal banquet room, with a maximum capacity of 200, had exceptional versatility. It could be segmented into three individual rooms, each possessing its own streaming capability. This allowed for parallel sessions, providing flexibility to event dynamics. Additionally, the venue's ability to alter room configurations within a mere 10 minutes was critical to the success of parallel sessions.

Catering

The venue provided a catered lunch option on all primary event days. Lunch was free to all non-federal attendees and available to Federal employees at $20/full event day. The package also included refreshments and coffee, ensuring participants were prepared to enjoy the full schedule of sessions.

Additional Rooms

Beyond the main event space, the venue housed multiple smaller conference rooms. These were employed by attendees for side workshops, training sessions, and private in-person meetings. To enhance the collaborative spirit, these rooms were equipped with Google Meet capabilities.

Additional Accommodations

The venue’s proximity to essential services was another strength. Attendees had easy access to a variety of hotels within a 10-minute drive. This ensured convenience and reduced travel time, enhancing the overall attendee experience.

RECOMMENDATIONS FOR FUTURE EVENTS

This section will focus on recommendations specifically geared towards UIFCW. While the insights and suggestions provided here are tailored to UIFCW, many of these recommendations may be applicable to other similar events. Future UIFCW events must be streamlined to ensure greater engagement and success, and lessons learned from previous workshops have highlighted several key areas of focus.

Communication about the Program

Transparency is vital to communication about the program. The first day should include an overview of the status of EPIC and the UFS to summarize accomplishments and outline the current state of the UFS community.

Improvements to UIFCW Organization

Several administrative and logistical improvements could enhance the workshop experience from registration to participation. Forms for registration, abstract submissions, and consent need to be streamlined to ensure questions and sections are not repeated. This would create more efficient forms and avoid unnecessary duplication of sections. Smartsheets has been recommended as a solution to this challenge.

Additionally, careful consideration is needed for the program's timing, structure, and content. At a high level, UIFCW should be organized to start with overarching UFS discussions and progress to specific, focused conversations as the week continues. Specific sessions would also benefit from modifications. For example, complex discussions like the Research to Operations to Research (R2O2R) process require more than the allotted 75 minutes. Additional time for side meetings and parallel sessions at strategic points during the day could also maximize time efficiency and collaboration.

Certain elements of the workshop delivery also left room for improvement. For example, it may be helpful to use platforms like Slack for online interactions and include pre-recorded sessions or slides instead of live demos to ensure a smoother experience.

Catering to a Diverse Audience

The event's organizers must recognize the diversity of UIFCW's audience, which includes students, early career professionals, and mid-to-late career professionals. Starting the workshop with essential information can engage a broader audience. Expanding the student/Lapenta intern session early in the week is vital to draw in a new, younger generation and it should not be left to the end. An additional student or early-career track may also be advantageous. All participants would benefit from networking and community-building activities and round-table discussions, which all help to form connections. Full integration of virtual participants is essential to making UIFCW accessible and worthwhile to a fully remote audience. Improving the robustness of participants' remote Q&A experience requires further attention. Additionally, breakout rooms for virtual participants are a promising option that could allow remote participants to engage in the same kind of valuable discussions that arose organically during breaks in the in-person agenda.

Building on Past Success

Future UIFCW events should adopt these recommendations and explore other ideas to build on past success. A focus on engaging the community, refining administrative processes, and ensuring well-structured, inclusive content will make UIFCW a cornerstone event in the field. The input from stakeholders and lessons learned from UIFCW 2023 offer a robust roadmap for growth toward this goal.

POST-EVENT AND FOLLOW-UP ACTIONS

UIFCW Planning Committee Debrief held on August 9th, 2023

The debrief session identified several insights and recommendations for improvement. Below, the discoveries are grouped, and possible actions by EPIC are outlined.

Aspects That Worked Well

The UIFCW planning committee provided feedback on various aspects of the event, highlighting key successes. The committee liked the mix of talks and training sessions and appreciated the diverse range of topics and learning opportunities provided at UIFCW. They also praised the breakout sessions and plenary activities, which created a

more unified experience. Providing lunches and snacks on-site was recognized for encouraging mingling and informal networking among participants. The roundtable discussions were also deemed particularly effective.

What Didn't Work Well

The UIFCW planning committee also identified several areas for improvement during the debrief. Some talks were overly technical, and the committee suggested that future talks be tailored to a broader audience. Additionally, there were technical challenges related to live demos and poor projector image quality. To avoid unexpected problems, live demos should instead be pre-recorded, and the poor image quality of projectors should be addressed. The committee also expressed concerns about the timing of breaks and poster sessions, the lack of a firm cutoff for agenda changes, and the fragmented process for registration, presentations, and abstract submissions.

Follow-up Strategies

Improving Projector Quality:
Discovery: Projectors had poor image quality and were missing colors.
Action: Ensure proper testing and upgrade projectors to improve image quality; discuss alternatives with the venue ahead of the event.

Enhancing Poster Sessions and Breaks:
Discovery: Poster sessions were later in the day, and breaks were too short.
Action: Schedule poster sessions strategically and extend break durations.

Managing Agenda Consistency:
Discovery: Last-minute agenda changes caused inconsistency and additional stress.
Action: Enforce a cutoff for agenda changes at least a week ahead of time.

Streamlining Registration and Submission Processes:
Discovery: Forms for registration, presentations, and abstracts were fragmented.
Action: Streamline registration, presentation, and abstract submission forms.

Enhancing Roundtable Discussions:
Discovery: Roundtable discussions went well.
Action: Explore ways to build on the success of the roundtable format for future events, including virtual break out rooms.

Improving Networking and Interaction:
Discovery: More focused interaction is needed.
Action: Allocate spaces for "working lunch rooms," longer breaks, and planned meeting locations.

Presenter Guidance and Best Practices:
Discovery: Clear expectations and best practices for presenters are needed.
Action: Create and share guidelines and best practices with presenters.

Student Engagement and Specialized Tracks:
Discovery: Specific student sessions and specialized tracks could be beneficial.
Action: Create a student track within the agenda and include introductory sessions on UFS applications.

Enhanced Collaboration and Strategic Discussions:
Discovery: More involvement from groups like DTC/Testbeds would enhance UIFCW; pre-identify key discussions.
Action: Foster collaboration and strategically plan key discussions with invited participants.

Managing Technical Talks and Live Demos:
Discovery: Some talks were too technical; live demos should have been pre-recorded to avoid unexpected problems.

Action: Provide guidelines for talk complexity and encourage pre-recorded demos.

ATTENDEE FEEDBACK

The survey conducted for UIFCW 2023 (See Appendix A) garnered valuable insights from a total of 95 responses, shedding light on various aspects of the event and the attendees' preferences and perceptions. Responses that indicated a clear misunderstanding of the questions or that were unrelated to the survey questions were removed from the analysis. Additionally, responses marked "not applicable," were removed from the analysis. While not all respondents answered every question, the data obtained provides a comprehensive overview of the event's success and areas for improvement.

The responses indicate a healthy spread of attendees from various sectors, such as government, academia, private industry, and international entities. Participants' awareness of the event was mainly through emails and word of mouth, reflecting the importance of community engagement. The quality of the sessions was rated positively, with the majority of respondents expressing satisfaction. Preferences for future participation were diverse, leaning toward in-person and hybrid models; this mirrors the current trend in professional gatherings.

The survey also gathered insights into the use of and expectations surrounding the UFS. This data includes information on respondents' roles, applications, and interests, and paints a picture of an active and engaged community working in various capacities within the UFS ecosystem. Respondents generally felt a sense of community and belonging within the UFS, although there were diverse opinions, providing potential areas for growth and greater inclusivity. The detailed analysis below will further explore these insights, informing the path forward toward continued excellence and impact in the community.

CONCLUSION

UIFCW 2023 marked a significant milestone in the collaborative efforts of EPIC and the UFS community. UIFCW brought the community together for a productive exchange of ideas, targeted training sessions, and the opportunity to shape the future direction of forecasting technologies.

Future UIFCW events must focus on enhancing various aspects, including logistics and organization, and tailoring the content to cater to different experience levels, such as students or less advanced technical individuals. The recommendations provided in this report, drawn from detailed feedback, are aimed at refining and optimizing these areas. The insights gained are also relevant beyond this specific event and offer valuable lessons for other similar gatherings in the field.

UIFCW's success is evident in the progress made since the previous event, with specific improvements that had a tangible impact on attendees and the UFS community. The enhancements include increased registrations and overall participation, an improved experience for virtual attendees by streaming audio and slides directly to YouTube, and selecting a venue that handled all audio and video equipment professionally. By continuing to implement the recommendations outlined in this report, future UIFCW events can build on this success, reaffirming the event's role as an essential catalyst in the ongoing evolution of forecasting capabilities. This continued dedication to improvement ensures that UIFCW remains not just a conference but an example for the community.

EXTERNAL REFERENCES AND LINKS

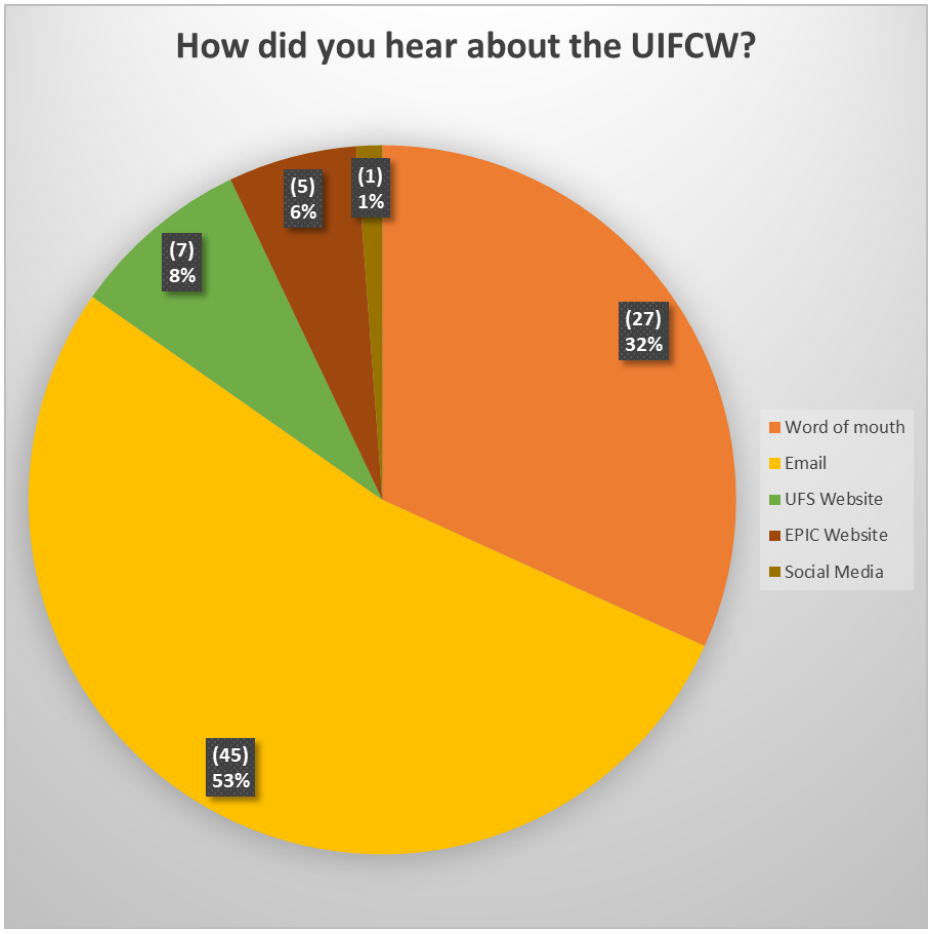
EPIC Community Portal UIFCW 2023 Page
EPIC Community Portal Metrics

APPENDIX A - SURVEY ANALYSIS

Samples responses quoted below have been edited for grammar and syntax but otherwise remain as the authors wrote them.

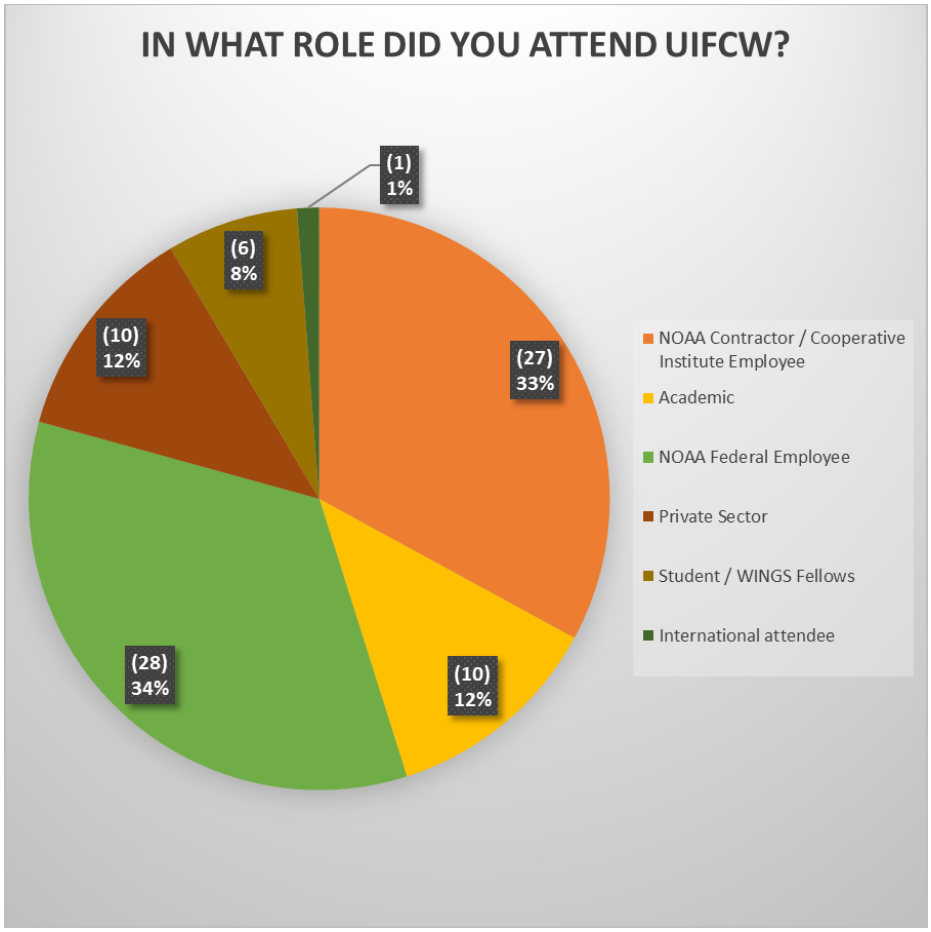
How did you hear about UIFCW?

The responses to this survey question revealed that the majority of participants learned about the event through email, followed by word of mouth. Fewer respondents discovered the event through the UFS website, the EPIC website, or social media.



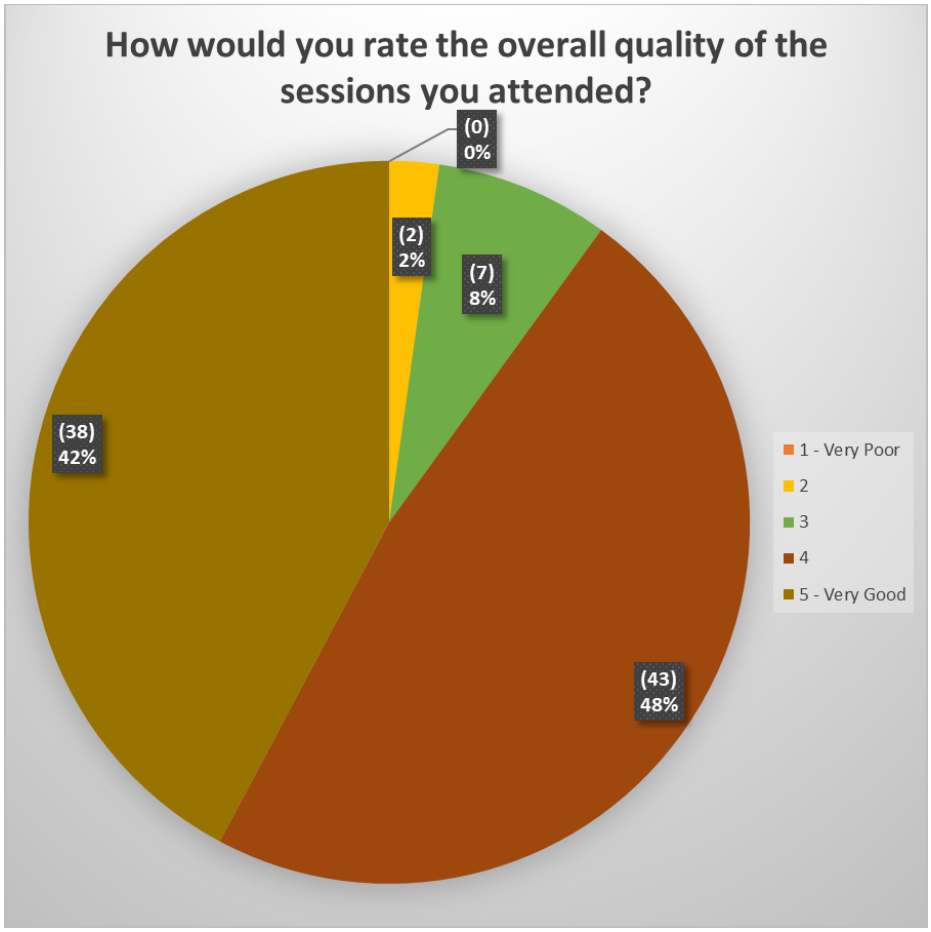
In what role did you attend UIFCW?

The responses to this survey question indicated that the majority of the attendees were NOAA Federal Employees and NOAA Contractor/Cooperative Institute Employees, followed by participants from the Private Sector and Academia. A smaller group consisted of Students/WINGS Fellows, with only one international attendee.



How would you rate the overall quality of the sessions you attended?

The responses to the survey question about the overall quality of the sessions indicated a generally positive experience. The majority of attendees rated the sessions as either good (4) or very good (5), with a small number giving a neutral rating of (3). Only two respondents rated the sessions as below average (2). No attendees rated the sessions as very poor (1).



Do you have any additional comments on the quality of the sessions you attended?

The feedback on the quality of the sessions at UIFCW revealed a mix of positive remarks and areas for improvement. Attendees appreciated the overall quality but highlighted concerns related to early career and student engagement, content balance and organization, and technical issues, along with positive feedback on various aspects of the sessions.

EARLY CAREER AND STUDENT ENGAGEMENT (2 COMMENTS)

Comments indicated difficulty for newcomers and students in understanding content, as well as a need for more sessions on the basics.

- "I appreciate the Lapenta Intern presentations at the end. As an early career employee (2 months) their struggles with using and setting up UFS has been something I also have seen."
- "A majority of presentations were given as if it was specifically intended for their mid-career peers, which excludes newer people (like myself, a student) from participating in or understanding the content being discussed."

CONTENT BALANCE AND ORGANIZATION (7 COMMENTS)

Responses included various comments on the balance of content, scheduling, and session organization.

- "I would prefer fewer programmatic sessions and more presentations on the science being done."
- "The sessions were all high quality with engaging talks, panels, etc. I felt that the content on Tuesday should have been emphasized more."

- "Would be great to have the videos of the sessions I missed the next day or at least sooner than a week afterwards."
- "The talks were very good. The Q&A and organization left a lot to be desired."
- "Too many panel discussions and not enough time for scientific discussions. But I am probably biased."
- "I was interested in more than one of the breakouts—so hard to capture the info. Rooms were tight for the breakouts."

TECHNICAL ISSUES AND QUALITY (4 COMMENTS)

Participants commented on the quality of the presentations and technical difficulties.

- "The projector issues in the breakout sessions led to a reduced quality in much of the data that was presented."
- "There was one on 'Live Demo Running the UFS SRW Application in the Cloud' that didn't go well because it made the process look extremely complicated."
- "The projection system in the session I gave a talk in was pretty bad."
- "Regarding the UFS in containers demonstration/tutorial, it needed more of an introduction, and especially an overview. Without an overview/outline, it is hard to follow what we are doing and very hard to understand why."
- "It was sometimes very hard to hear the presenters. It would be good to remind the presenters about the need to speak directly into the microphone and not turn around."

POSITIVE FEEDBACK (6 COMMENTS)

Responses included positive remarks about the overall quality and execution of the sessions.

- "It was good to know how the modelling community interacts with different sectors (industry and government)."
- "Lots of great presentations/discussions."
- "The transparency was terrific!"
- "Professionally run...presentations were relevant and chairs kept us on schedule."
- "Quality was very good across the many sessions. Some audio issues were rapidly corrected."
- "A lot of good presentations on the use of the UFS with sufficient scientific content."
- "Time-keepers did an excellent job keeping us generally on track."

Do you have any additional comments about virtual participation?

The feedback on virtual participation at the workshop revealed both challenges and successes. Attendees expressed issues with audio and video quality, along with difficulties engaging as virtual participants. However, there were also positive remarks about the overall experience, as well as suggestions for future improvements.

VIRTUAL EXPERIENCE CHALLENGES (10 COMMENTS)

Challenges with the virtual experience included issues with volume, connection, and engagement. It's worth noting that some connection issues may be out of our control, such as those originating from the listener's end.

- "Streams were often choppy, and it was difficult to maintain connections. It was a poor virtual experience."
- "The volume (at times) was difficult to hear/make out. Recommend providing speakers info about talking clearly, loudly, and slowly."
- "The online part of the sessions was not that good. Quite frequent loss of streaming connections."
- "There were some technical difficulties, but nothing that rendered participation completely unworkable."

POSITIVE ASPECTS OF VIRTUAL PARTICIPATION (7 COMMENTS)

Some participants found the virtual experience positive, appreciating the options and overall organization.

- "Virtual participation was great. It was the best virtual conference experience I've had so far."
- "Virtual participation seemed to go very well thanks to the great IT folks behind the scenes."
- "Loved the virtual option as I learned a lot!"
- "Virtual participation was very smooth and nicely organized."

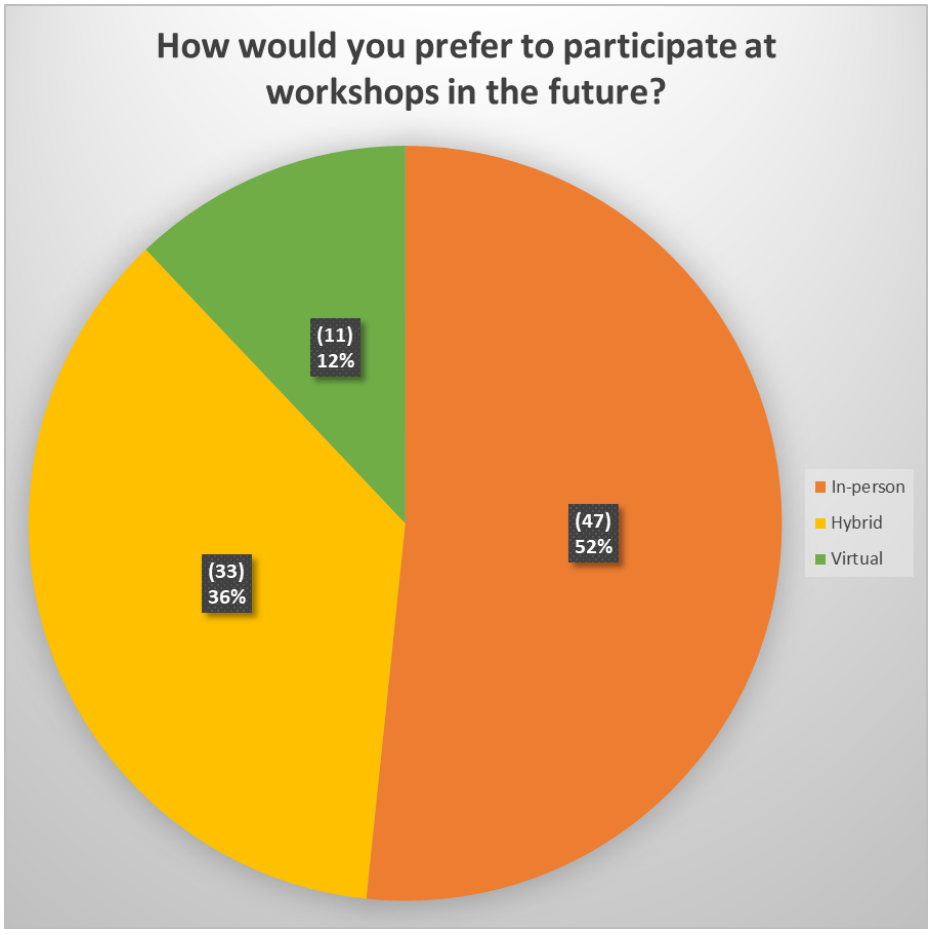
SUGGESTIONS FOR IMPROVEMENT (6 COMMENTS)

Participants offered various preferences or suggestions to improve virtual participation, such as hybrid options, more interaction, and improved technical quality.

- "The live stream through YouTube was not conducive to virtual participation. There was no way for virtual attendees to view the in-person posters."
- "The different microphones had vastly different volume levels, causing me to mess with settings way too often."

How would you prefer to participate at workshops in the future?

The responses to the survey question about preferred participation at future workshops revealed that the majority of attendees favor in-person attendance. This is followed by a substantial interest in a hybrid format, while a smaller group expressed a preference for virtual participation.



Any suggestions for future UIFCW workshops? What would you change, if anything?

Feedback for future UIFCW events focused on improving scheduling and agenda planning, with calls for better organization and avoidance of parallel sessions. Other key themes included a desire to increase the focus on science talks, address logistical issues related to venue and transportation, and enhance opportunities for discussion and interaction.

Scheduling and Agenda Planning (19 comments)

Many respondents commented on issues related to scheduling, parallel sessions, and the need for better organization of the agenda. Specific concerns were raised about the duration of the workshop, the placement of talks, and the management of parallel sessions.

- "This workshop, in my opinion, tried to cover too broad of an agenda."
- "I would potentially move the poster session up by an hour or two."
- "Avoid parallel sessions for presenters to attend talks in the other sessions."
- "The training sessions can be held separately so that they do not overlap with the talks/presentations."

Content and Focus (17 comments)

Feedback about the content was common, with suggestions to increase the focus on science talks, provide more technical training, and emphasize new technologies such as AI.

- "I would prefer more science talks."
- "Little emphasis was put on new technologies like AI and emerging computer architectures."
- "More science-focus, allowing the community to move forward."

Logistics and Venue (5 comments)

Several respondents raised issues related to the workshop location, transportation, room size, and the necessity to host the workshop outside of Boulder.

- "I would also look to have host venues that are a bit more walker-friendly to local amenities."
- "I would also strongly encourage that the next workshop take place somewhere other than Boulder."
- "Bigger rooms were needed for some of the breakouts - if we have breakouts in the future. Poster session area was tight as well."

Discussion and Interaction (10 comments)

Many respondents expressed a desire for more time for questions and discussions and more opportunities for interaction; responses also included suggestions for more engaging Q&A sessions.

- "Need more time in discussion sessions."
- "There were one or two sessions where there was no time for questions for each talk."
- "It is difficult to have a hybrid discussion; perhaps leave discussion sessions to be only for in-person participants?"
- "When there are breakout sessions with different sets of talks, allow for discussion/questions within those sessions."

If you would like, please provide feedback about your participation in the UFS.

The survey responses related to participation in the UFS reveal themes of general satisfaction. Responses touched on specific roles and involvement, improvements and barriers, and opportunities for collaboration. However, survey respondents mostly misunderstood this question as asking for feedback about their participation in the UIFCW event and not in the UFS, leading to a number of unrelated comments and experiences.

Role and Involvement in UFS (4 comments)

A few comments were centered on the respondents' specific roles and involvement in the UFS, whether as a modeler, developer, or team member.

- "UFS SC, modeler."
- "I'm a developer of the global UFS system."
- "I am part of the CCPP-SCM team."
- "I just began using the UFS this summer for my project as part of the William M. Lapenta Student Internship program. I have found that it is very beneficial for funding and collaboration purposes!"

Improvement, Barriers, Collaboration and Development(2 comment)

Comment addressed the ongoing improvements in the situation while highlighting the barriers still present. Another comment mentioned development and collaboration aspects of the UFS, especially in terms of coordination with other entities.

- "The situation is improving, but barriers to use are still high."
- "We have been working with UFS components over the last 1.5 years to develop our own UFS air-sea forecasting application at Sofar. NOAA does not currently have such an effort. We would be interested in engaging more with NOAA about this UFS application and determining whether there could be further coordination with NOAA on this activity (whether on modeling, data assimilation, cloud infrastructure, or targeted observations)."

If you would like, please provide feedback about UFS application releases.

Feedback regarding UFS application releases highlights areas for improvement in user-friendliness, real-world applicability, and communication. Respondents suggest simplifying the interface and workflow, focusing on operational support, and improving communication and planning for future releases. These sometimes conflicting suggestions indicate the diversity of interests and experience levels in the UFS community. Some survey respondents misunderstood this question as asking for feedback about the UIFCW event and not the UFS, leading to a number of unrelated comments and experiences.

Usability and Accessibility (5 comments)

Respondents raised concerns about the user experience in relation to UFS application releases. There are comments about the need for clearer documentation, simpler driver scripts, and confusion around installation and use.

- "More assistance is needed getting UFS to run on various supercomputers around the country. Definitely is not 'plug and play' at the moment."
- "Clear route in documentation for different levels of user."
- "Provide simple driver scripts instead of an 'operations'-like complicate[d] workflow for app releases to make them easier to understand and use for community users outside of NOAA."
- "After the workshop I checked out UFS from https://github.com/ufs-community/ufs-weather-model. There are compile.sh and build.sh scripts, which in itself is confusing, and the website does not help (some pages say under construction)."
- "Consolidate around a portable software stack required to install the UFS components and Apps."

Functionality and Focus (3 comments)

There were suggestions related to the development and focus of the applications, emphasizing the need for real-world applications and moving past a weather-focused approach.

- "Need to move past weather focus; I would love to see a coastal app released."
- "It would be good if the UFS application releases focus more on real-world cases (big domain, high resolution, etc.) closely tied to operational systems, not only toy models or reduced-complexity cases."
- "It would be beneficial to release and support operational UFS application workflows and capabilities to promote an easy R2O2R transition."

Community Engagement (3 comments)

Comments highlighted the need for more community involvement and a better understanding of users' needs.

- "Ask more questions about how folks want to use the releases. Not just lean on 'for research' but learn more about what kinds of research they'd like to be doing."
- "Before planning more releases, knowing who your audience/user of a release is and widely clarifying that and the purpose of a release will be required to better inform the process moving forward."
- "We need to be able to signal to the community when certain releases will be forthcoming, so the community can plan."

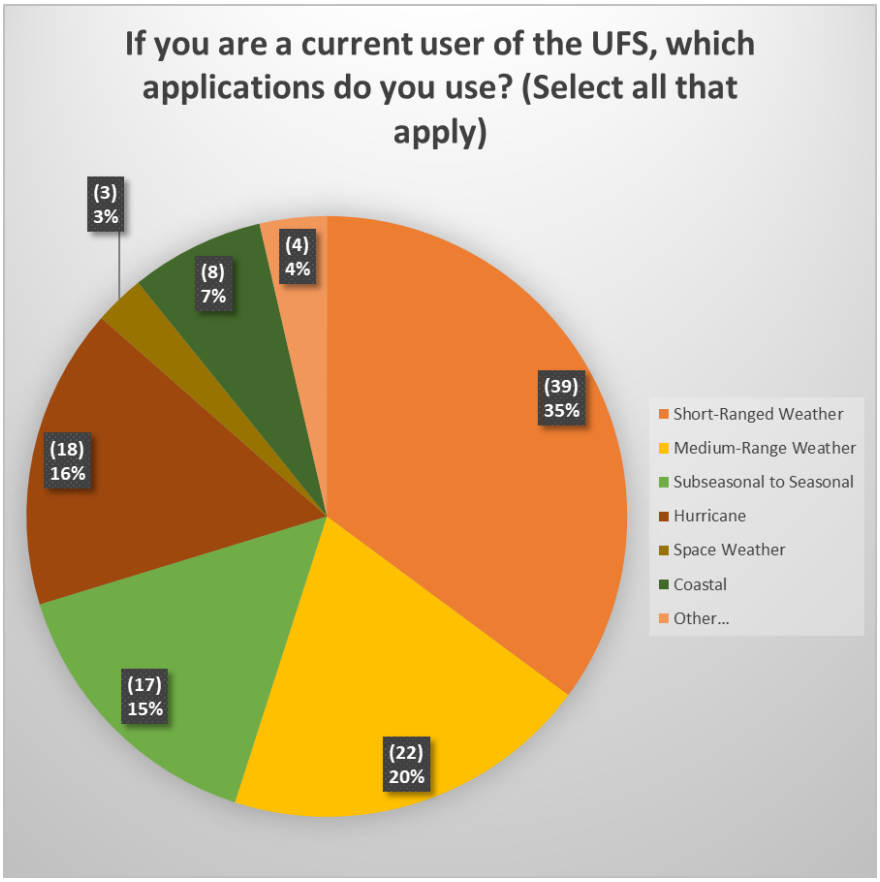
Coordination and Standardization (2 comments)

A couple of comments spoke to the need for more standardization, continuous integration, and coordination between various UFS applications.

- "Continuous integration and continuous code releases will help out the community more efficiently. The more standardized these become, the easier they will be to use."
- "The main issue that I have is ensuring that operational releases and community releases of UFS applications remain closely related."

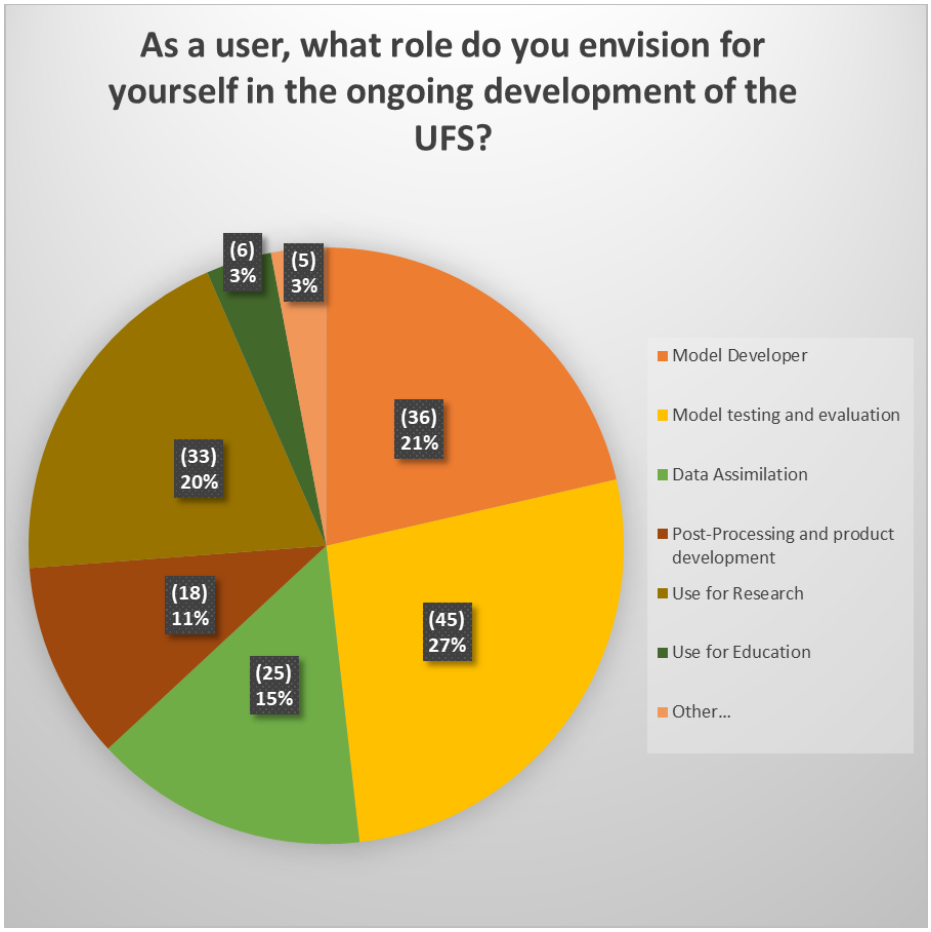
If you are a current user of the UFS, which applications do you use? (Select all that apply)

The responses indicate that the majority of users are engaged with the Short-Range Weather (SRW) Application. This is followed by Medium-Range Weather and a similar number of users utilizing Hurricane and Subseasonal to Seasonal applications. Fewer respondents are involved with Space Weather, Coastal, and other applications.



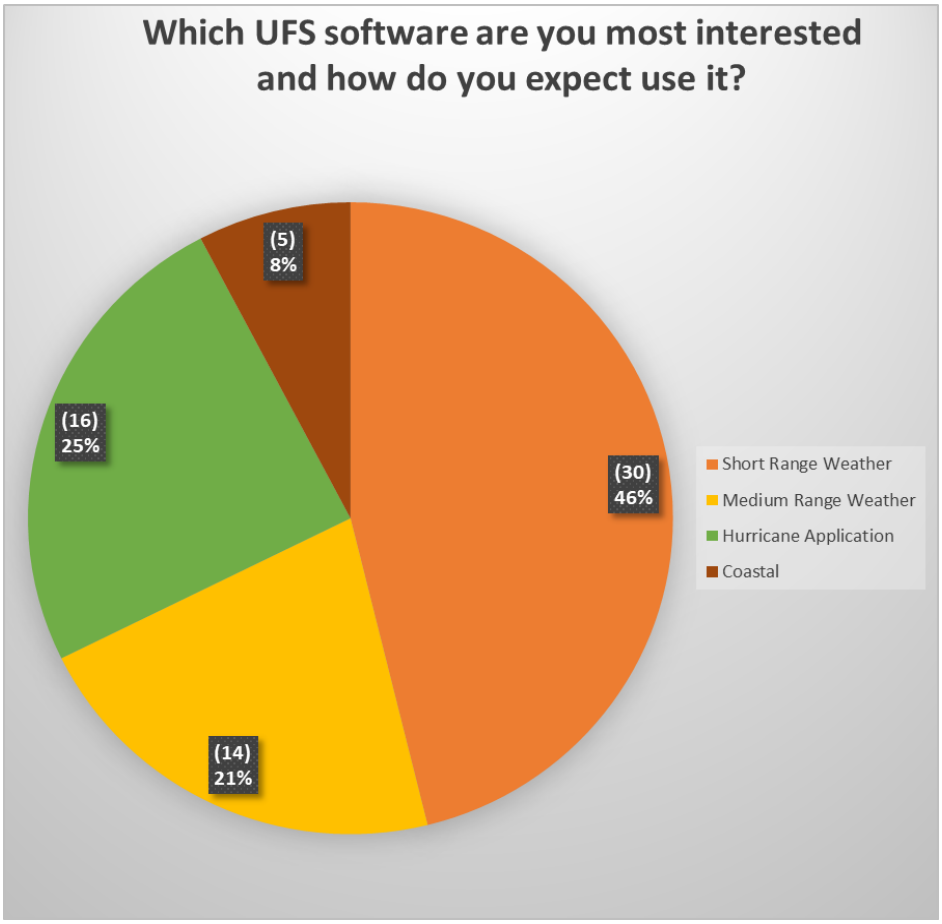
As a user, what role do you envision for yourself in the ongoing development of the UFS (e.g., offering ideas, reporting bugs, contributing code or documentation)?

The responses to this survey question reveal that most respondents see themselves involved in model testing and evaluation. This is followed by model developer and research roles. Fewer participants see their role in data assimilation, post-processing and product development, education, and other aspects.



Which UFS software are you most interested in? (e.g. Short-Range Weather, Medium-Range Weather, Hurricane Application, etc.)

Participants provided detailed long-form responses discussing multiple subjects. Some respondents may be counted multiple times if they provided insights on several distinct topics or applications related to UFS software.



SHORT-RANGE WEATHER APPLICATION (SRW) (27 COMMENTS)

Interest in the Short-Range Weather Application is widespread, and users have numerous goals, including unifying, testing, and evaluating the Application.

- "SRW - currently trying to unify the applications via the Unified Workflow Team."
- "My team uses short-range weather & coastal coupling."
- "I use SRW currently for a lot of extensive testing and evaluation with RRFS."

MEDIUM-RANGE WEATHER APPLICATION (MRW) (12 COMMENTS)

The Medium-Range Weather application appears to be of interest for various purposes including model development and land component work.

- "I am most interested in the S2S application; I will use it as a model developer."
- "Medium-Range Weather, land component."
- "SRW / MRW - would be great to explore post-processing options for the RRFS and future medium-range convection-allowing guidance as well!"

HURRICANE APPLICATION (HAFS) (10 COMMENTS)

The Hurricane Application (HAFS) is noted for its use in improving forecasting, testing, and weather response, although some difficulty in implementation was mentioned.

- “I currently run both the SRW and HRRR App for testing & evaluation purposes.”
- “Hurricane HAFS application (R2O2R).”
- “Hurricane Application. It is the closest NOAA UFS application to our targeted global air-sea forecasting application at Sofar.”

COASTAL APPLICATION (4 COMMENTS)

The Coastal Application is specified as a field of interest, often paired with other applications.

- "WW3 and coastal."
- "Coastal and Hurricane Application."
- "My team uses short-range weather & coastal coupling."

DIFFICULTIES AND SPECIAL PROJECTS (4 COMMENTS)

Some responses included remarks on difficulties faced or special projects related to UFS applications.

- "Hurricane (HAFS). Still trying to get it to run. Have spent about 2 weeks with our supercomputer guru."
- "One of the main components of my summer project was to evaluate tutorials for the Short-Range Weather Application to measure their usability in an academic setting."

How would you describe your experience working with the UFS, such as interaction with other users, usability, and support resources?

The responses to the question about experiences working with the UFS highlighted key themes such as challenges in usability, mixed feedback about support and resources, an emphasis on collaboration and community, and implementation and technical issues.

USABILITY (13 COMMENTS)

Difficulties and challenges with usability were a common theme, with varying experiences.

- "Usability is difficult when first starting out, and there aren't many support resources."
- "It has generally been difficult to find a single source of useful information about the UFS and its applications."
- "So far the components have been less than user-friendly for implementing onto our local machines."

SUPPORT AND RESOURCES (11 COMMENTS)

There were mixed opinions about support and resources, ranging from praise to a need for more assistance.

- "Right now, support needs to be increased given the difficulty in porting."
- "There have been growing pains especially in the early years of UFS, but in the past 1-2 years things seem to be much better as the community matures."
- "Usability and support resources are good, with the exception that the UFS is unusable for sub-3km (accuracy declined with increasing resolution)."

COLLABORATION AND COMMUNITY (8 COMMENTS)

Respondents put a strong emphasis on collaboration and community engagement, both positively and with room for improvement.

- "Great collaboration among the UFS Hurricane (HAFS) Application team! More community support will be beneficial."
- "It's a little challenging to use for the research because of the very coarse temporal resolution of model runs and post-processing."
- "Very collaborative."

IMPLEMENTATION AND TECHNICAL ISSUES (7 COMMENTS)

Some respondents noted implementation and technical challenges.

- "The Weather Model is easy enough to install but there are serious challenges to portability when running its regression tests."
- "It would be much more intuitive for development if the RRFS that will be supported operationally is also available in an official SRW release."
- "DTC has helped transition user support for UFS Apps to EPIC. Use of the HSD approach for model improvement, which leverages CCPP and METplus, is key."

When thinking about participating in the development of the UFS, what are some additional resources (e.g., tutorials, training) or existing barriers (e.g., documentation, responsiveness of support) that we need to consider to promote greater collaboration among users?

Participants provided detailed long-form responses, allowing them to discuss multiple subjects. Responses discuss various needs, including better documentation, more tutorials, standardized code, transparency, and reduced complexity.

NEED FOR TUTORIALS AND TRAINING (14 COMMENTS)

Better onboarding, catering to both beginners and experienced users, was a recurring suggestion.

- "Make the model easier to use on a variety of computing platforms."
- "Tutorials geared toward less experienced scientists with interest in NWP."
- "Tutorials and training are currently aimed at someone with experience. Aim it to someone who is completely new to it or is less Involved. Think K-12th grade."
- "Online, virtual, and in-person tutorials. Comprehensive and up to date documentation. Support and access to multiple HPC platforms."

IMPROVEMENT IN DOCUMENTATION (9 COMMENTS)

Respondents called for clearer, centralized, and regularly updated documentation to ease the user experience.

- "More clear, centralized documentation including reproducible test cases and tutorials."
- "Some tutorials/training is out of date or is limited to cloud computing. Some documentation is several years old."
- "Improved documentation and more tutorials."
- "Provide tutorials for different levels of users; make searching keywords from documents easier."

TECHNOLOGICAL BARRIERS AND SUPPORT (8 COMMENTS)

Respondents identified various technological challenges, from installation issues to cross-platform compatibility.

- "I never want to install hpc-stack again! I hope that Spack Stack makes that process easier and more efficient. I'd also like a streamlined way to install the other support software that makes the process easier to move to the cloud."
- "Portability on target HPC systems."
- "Provide guidance on setting up and configuring UFS in different computer systems. Currently, it takes a lot of time and effort to just set up UFS on a non-NOAA supercomputer."
- "Clearly there are barriers between component-level development and the whole community."

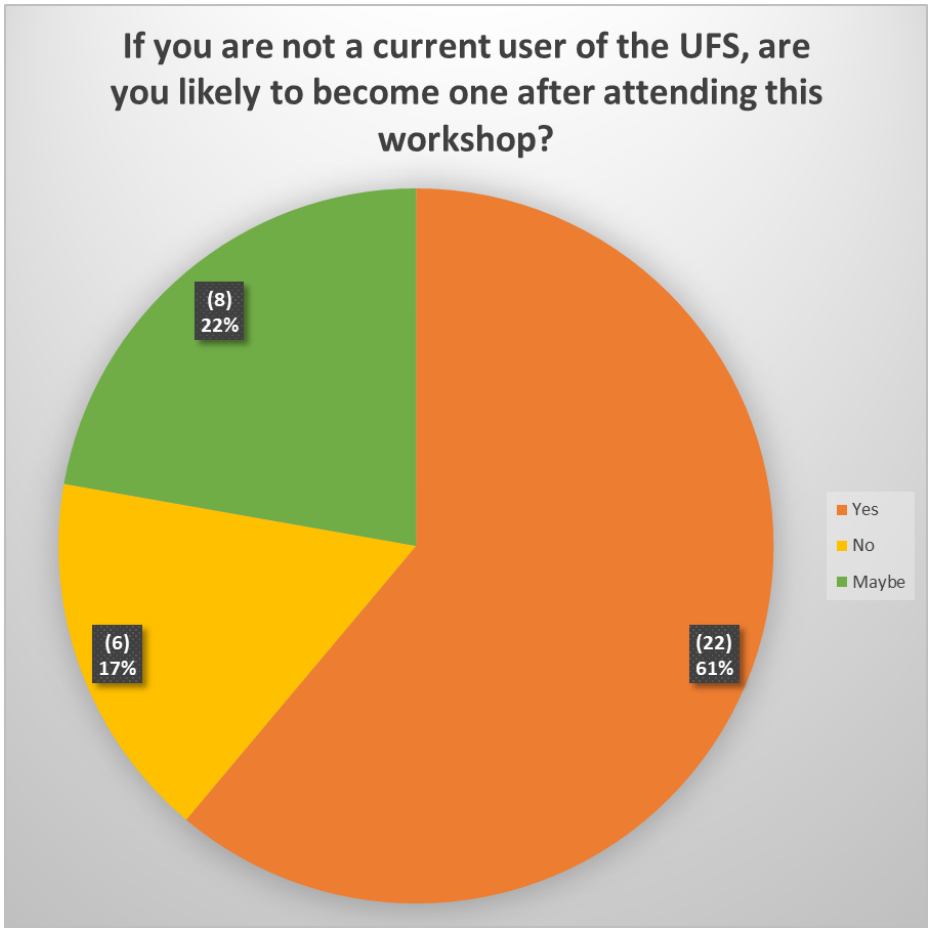
TRANSPARENCY AND STANDARDIZATION (4 COMMENTS)

Respondents emphasized the need for a more transparent and standardized approach to coding and workflow.

- "Code management needs to be more transparent, documented, and streamlined."
- "Contributions that are not considered official UFS operational code are not accepted nor supported. An R&D branch of sorts including workflow tools, etc. would support the R&D community much better."
- "I think the UFS needs one website for all component development and a message board for questions."
- "Standardization across code, documentation, and applications would be extremely useful. Sharing those standards with the community would help in accelerating R&D and R2O activities. This also reduces the proliferation of documentation and reduces the need for in-person support."

If you are not a current user of the UFS, are you likely to become one after attending this workshop?

Out of 34 responses, 20 said they would likely become users, 6 indicated they would not, and 8 were undecided and responded with "Maybe." The workshop appears to have encouraged a majority of the attendees to consider using UFS.



What would incentivize you to participate in the UFS?

The responses to the question about incentives for participating in UFS were varied but mostly centered around training, collaboration, funding, ease of use, and project alignment.

TRAINING AND SUPPORT (7 COMMENTS)

Participants emphasized the need for tutorials, training, beginner-friendly resources, and stable support.

- "Tutorials and trainings and more on the basics."
- "Better resources to learn how to use it in a way that is beginner-friendly."
- "Easier-to-understand tutorials."

COMMUNITY AND COLLABORATION (5 COMMENTS)

There is a desire for better collaboration, community linkage, and relationships within the project, reflecting the need for an inclusive environment.

- "Great community linking research, operations, and industry."
- "Better collaboration."
- "Relationship of my project to the focus of the UFS."

FUNDING AND RESOURCES (8 COMMENTS)

Responses demonstrate a clear interest in funding, whether for development, enhancement, or academic opportunities.

- "Funding is obvious but still should be said."
- "Short-term funding to enhance the UFS."

- “Better resources to learn how to use it, in a way that is beginner-friendly”
- "More funding to contribute :)"

USER INTERFACE AND EASE OF USE (7 COMMENTS)

The comments reflect the need for an improved user interface, easier testing frameworks, and ease of use.

- "Ease of use..."
- "Easy to use a complicated model."
- "Improved UI."

SPECIFIC INTERESTS AND PROJECT ALIGNMENT (6 COMMENTS)

Some responses related to the alignment of individual projects with UFS, along with specific interests like long-range forecasting and coastal applications.

- "New innovations."
- "Development of UFS coastal applications."
- "More on long-range climate change forecasting."

How did you hear about the UFS?

Responses show how the UFS tends to be disseminated through professional channels, personal networks, electronic communications, online platforms, and direct engagement with the system.

WORKPLACE AND JOB ROLE (14 COMMENTS)

Many respondents discovered the UFS through their professional roles, including postdoc positions, managerial communication, developer roles, and internships.

- "Through my postdoc job."
- "My group at NOAA GSL is developing the RRFS."
- "Developer for UFS applications."
- "My summer internship."

COLLEAGUES AND MENTORS (7 COMMENTS)

Several people heard about the UFS through coworkers, mentors, or other scientists.

- "Through my coworkers."
- "Mentors."
- "Other scientists."

ONLINE SOURCES AND COMMUNICATIONS (10 COMMENTS)

Several responses highlight online searches, emails, and specific websites as the source of information about UFS.

- "Online search."
- "Google."
- "From NOAA and EPIC Websites."
- "UFS website."

LONG-TERM INVOLVEMENT (6 COMMENTS)

Some respondents have been part of UFS from the start or have known about it for a long time.

- "Been there from the start."
- "I’ve been involved since the beginning."
- "UFS is the future modeling framework in the U.S. I have known this from 2021."

COMMUNITY AND WORD OF MOUTH (4 COMMENTS)

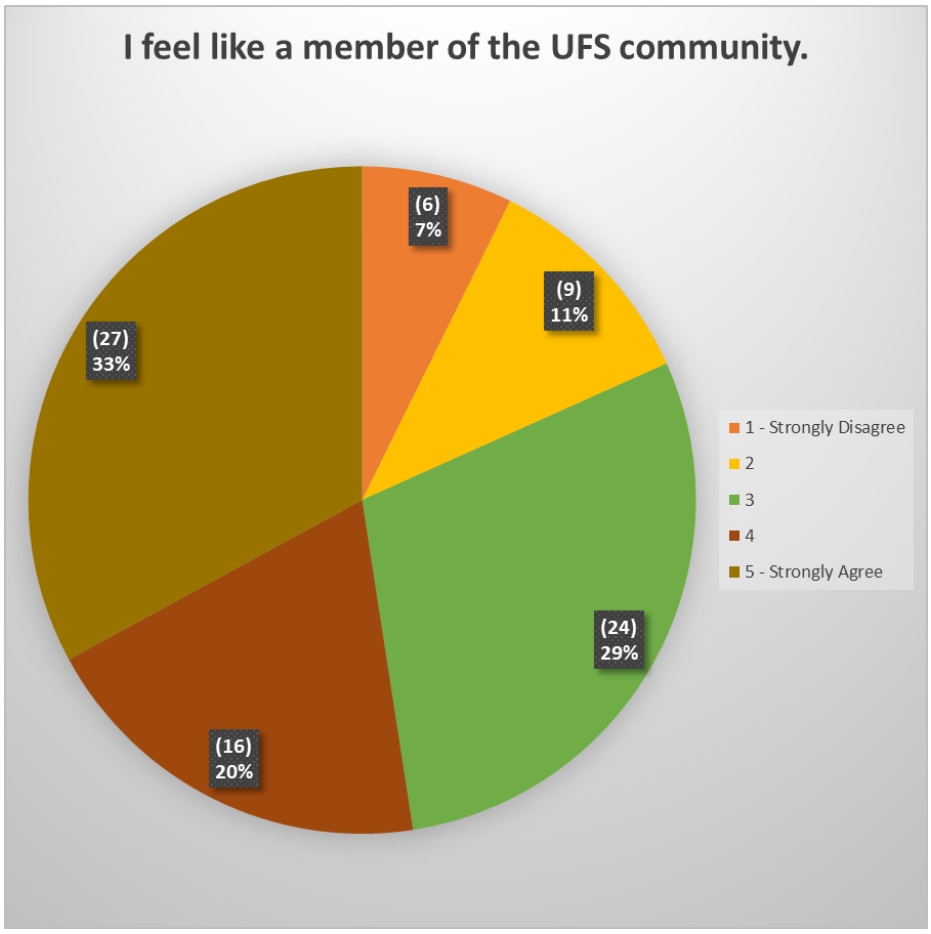
A few respondents mentioned hearing about the UFS through the community and word of mouth.

- "Word of mouth."
- "Community."

- "Over the years, I've heard about it from word of mouth and have subjectively evaluated some of the output for high-impact weather."

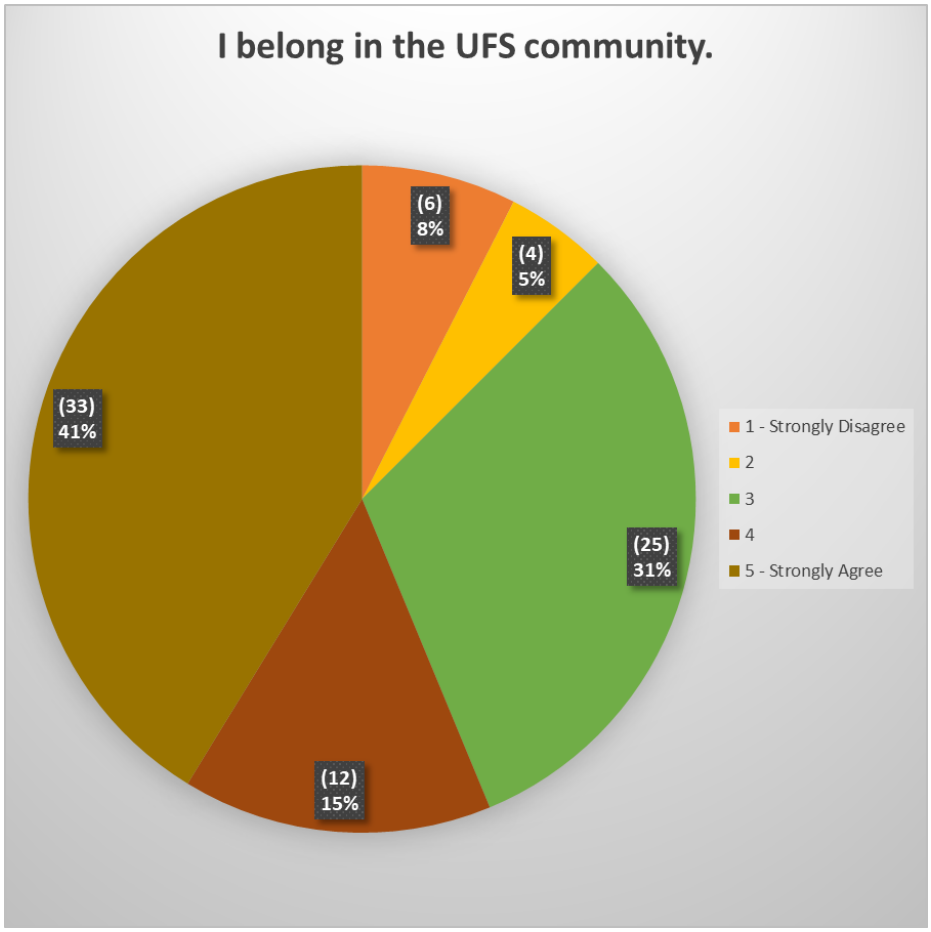
I feel like a member of the UFS community.

A scale of 1 to 5 is designed to measure the respondent's sense of inclusion and association with the UFS community. A low rating (such as 1 or 2) might not necessarily reflect dissatisfaction or disappointment with the UFS community. Instead, it could simply be an indication that the individual's job or role is not directly associated with the UFS.



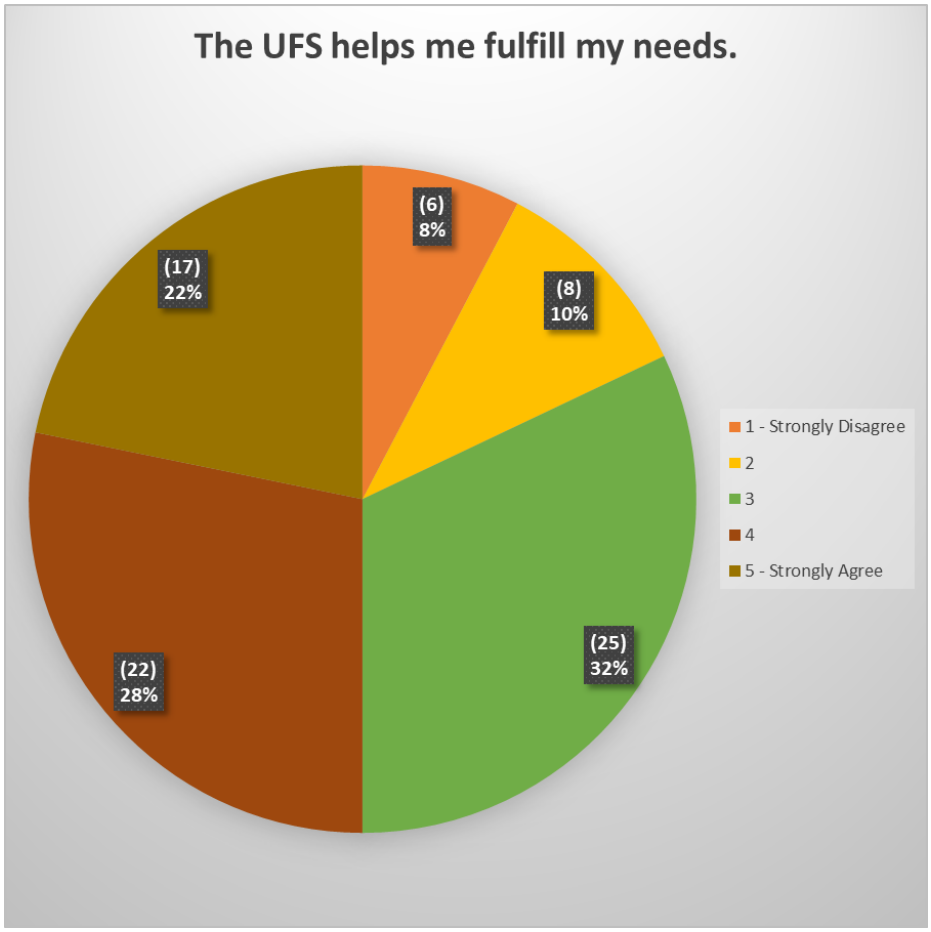
I belong in the UFS community.

A scale of 1 to 5 is designed to measure the respondent's sense of inclusion and association with the UFS community. A low rating (such as 1 or 2) might not necessarily reflect dissatisfaction or disappointment with the UFS community. Instead, it could simply be an indication that the individual's job or role is not directly associated with the UFS.



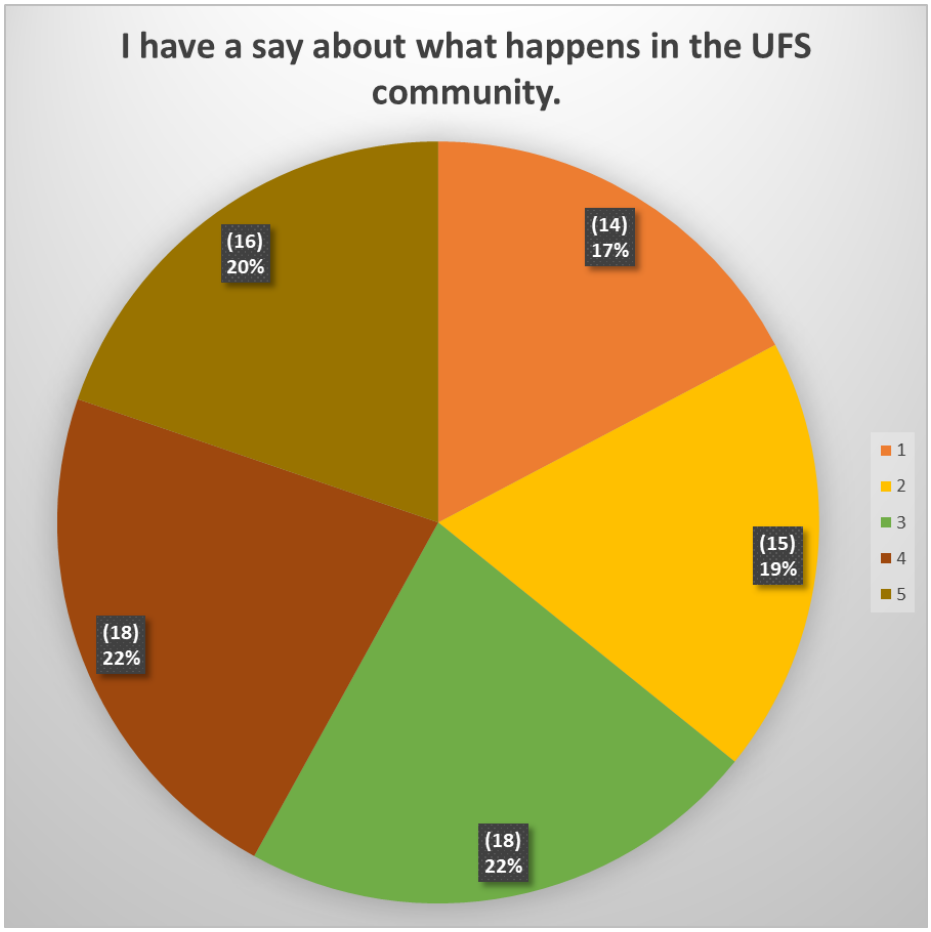
The UFS helps me fulfill my needs.

A scale of 1 to 5 is designed to measure the respondent's sense of inclusion and association with the UFS community. A low rating (such as 1 or 2) might not necessarily reflect dissatisfaction or disappointment with the UFS community. Instead, it could simply be an indication that the individual's job or role is not directly associated with the UFS.



I have a say about what happens in the UFS community.

A scale of 1 to 5 is designed to measure the respondent's sense of inclusion and association with the UFS community. A low rating (such as 1 or 2) might not necessarily reflect dissatisfaction or disappointment with the UFS community. Instead, it could simply be an indication that the individual's job or role is not directly associated with the UFS.



What would make you feel more connected to the UFS community?

Survey respondents highlighted a need for better communication and outreach, increased involvement and networking, technical and code-related connections, education, forums, and conferences to feel more connected to the UFS community.

IMPROVEMENT IN COMMUNICATION AND OUTREACH (7 COMMENTS)

Many respondents suggested that better communication, outreach, and more targeted discussions would foster a stronger connection.

- "The communication could be improved. More diversity at the top."
- "A UFS email list with periodic news, information."
- "Better communication and outreach to participants that are not EMC."

INCREASED INVOLVEMENT AND NETWORKING (6 COMMENTS)

Respondents expressed a desire for more networking opportunities, getting involved, and creating collaborations.

- "More networking opportunities."
- "Getting more involved as a user of the outputs."
- "Build collaboration and get involved in the decisions of model physics development."

TECHNICAL AND CODE-RELATED CONNECTIONS (6 COMMENTS)

Suggestions related to code usability, standardization, and development were noted as ways to connect better with the UFS community.

- "Easier barrier of entry into understanding the discussions surrounding the UFS."

- "Actively working on the code and creating pull requests."
- "Clearer definitions of what constitutes the UFS and UFS applications. Standardization of documentation, code repositories, software design, code organization and style, I/O formatting, and dissemination of these standards."

EDUCATION, FORUMS, AND CONFERENCES (5 COMMENTS)

Respondents were interested in more educational opportunities, conferences, workshops, and forums to understand the UFS better.

- "Special panels for students."
- "More sessions with academia where the topic was for them to tell us what they would like to do with the UFS."
- "One suggestion could be to have periodic webinars on the progress/updates made to the different models (or prototypes that are under development) under the UFS."

INCREASED ACCESS AND USABILITY (4 COMMENTS)

Respondents mentioned immediate access to run the code and increased investment in research infrastructure as ways to enhance the connection.

- "Once the UFS application successfully runs on my HPC."
- "Being able to run the code now and not 6 months from now."
- “Clearer definitions of what constitutes the UFS and UFS applications. Standardization of documentation, code repositories, software design, code organization and style, I/O formatting, and dissemination of these standards. Broader acceptance of innovative UFS applications that do not fit into current NOAA-sponsored UFS applications boxes.”

ENGAGEMENT WITH YOUNGER PROFESSIONALS AND DIVERSE ROLES (3 COMMENTS)

The importance of engaging early-career developers, forecasters, and various roles was highlighted.

- "Maybe if the UFS community solicited more thoughts from the early-career developers and users, or even the forecasters."
- "I would like to see a Testbed Section of the UFS structure. We, the Testbeds, have a lot to offer in user experience and we have the personnel to dive into the specific problems."

How would you like to contribute to the UFS community in the future, if at all?

The analysis reveals a rich variety of ways in which participants are willing to contribute to the UFS community, ranging from active involvement in research and development to collaborative efforts with various stakeholders, hands-on model testing, and education and training.

RESEARCH AND DEVELOPMENT (9 COMMENTS)

Many respondents expressed a desire to contribute through research, model development, and application creation.

- "Research, R2O, CMB."
- "Through model implementation for new architectures."
- "I hope my research will lead to a new and important application for this model."
- "I want to run and test UFS examples/templates and provide feedback on how they run on a wide variety of compute resources."

CONFERENCES, WORKSHOPS, AND PRESENTATIONS (8 COMMENTS)

Respondents indicated that they would like to attend conferences, workshops, or give presentations and share research findings.

- "Present our research at a future conference."
- "More conferences like this and submitting contributions."
- "For me, I could see participating in conferences or workshops with a poster or short presentation...especially an application session at the AMS annual meeting since I am usually there."

DATA ASSIMILATION AND MODEL TESTING (6 COMMENTS)

Several comments focused on improving data assimilation and conducting model testing and evaluation.

- "Improve the satellite data assimilation performance in the UFS."
- "Model testing, evaluation and post-processing/product generation."
- "Develop and understand the data assimilation for short-range weather predictions."

STUDENT AND COMMUNITY ENGAGEMENT (4 COMMENTS)

Respondents highlighted the importance of student engagement and broader community interaction.

- "Soliciting broader engagement from the private sector."
- "Student engagement."
- "I would love to work towards the SRW reconfiguration into Jupyter Notebooks! My project revolves around creating a UFS Student Engagement Plan and a technical report."

SPECIFIC PROJECTS AND COLLABORATIONS (3 COMMENTS)

Some participants indicated an interest in working on specific projects or building partnerships with the UFS.

- "We would be open to engaging more with NOAA and the UFS community regarding modeling at the air-sea interface."
- "Development of UFS coastal application, UFS infrastructure / build system and portability."

APPENDIX B - ACRONYMS

CG1 - Center Green 1
ECMWF - European Centre for Medium-Range Weather Forecasts
EPIC - Earth Prediction Innovation Center
HAFS - Hurricane Analysis and Forecast System
MC - Master of Ceremonies
MRW - Medium-Range Weather
NCAR - National Center for Atmospheric Research
NOAA - National Oceanic and Atmospheric Administration
NWS - National Weather Service
OSTI - Office of Science and Technology Integration
R2O2R - Research to Operations to Research
SRW - Short-Range Weather
UIFCW - Unifying Innovations in Forecasting Capabilities Workshop
UCAR - University Corporation for Atmospheric Research
UK Met Office - United Kingdom Meteorological Office
UFS - Unified Forecast System
WINGS Fellow - Weather Program Office (WPO) Innovation for Next Generation Scientists
WPO - Weather Program Office

APPENDIX C - UIFCW PLANNING COMMITTEE MEMBERS

<u>Listed in Alphabetical Order:</u>

Usama Anber (Brookhaven National Lab)
Farida Adimi (Raytheon)
Hedanqui Bai (George Mason University)
Keven Blackman (Raytheon)
Sen Chiao (Howard University)
Christopher Domanti (NOAA/EPIC)
Michael Ek (NCAR)
Tracy Fanara (NOAA/NOS)
Shira Francis (NOAA/NWS)
Kevin Garrett (NOAA/NWS)

Iman Gohari (Intel)
Doug Hilderbrand (NOAA/NWS)
Maoyi Huang (NOAA/EPIC)
Neil Jacobs (UCAR)
Amber Jenkins (Raytheon)
Aaron Jones (Raytheon)
Youngsun Jung (NOAA/NWS)
Kathryn Newman (NCAR)
Cyndee O'Quinn (NOAA/WPO)
Eric Pennaz (Google)
Jamese Sims (Mississippi State University)
Keri Dawn Solner (UCAR)
Hendrik Tolman (NOAA/NWS)
Jennifer "Jen" Vogt (NOAA/EPIC)
Jessica Wheeler (Raytheon)
Claudia Womble (NOAA/WPO)
Yan Xue (NOAA/NWS)

APPENDIX D - ACKNOWLEDGEMENTS

A sincere thank you to all who served as a part of the planning committee, reviewed abstracts, served as session chairs, MC's, moderators and facilitators. An even bigger thank you to Jessica Wheeler, Aaron Jones and Keri Dawn Solner who worked tirelessly alongside me and were instrumental in the success of the event. ~Jennifer "Jen" Vogt

Session Chairs		Moderators/Facilitators/MCs	
Cindy Bruyère	Tara Jensen	Daryl Kleist	Terra Ladwig
Maoyi Huang	Mike Barlage	Krishna Kumar	Jim Kinter
Curtis Alexander	Arun Chawla	Shuxia Zhang	Mike Ek
Louis Wicker	Keven Blackman	Le Jiang	Ligia Bernardet
Christiane Jablonowski	Vijay Tallapragada	Jamese Sims	Lisa Bengtsson
Jacob Carley	Louisa Nance	Kris Booker	Krishna Kumar
Fanglin Yang	Iman Gohairi	Hendrik Tolman	Gillian Petro
Lucas Harris	Aijun Zhang	Yan Xue	John Ten Hoeve
Avichal Mehra	Jessica Meixner	Jose-Henrique Alves	Claudia Womble
Xuejin Zhang	Saeed Moghimi	Kevin Viner	Alekya Srinivasan
Zhan Zhang	Gregory Frost	Luke Pfeffers	Tracy Fanara
Fred Carr	Ivanka Stajner	Tim Fuller-Rowell	Aaron Jones

APPENDIX E - NOTES

Day 1- July 24, 2023 Notes
Day 2 - July 25, 2023 Notes
Day 3 - July 26, 2023 Notes
Day 4 - July 27, 2023 Notes
Day 5 - July 28, 2023 Notes