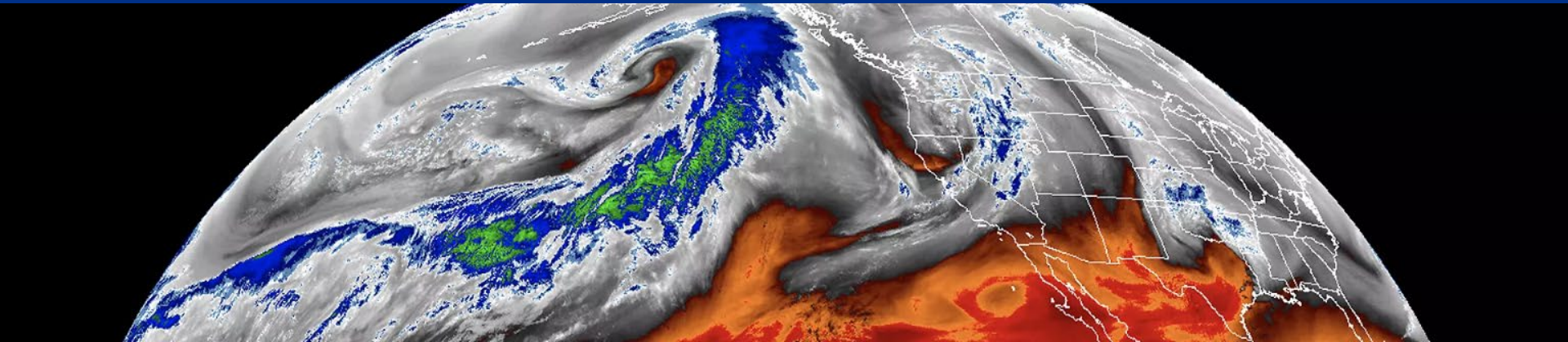
NOAA WEATHER PROGRAM OFFICE

June 21, 2023

North American Multi-Model Ensemble: Meeting Future Needs

Welcome . . .

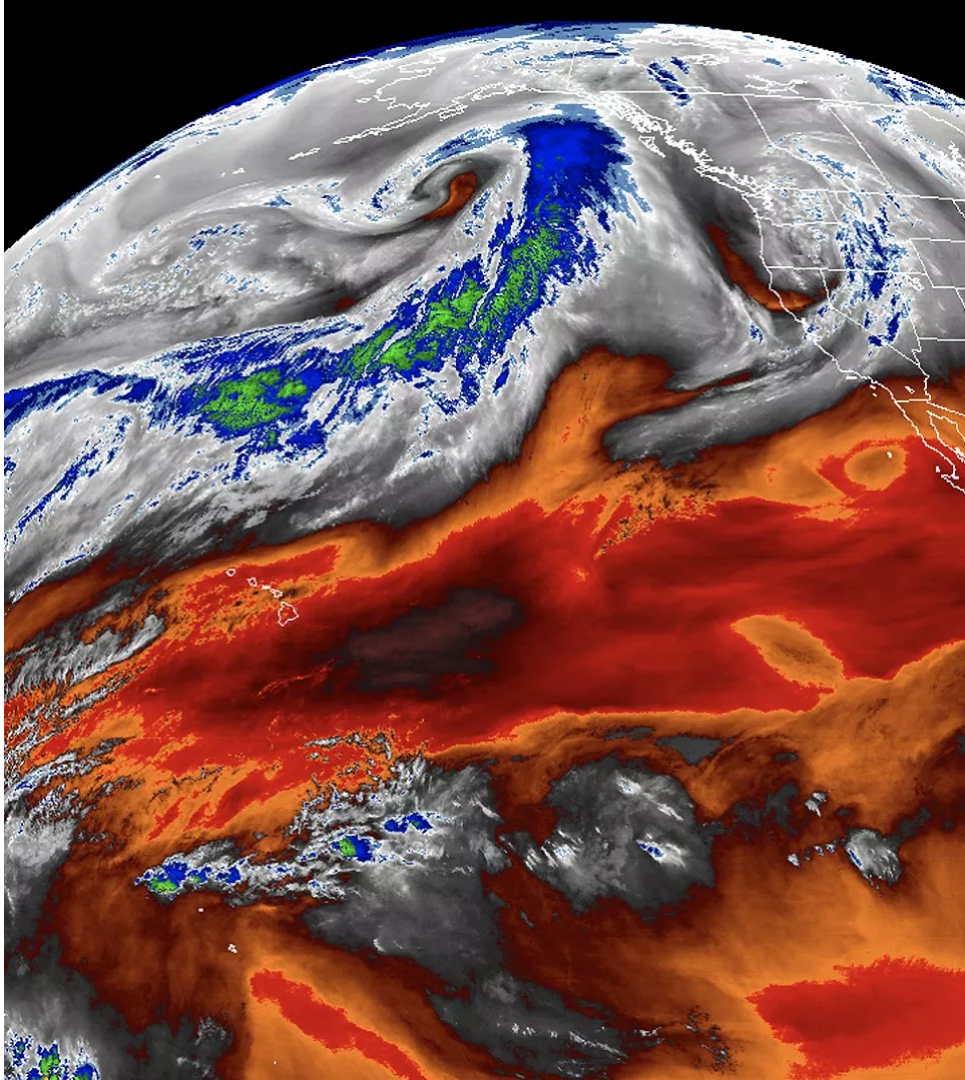
Dr. Jessie Carman, Earth System Research and Modeling Division Chief



MULTI-MODEL ENSEMBLES (MMEs)

Real-time, updating, multi-model ensembles over S2S timescale pull greater, unified benefit from multiple agency investments (e.g., NMME).

- Operational and research models (dual use)
- MMEs as proxy for modeling uncertainty
- Decision support
- Community data-sharing for decision support, product development
- Constantly updating research tools & materials for case studies/process comparisons



Background

NMME's history spans more than a decade:

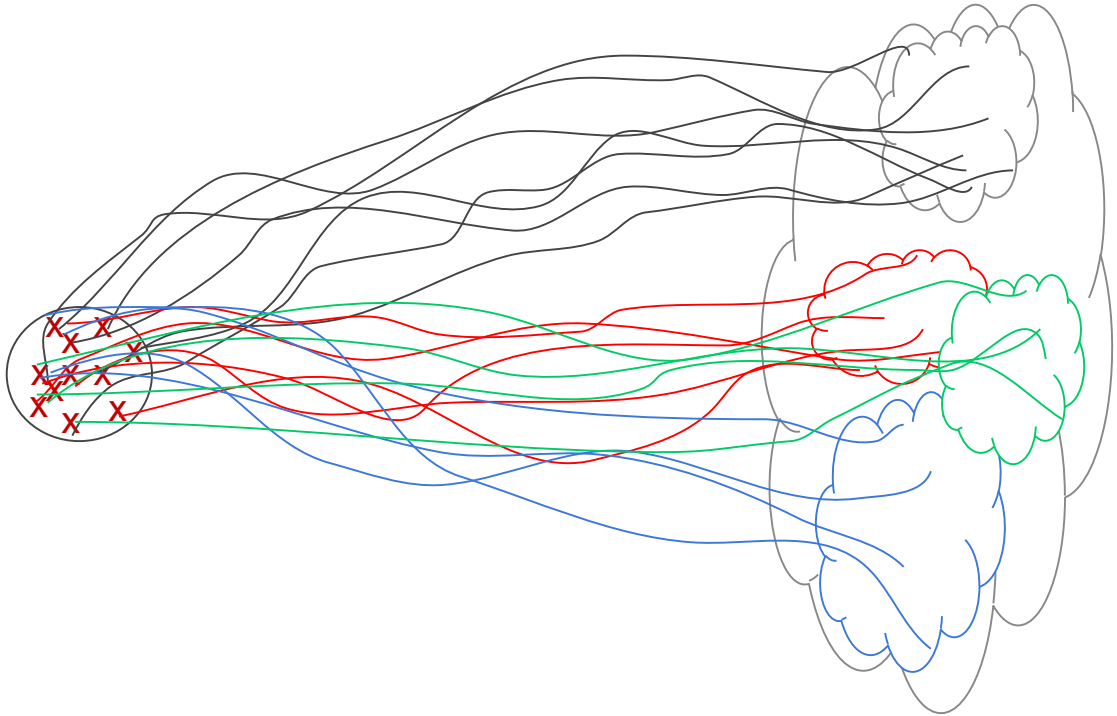
- NRC recommendations in 2010 for MME forecast strategies
- Novel creation in 2011 with "relatively spare protocol" to encourage model diversity, minimize impact on processing centers
- Leverages both research and operational models
- Ensemble not "operational," some members, some products are
- Inspired partnership efforts, external research

Becker et al. 2022 https://doi.org/10.1175/BAMS-D-20-0327.1

Participating Models

Broaden access to uncertainty

- Initial condition uncertainty
- Every model has individual characteristics
- Even with varied starting conditions, model characteristics will lead to a limited number of endpoints
- Use multiple models to access the wider range of possible outcomes

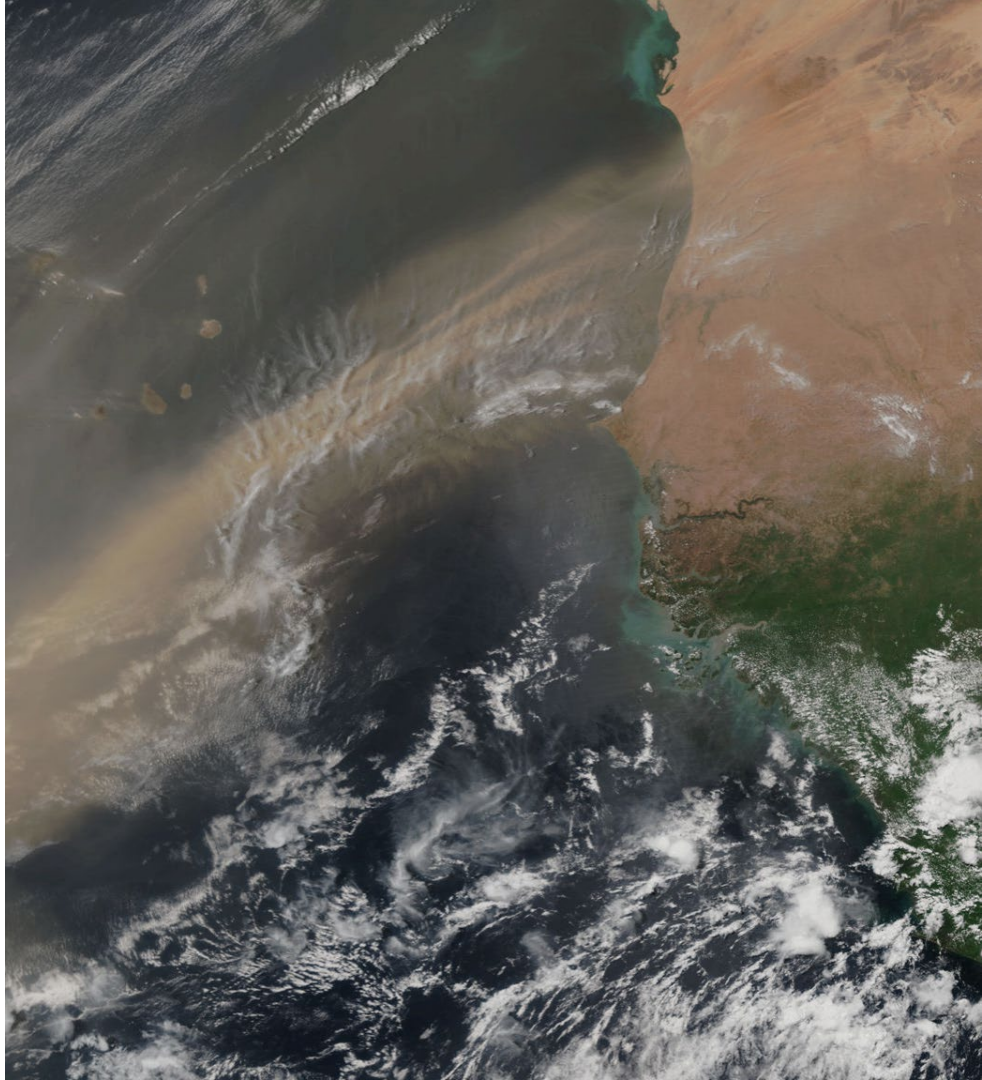


Participating Models

NMME consists of contributions:

- NCEP CFSv2
- GFDL SPEAR
- ECCC CanCM4
- NASA GEOS5
- NCAR CESM

Documentation mentions/refers to “sparse” basic data provided, as well as optional additional output



“Cooperation Arrangement”

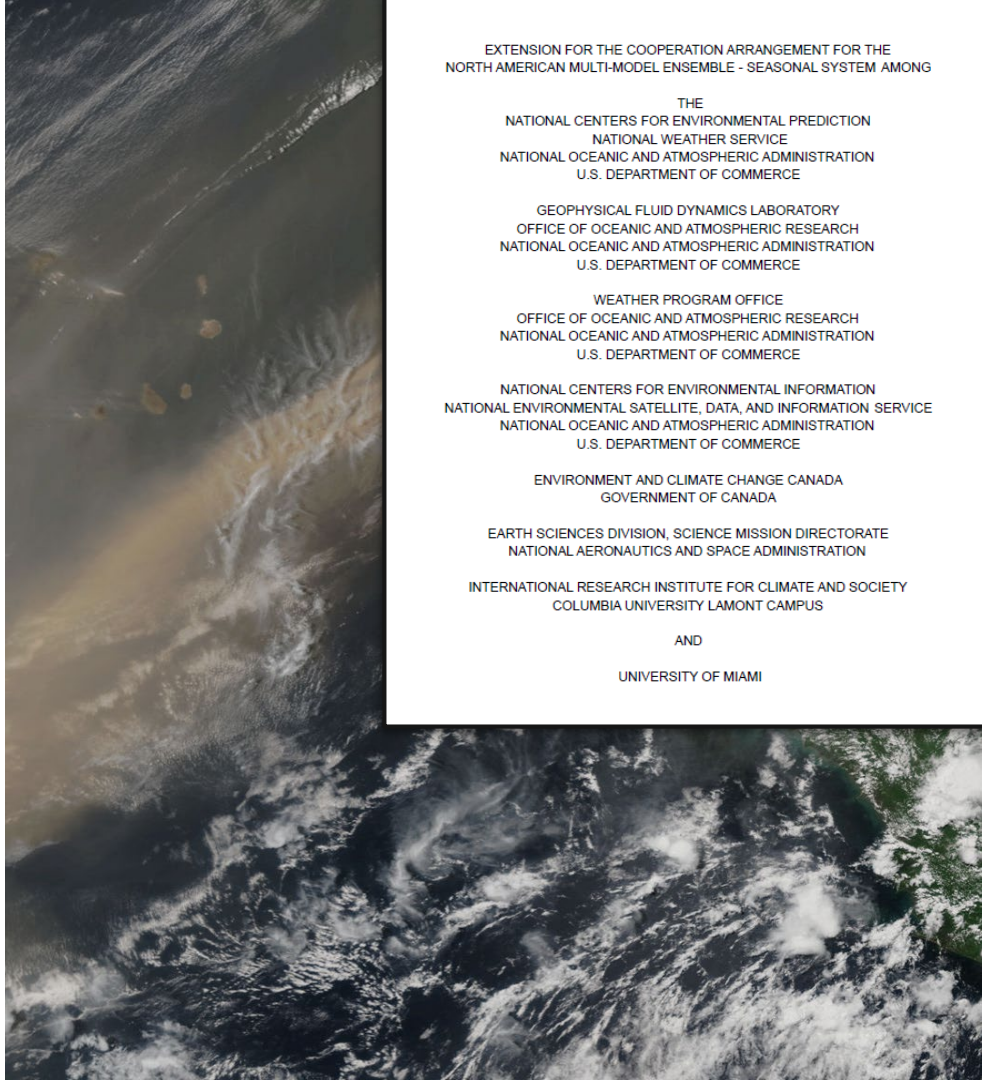
NMME’s ~~agreement~~ runs between:

- NOAA NCEP, GFDL, WPO, NCEI
- ECCC
- NASA ESD
- Columbia U IRI
- U of Miami

3-year document, signed in 2021

Documents participants, protocol for distributed system, member upgrade procedures, etc.

- Lengthy process to update . . .



EXTENSION FOR THE COOPERATION ARRANGEMENT FOR THE
NORTH AMERICAN MULTI-MODEL ENSEMBLE - SEASONAL SYSTEM AMONG

THE
NATIONAL CENTERS FOR ENVIRONMENTAL PREDICTION
NATIONAL WEATHER SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

GEOPHYSICAL FLUID DYNAMICS LABORATORY
OFFICE OF OCEANIC AND ATMOSPHERIC RESEARCH
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

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U.S. DEPARTMENT OF COMMERCE

NATIONAL CENTERS FOR ENVIRONMENTAL INFORMATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

ENVIRONMENT AND CLIMATE CHANGE CANADA
GOVERNMENT OF CANADA

EARTH SCIENCES DIVISION, SCIENCE MISSION DIRECTORATE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

INTERNATIONAL RESEARCH INSTITUTE FOR CLIMATE AND SOCIETY
COLUMBIA UNIVERSITY LAMONT CAMPUS

AND

UNIVERSITY OF MIAMI

Presently

NMME forms an important international/ interagency partnership to mutually address similar needs

- Leverages existing agency model development infrastructures, upgrade protocol
- Provides robust backup, continuity
- Forms an efficient way to broaden uncertainty envelope, improve accuracy/ quality
- Potential to identify, diagnose model errors

There remain unmet needs/ research goals

- Details of construction, content, operational and research uses will be described today
- Technologies have changed: computing, communications
- Potential to strengthen utility can be examined: what possibilities can we leverage to better meet decision needs, research goals?

This workshop

Presenters will discuss

- Overarching view of interagency perspectives
- State of NMME
- Improvements in constituent models
- End user activities: operational, research
- Observed gaps

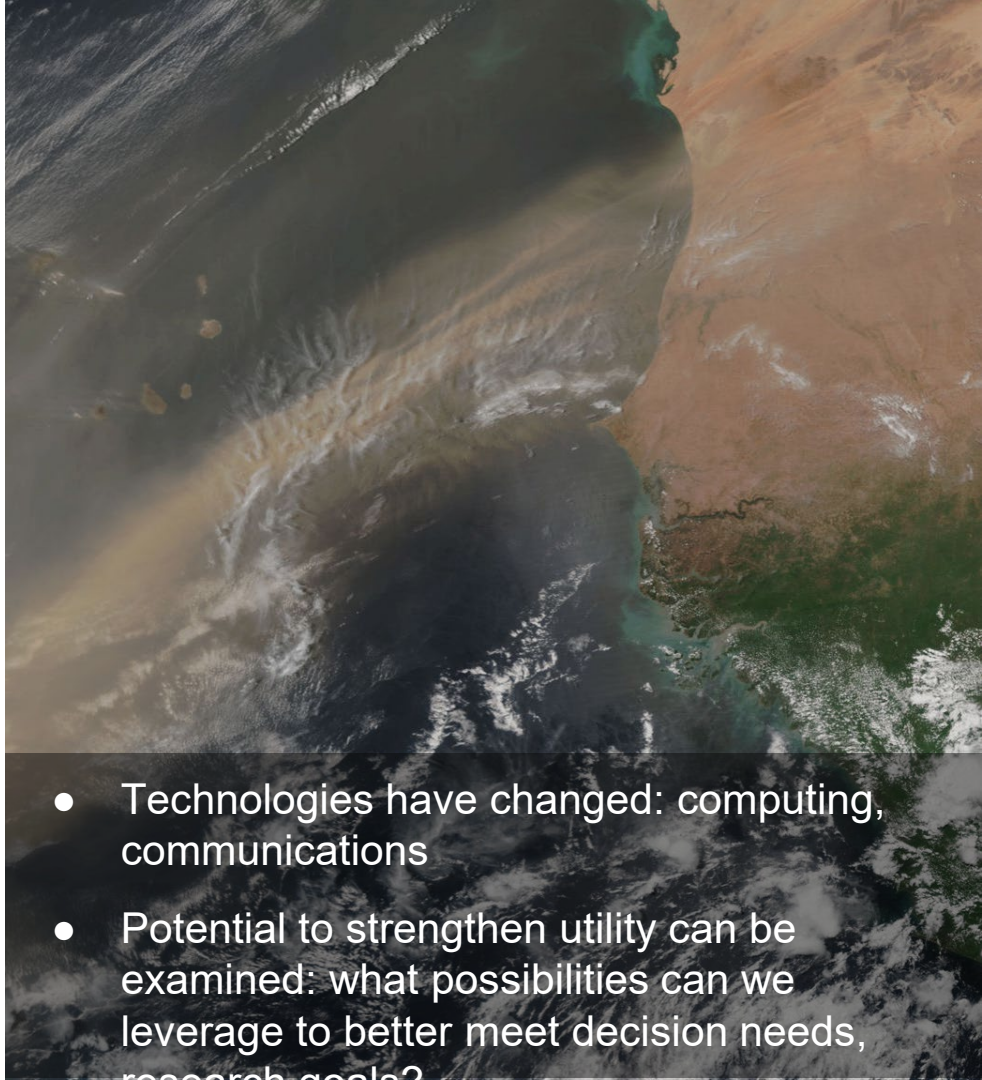
Breakouts will examine

- Scientific/technical challenges and possible solutions

GUIDING QUESTIONS

We will have discussion groups to delve into potential questions.

- What are the data needs of the forecaster communities/users over this extended time frame?
- How do you (and your stakeholders) use NMME?
- What would each group like NMME to do that it isn't currently?



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Goals

Inform the evolution of NMME:

- What output variables, frequency, etc would be useful for various stakeholders?
- What does technology make possible nowadays?
  - Data storage, access
  - Consider resolution, initialization, ensemble size etc.
  - Can NMME be used as a testbed to examine model updates, prediction/predictability?
- What are the technical challenges?
  - Operational Gaps
  - Modeling Center needs
  - Initialization issues


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THANK YOU

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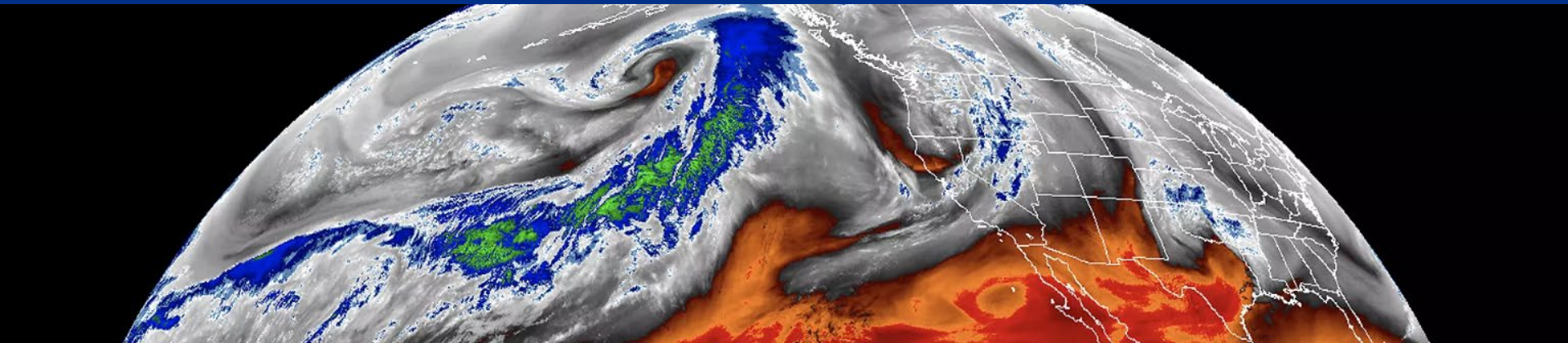
June 21, 2023

North American Multi-Model Ensemble: Meeting Future Needs

Dr. Mark Olsen, NOAA/OAR/Weather Program Office, S2S Deputy Program Manager

Logistics



Necessary Information

- **In the event of fire:** Exit through side doors and proceed to the parking lot
- Wireless login:
  - Network name: noaaguest
  - use your email address
- We ask that you do not eat food or drink in the auditorium
- Restrooms are down the hall
- We will have 3 small breakout rooms for side discussions and food

Necessary Information

- **Please note:** Unless speakers have asked otherwise, all sessions will be recorded. Your continued participation implies consent to recording.
- Please be sure to mute all microphones when not speaking
- There may be time for questions following after each presentation; further questions can be made during the discussion period in addition to comments, other perspectives, etc.
- Virtual Attendees: Questions or comments may be made using the chat box or by unmuting during the discussion periods. **Please post in the chat if you wish to speak and we will call on you.**

Workshop Overview Highlights

Day 1

9:00 am Overarching view

10:00 am State of NMME

11:00 am Model Improvements

1:30 pm End User Activities and Needs

3:30 pm Operational Gaps Discussion Panel

Workshop Overview Highlights

Day 2

9:00 am Research Needs Discussion Panel

11:00 am Breakout Session 1 (3 groups)

- Group 1A: Data Needs and Access
- Group 1B: Model Improvements
- Group 1C: Prediction/Predictability Testbed

1:00 pm Breakout Session 2 (3 groups)

- Group 2A: Operational Gaps
- Group 2B: Modeling Center Challenges
- Group 2C: Initialization Frequency: Requirements and Limitations

2:00 pm Report Out

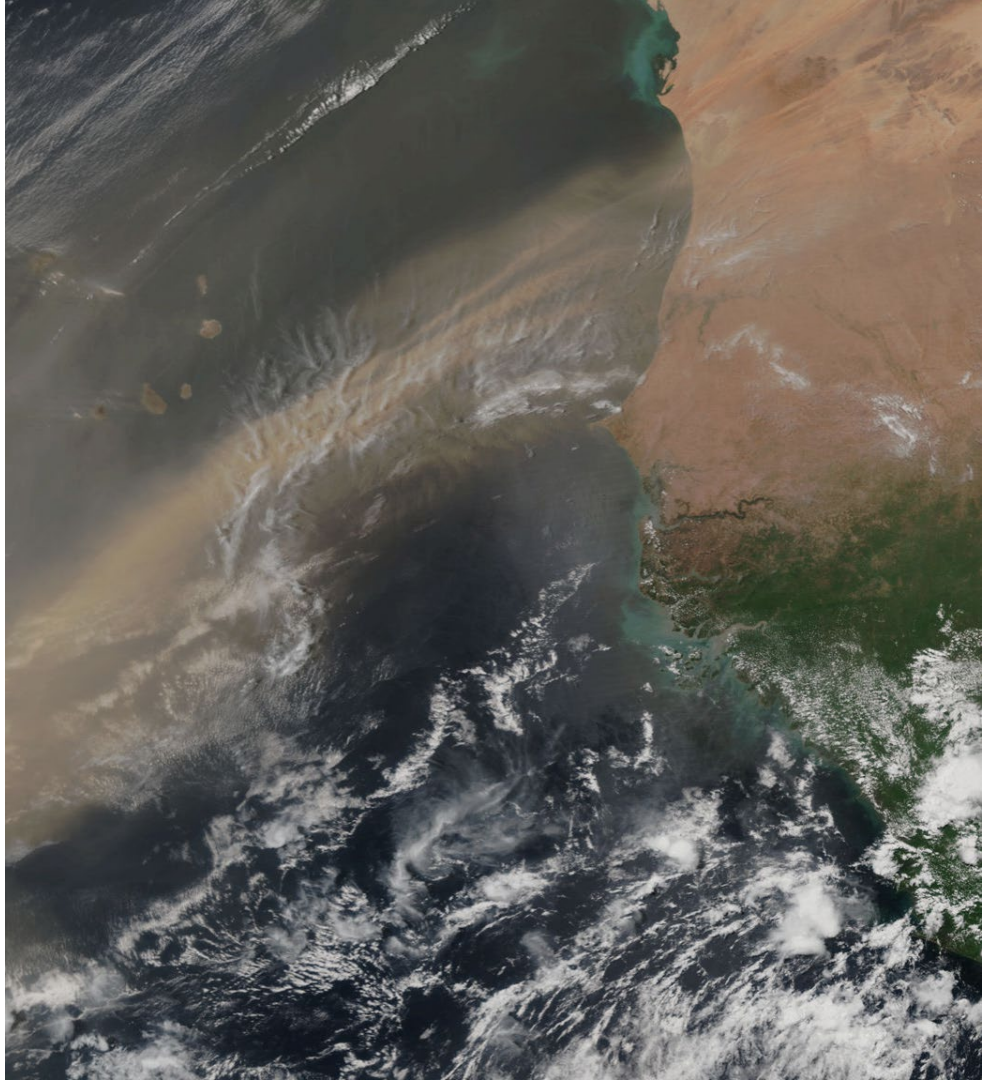
3:30 pm Meeting Outcomes Discussion

Breakout Session Info

Group 1A: Data Access & 2A: Operational Gaps
Room #: Main Auditorium ← Note difference from Agenda
Link: *https://meet.goto.com/216619237*
You can also dial in using your phone.
United States: +1 (571) 317-3112
Access Code: 216-619-237

Groups 1B: Modeling & 2B: Modeling Center Challenges
Room #: Conference Room B
Link: *https://meet.goto.com/772612861*
You can also dial in using your phone.
United States: +1 (872) 240-3412
Access Code: 772-612-861

Group 1C: Prediction/Predictability Testbed &
2C: Initialization Frequency: Requirements and Limitations
Room #: Conference Room C
Link: *https://meet.goto.com/945046581*
You can also dial in using your phone.
United States: +1 (872) 240-3212
Access Code: 945-046-581




THANK YOU!