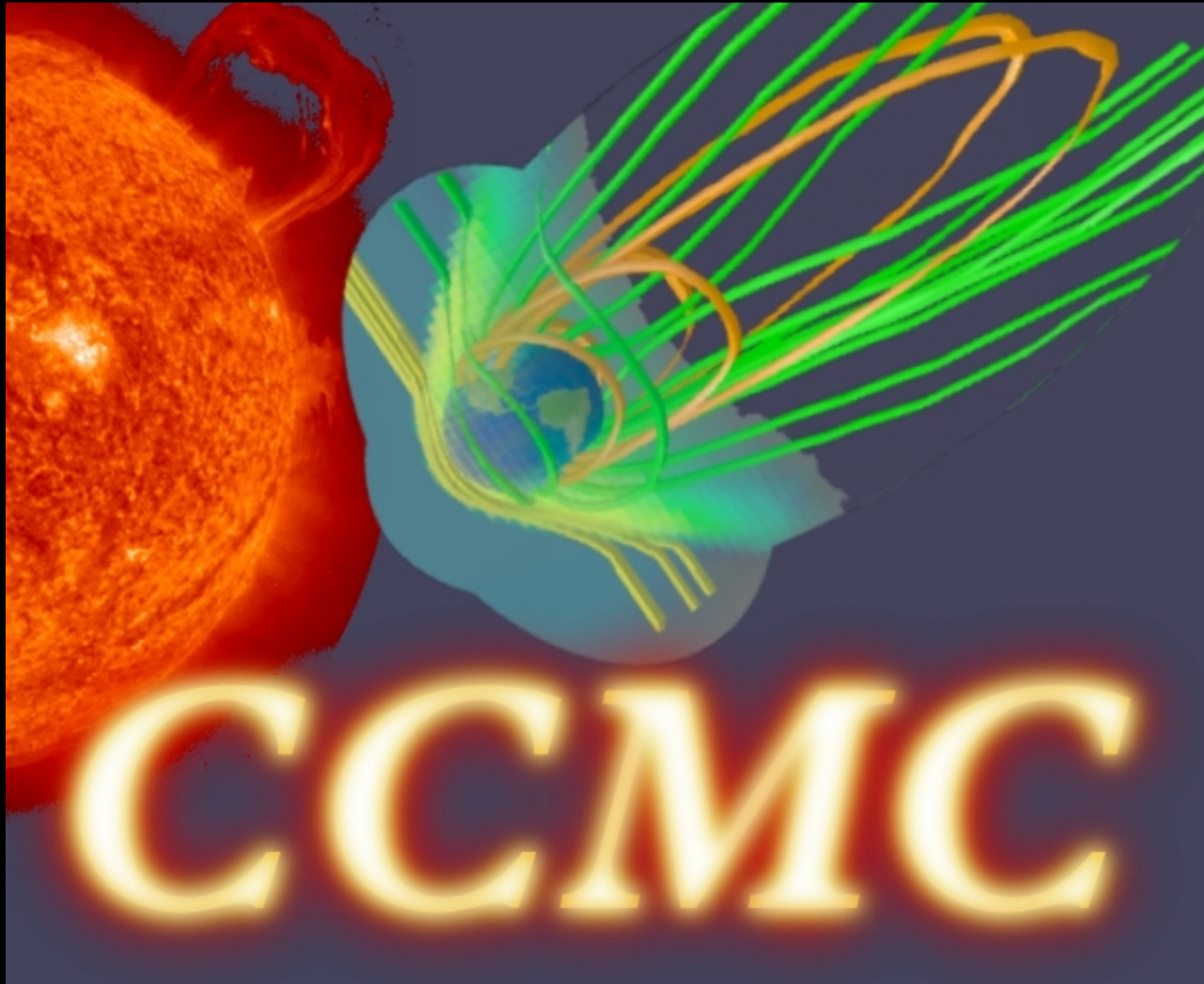


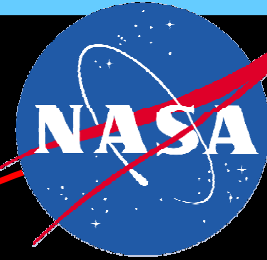
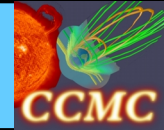
# The Community Coordinated Modeling Center



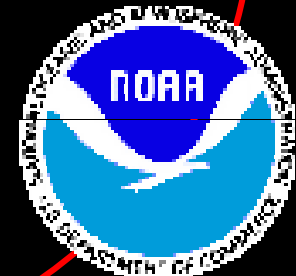
**Report**

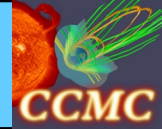
Michael Hesse

# COMMUNITY COORDINATED MODELING CENTER



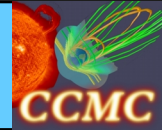
**“A multi-agency partnership to enable, support, and perform the research and development for next generation space science and space weather models”**





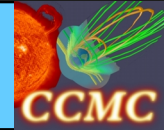
# Outline

- Background:
  - Charter
  - History
  - Organization
- Implementation:
  - Overview
  - Computational Resources
  - Models
  - Community research support
- Future

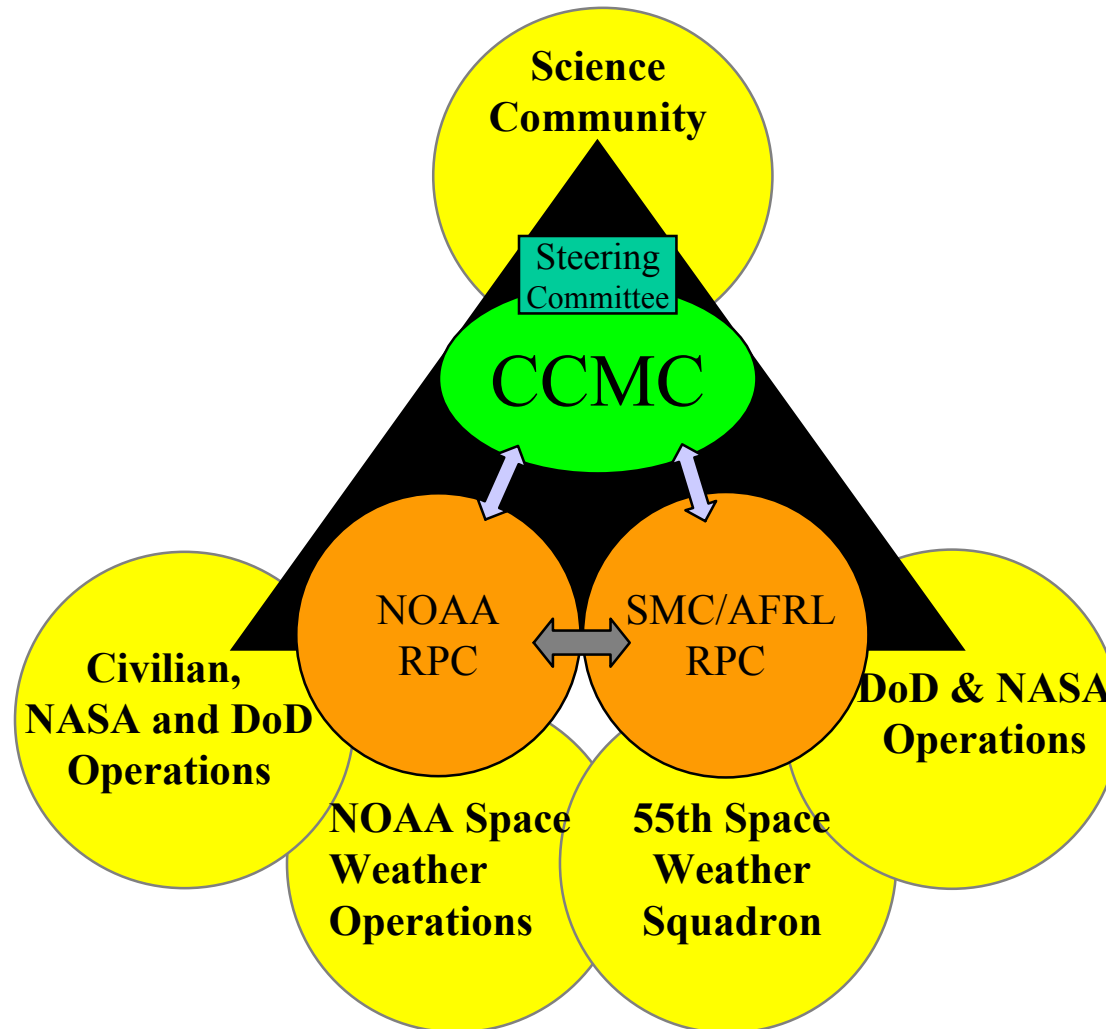


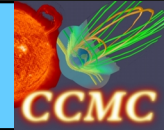
# Background: What is CCMC

- Strategic multi-agency activity aiming at the Nation's space weather needs
  - Through the development of advanced space weather prediction models
- Program bridging basic research and operational needs
  - Through testing and development of research models, jointly with model sources
  - Through product delivery to NOAA/SEC and USAF RPCs
- Service to the research community through access to state-of-the-art research models
- Key element in NASA's "Living With A Star," DoD Space Weather Transition Plan, and NSWP Implementation Plan



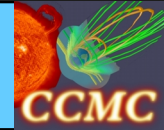
# Background: CCMC Goals





## Background: Charter

- Employ scientific research models to accomplish Space Weather objectives
- Serve the research community through access to scientific model results (“open model policy”)
- Work with the research community to generate a flexible model chain, which addresses solar atmosphere to Earth’s upper atmosphere
- Facilitate broad-based testing, combination and improvements of research models using government high performance computing
- Deliver science-tested models to Rapid Prototyping Centers for Space Weather Applications

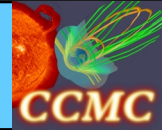


## Model Selection Menu

corona	solar wind	magnetosphere	ionosphere	rad belt
model 1 model 2 ....			model 1 model 2 ....	

## Data Input Menu

corona	solar wind	magnetosphere	ionosphere	rad belt
data 1 data 2 ....			data 1 data 2 ....	



## Background: CCMC History

**1997**

- NSWP identifies need for modeling center
- AF/NASA Partnership recommends “CCMC-like” capability

**1998**

- Rice University study recommends center at government facility to utilize federal resources for community goals
- CCMC partnership consortium formed as an inter-agency project (K. Scro)
- CCMC Steering Committee formed

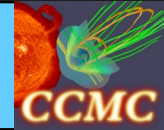
**1999**

- Consortium develops implementation plan
- CCMC facility established at GSFC in response to inter-agency request

**2000**

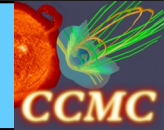
- CCMC operational with Maui HPCC (DoD high perf. computing center)
- Activation of Goddard connection to the Defense Research and Engineering Network
- Simulation results become web accessible
- Air Force Weather Agency computers available, now 70 processors





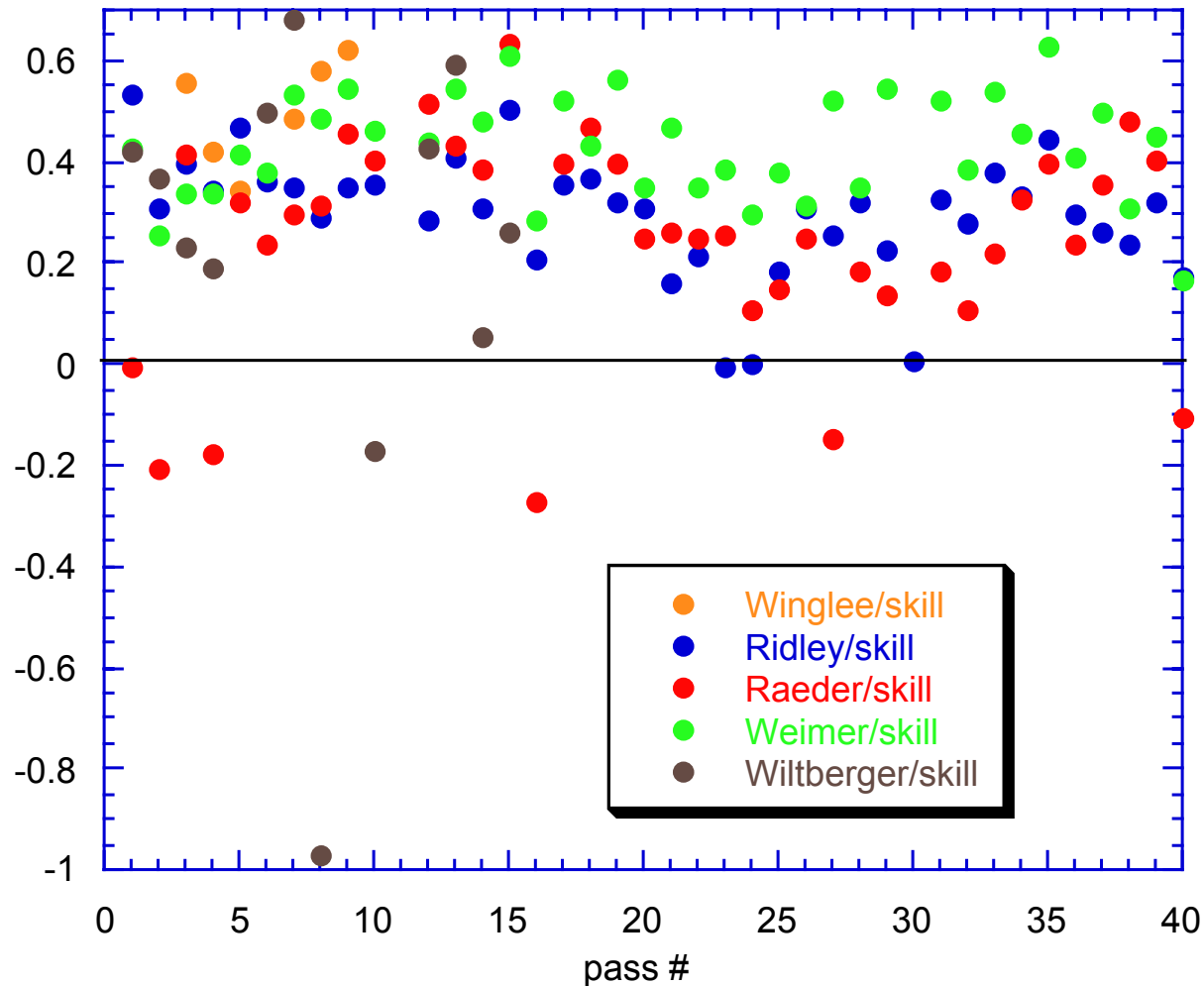
## Recent Developments

- IPLAN signed by all stakeholders and formal recognition by US Committee for Space Weather (K. Scro)
- CONOPS in draft version and delivered to CSW for information
- ONR (B. McCoy) added to Steering Committee
- Evaluated Magnetospheric Metrics Challenge
- Supported CISM space weather summer school through
  - eight runs-on-request
  - simultaneous web-based access to run results
- First model delivery to AF/SMC RPC



# Metrics challenge - example

Skill Scores December 98





## Background: Multi-Agency Activity

AFOSR

Manpower, Computing

AFRL

Computing

AF/XOW

Computing

NASA GSFC

Facility, Manpower, Networking

NASA HQ

Manpower

NOAA/SEC

Transition to Ops

NSF

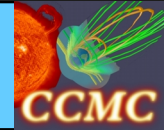
Manpower, Computing

ONR

Model support

SMC

Transition to Ops



## Background: Organization

- CCMC operates under the direction of the NSWP Council through the Committee for Space Weather (CSW)
- The CCMC Steering Committee guides development and operations. Present members are:

AFOSR

Maj. Paul Bellaire

AFRL

Dr Michael Heinemann

AF/XOW

Maj. Phyllis Kampmeyer (Co-Chair)

NASA GSFC

Dr. Michael Hesse

NASA Headquarters

Dr. Jim Sharber

NOAA

Dr. Terry Onsager

NSF

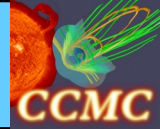
Dr. Bob Robinson (Co-Chair)

ONR

Dr. Bob McCoy

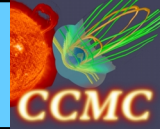
SMC/CI

Mr. Kevin Scro (Facilitator)



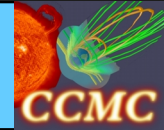
## Background: CCMC Implementation Facility

- Main facility located at GSFC
- Center with staffing (3FTE C.S., 2.5FTE Contractors, 1-4Postdocs)
- Fast network link to DoD computational facilities

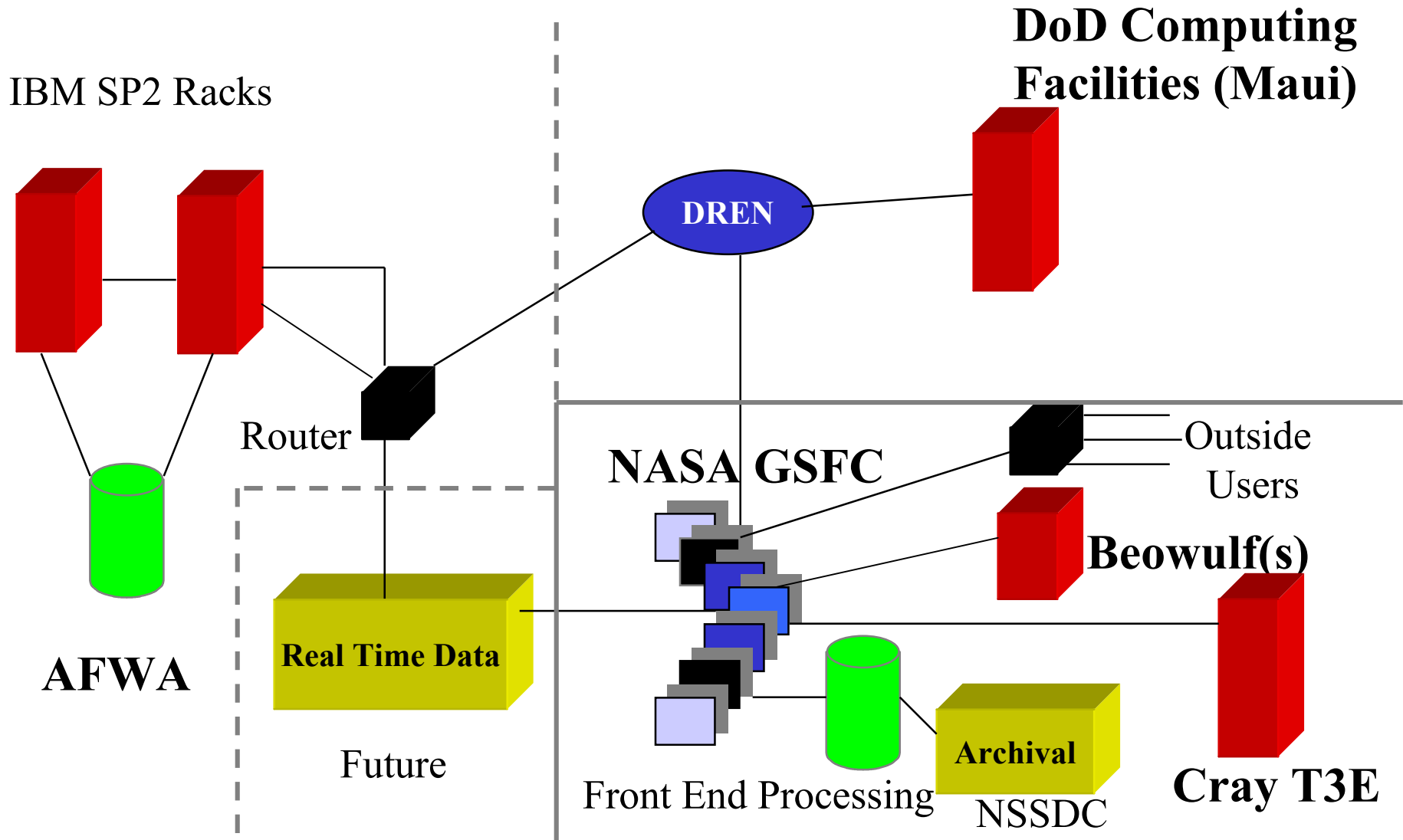


# CCMC Implementation: Computational Resources

- 70 Processors on-line at AFWA, used 24x7
- Maui HPCC used, additional resources now
- Support from NASA HPCC program (Cray time)
- Startup Beowulf arrived, turned on 3/13/01 (NSF/AFOSR funded)
- Additional Beowulfs expected in near future:
  - 64 node system (NSF and AFOSR supported)
  - 128 node system replacing AFWA machines



# Computational Infrastructure

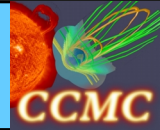


BEOWULF  
turned on 3/13/01

Sponsored by  
NSF and AFOSR

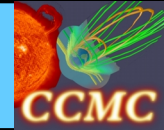






## CCMC Implementation: Models

- UMich and UCLA magnetospheric models used routinely
- Real time versions available
- Codes drive Fok ring current model, run routinely
- SAMI2 model implemented
- Developed advanced visualization tools
- BATSRUS spun off to AF/SMC RPC 9/01
- Further ionospheric, solar and heliospheric models to be implemented within 6 months

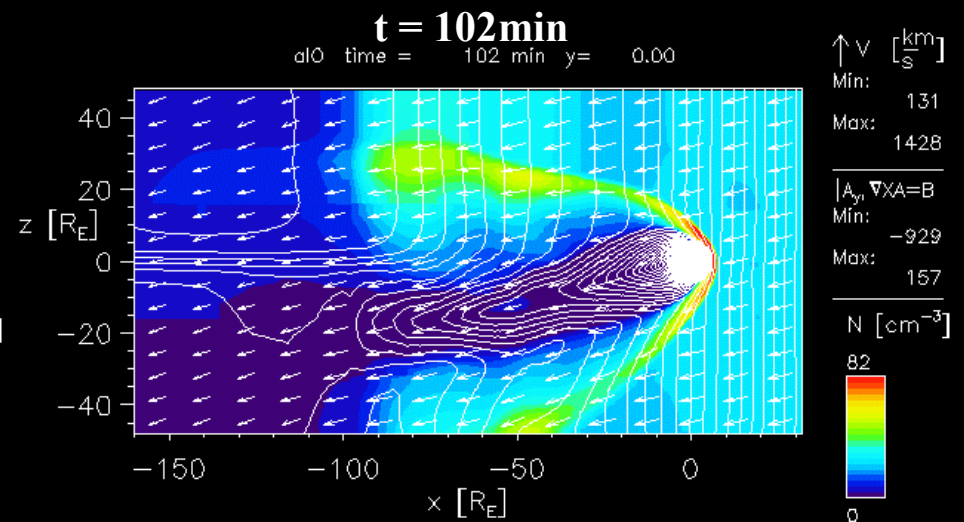
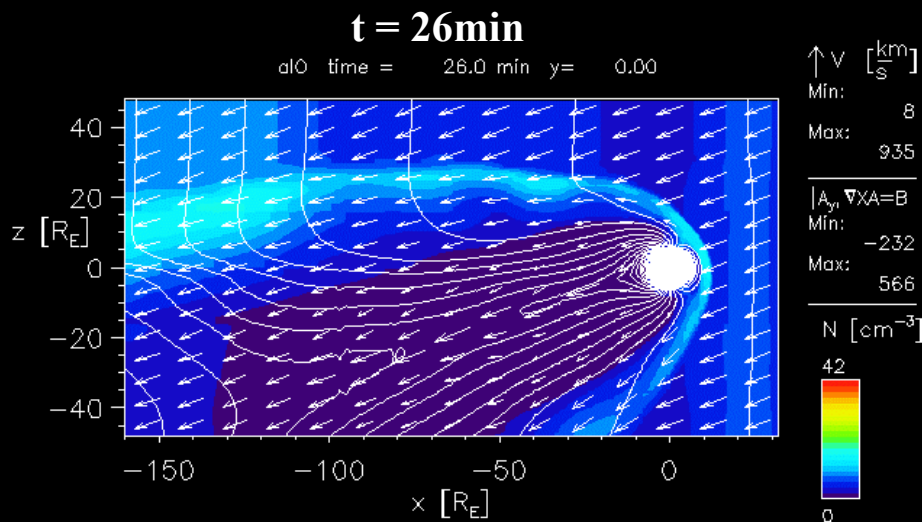


# Implementation: Activities

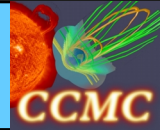
## Testing models 1:

### UMichigan model: Space Weather Event

### Bastille Day Event



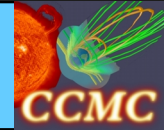
COMMUNITY COORDINATED MODELING CENTER



# Community Research Support

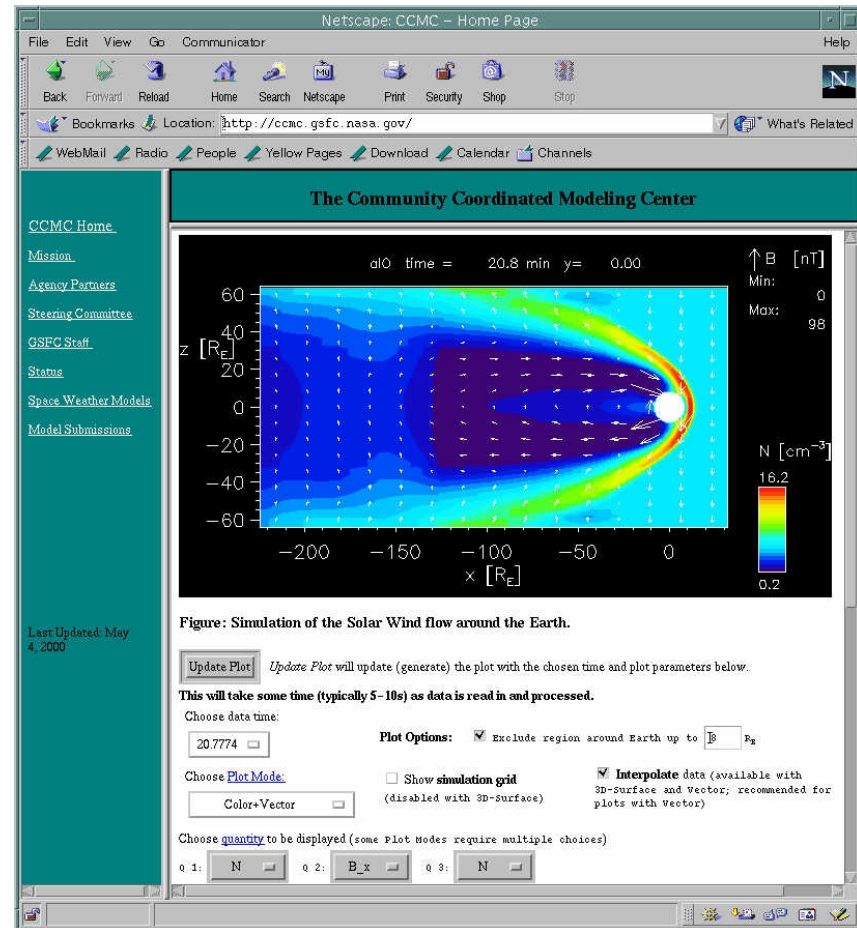
The screenshot shows a web browser window titled "Community Coordinated Modeling Center" with the address bar displaying "http://ccmc.gsfc.nasa.gov/". The website content includes a navigation menu on the left with links for Mission, Agency Partners, Steering Committee, GSFC Staff, Presentations and Publications, Space Weather Models, Latest Results, Submit Model, and Space Weather Metrics Study. The main content area features a large "CCMC" logo, a graphic of the Sun and a satellite, and a quote: "A multi-agency partnership to enable, support and perform the research and development for next generation space science and space weather models". Below the quote are logos for NASA, AFOSR, AFRL, AFWA, NOAA, and NSF. At the bottom, it states "02071 hits since March 30, 2000".

<http://ccmc.gsfc.nasa.gov>



# Community Research Support

- Through www-accessible run results
  - Purpose:
    - Enable broader model usage
    - Enable broad-based model testing
  - Goal: Perform runs on request
- Now available for
- BATSRUS
  - UCLA MHD
  - SAMI2 ionospheric model
  - Fok ring current model





## Run requests largely automated

### Step 1: Fill in the Form and Generate a Registration Number for each Requested Run.

The Registration Number is composed of your first name (FirstName), your last name (LastName), date (mmddy), and run identification number (RunNumber):

**FirstName\_LastName\_mmddy\_RunNumber**, e.g., George\_Siscoe\_060601\_1.

At the present time you are allowed to make up to 4 different submissions on the the same date (mmddy). For each new submission made on the same date you need to choose a new **Run Number** ("1", "2", "3", or "4"). Multiple submissions made on the same date with the same Run Number will overwrite the previous submission. You can use this feature to resubmit the request on the same date. If you decide to cancel or modify your submission at later date, please contact the CCMC staff:

e-mail: [requests@ccmc.gsfc.nasa.gov](mailto:requests@ccmc.gsfc.nasa.gov)  
tel.: Masha Kuznetsova (301-286-9571), Sheila Ritter (301-286-5447), Lutz Rastaetter (301-286-1085).

Please have registration numbers when making inquiries about your requests. You will need your registration number to view the results when the simulations have finished.

First Name:  (required)

Last Name:  (required)

Address:

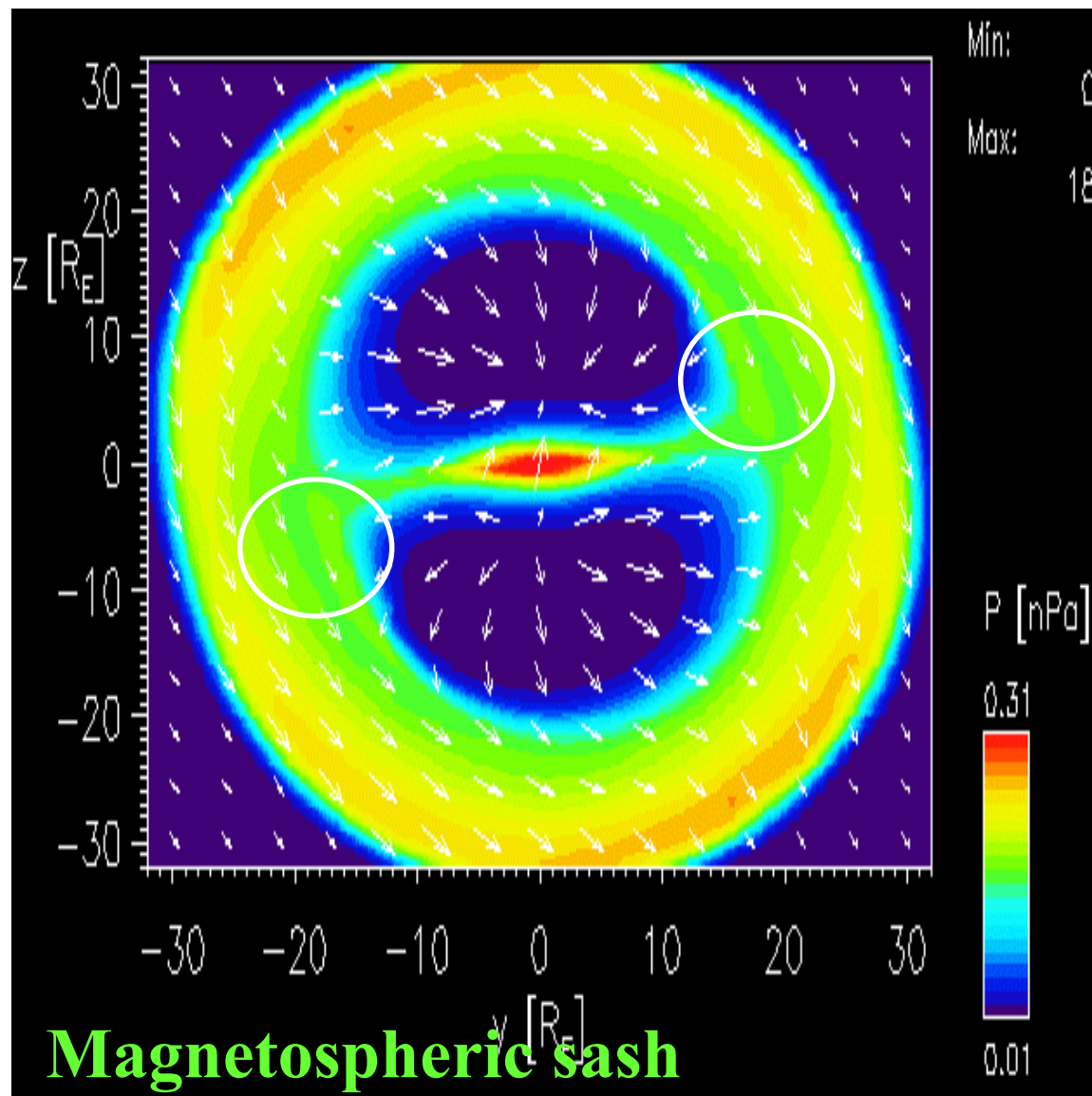
Telephone:  (required)

E-mail:  (required)

Run Number:

-> M. Kuznetsova's presentation

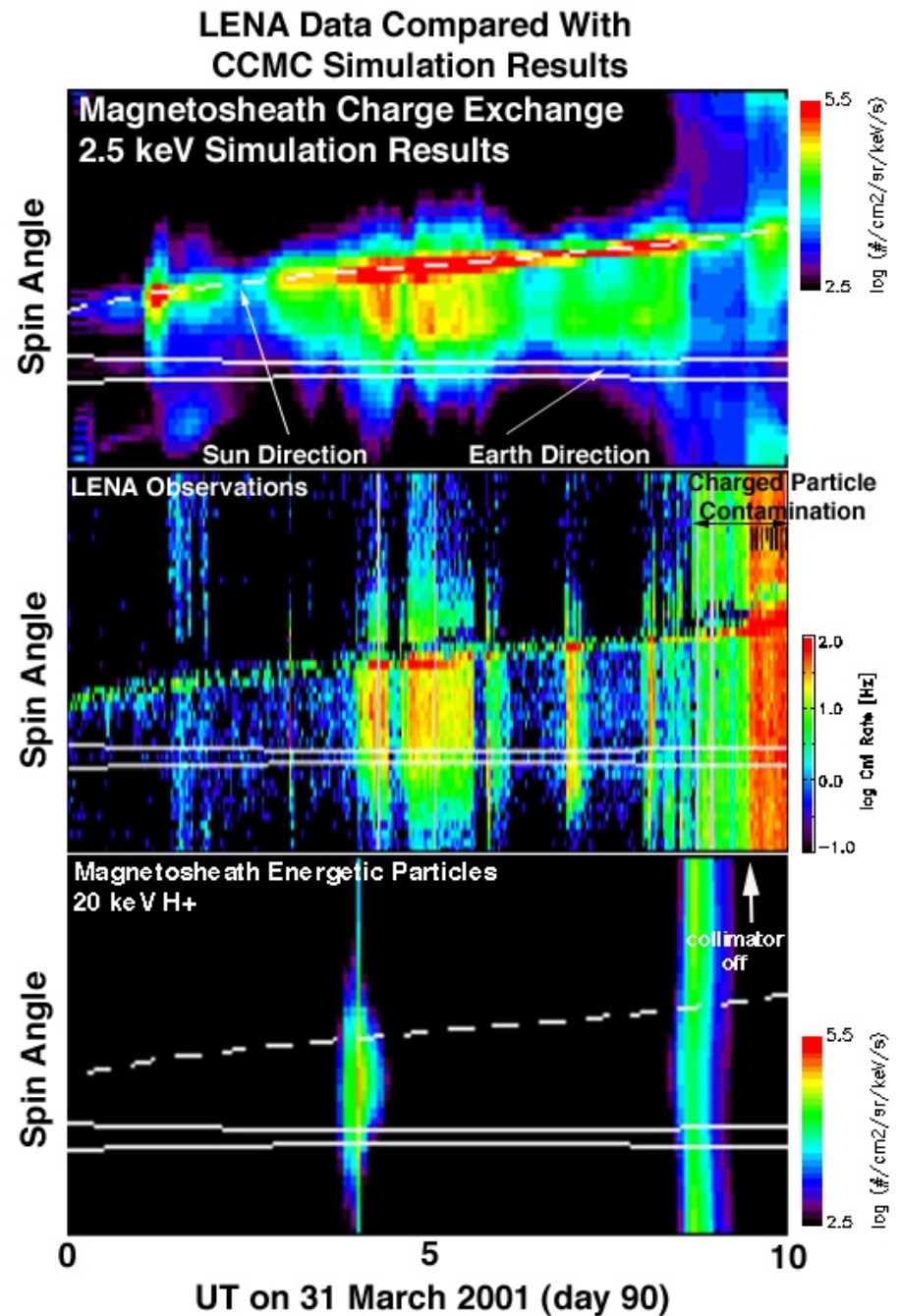
## Access to Simulation Output/Examples



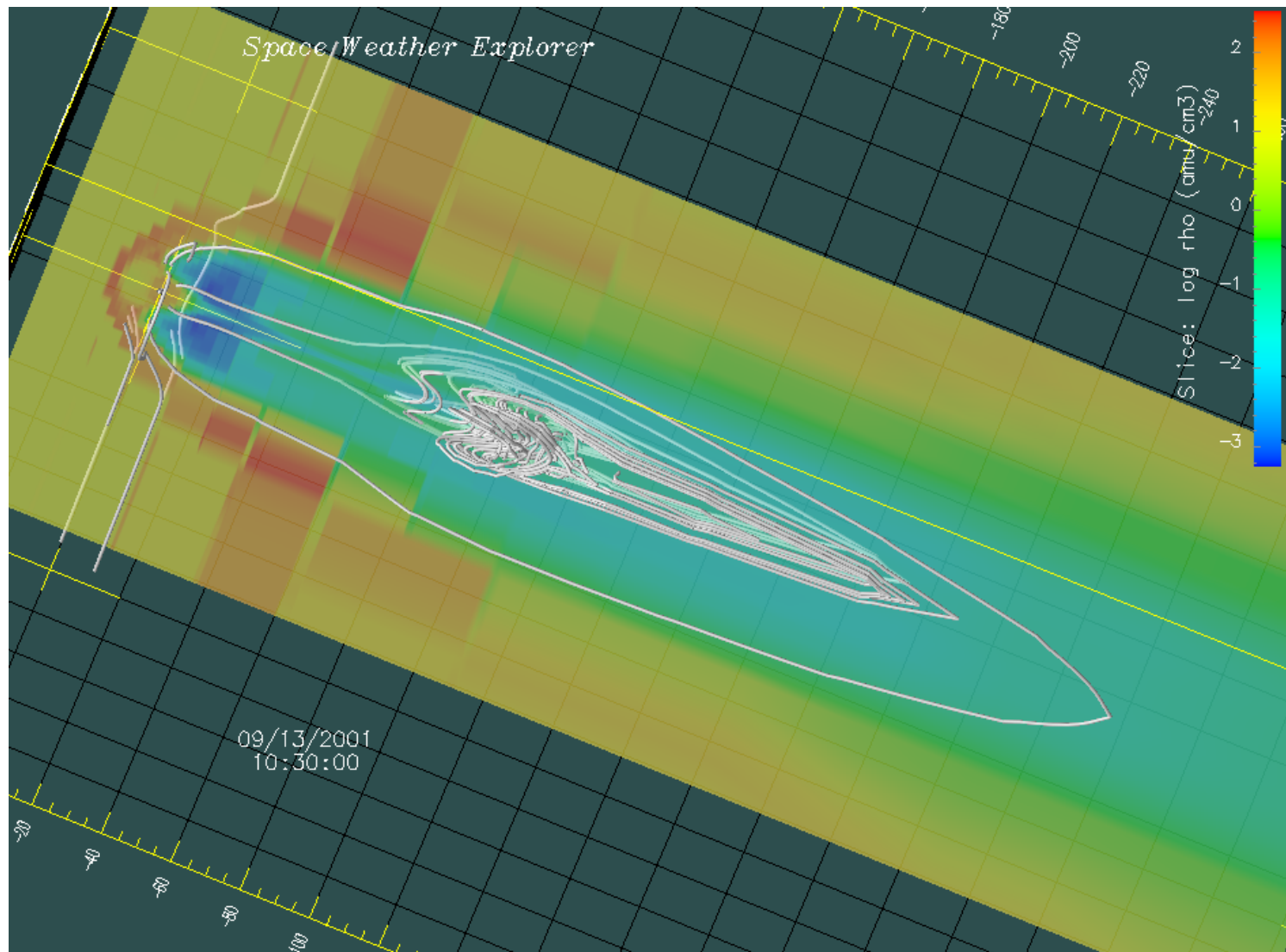
## Community use of CCMC models (example)

- Run requested for March 31, 2001 storm
- Magnetosheath densities and temperatures used for charge exchange calculations
- Results of line-of-sight integrations compared to IMAGE/LENA observations
- Model provided analysis tool to researchers
- Analysis/comparison reveal model quality

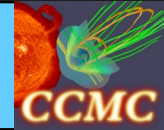
plot courtesy M. Collier



# Visualization tools: IDL-based, OpenDx-based

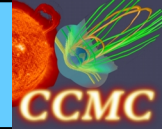






## Future - Vision

- Embedding in national and international space weather activities
  - CCMC is an inter-agency, strategic investment in US space weather program needs
  - CCMC part of DoD Space Weather/Tplan, NASA/LWS, NSWP/Iplan
- Activities
  - CCMC staff will work closely with the community on solar, heliospheric, magnetospheric, and ionospheric models
  - CCMC will be inclusive, cooperative rather than exclusive
  - Models will be continually improved, combined, and tested against metrics
  - Model transition to RPCs will continue, expecting feedback
  - CCMC will provide strong service to research community through access to state-of-the-art science models
  - CCMC will develop advanced visualization and tailored output for community research use and RPC applications



## Summary

- CCMC is a novel approach to the development of space weather models - we are still learning
- Success: Models run routinely on many platforms
- CCMC remains key ingredient in DoD Space Weather/Tplan, NSWP/Iplan, NASA/LWS
- CCMC continues as a successful example of working, strategic inter-agency collaboration
- CCMC provides service to research community
- CCMC delivered first model to USAF RPC, more to come
- Looking for continuous inputs from science and operational communities