

The Community Coordinated Modeling Center

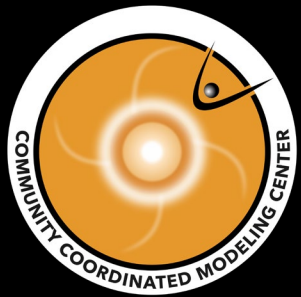
CCMC Current Transition Role

M. Leila Mays, *CCMC Director (Acting)*

&

CCMC Team

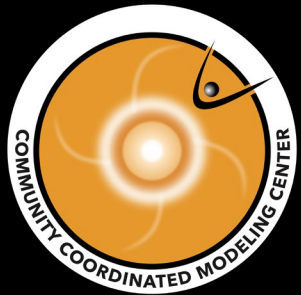
Space Weather Roundtable
September 1, 2026



The Community Coordinated Modeling Center

Facilitate
space science and
space weather
**research & model
development**

Support the transition
of advances in
research to **space
weather operations**

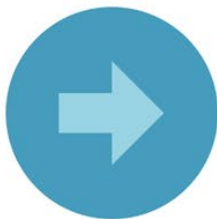


Multi-agency strategic investment in US space weather program



CCMC Simulation Services

Transformed the way advanced models are used in research



Runs-on-Request

Long running simulations by request. Submit a request and get notified when the results are ready.

63 (45%)



Continuous Run

Continuously running models. View the latest results of several models without a separate request.

30 (21%)



Instant Run

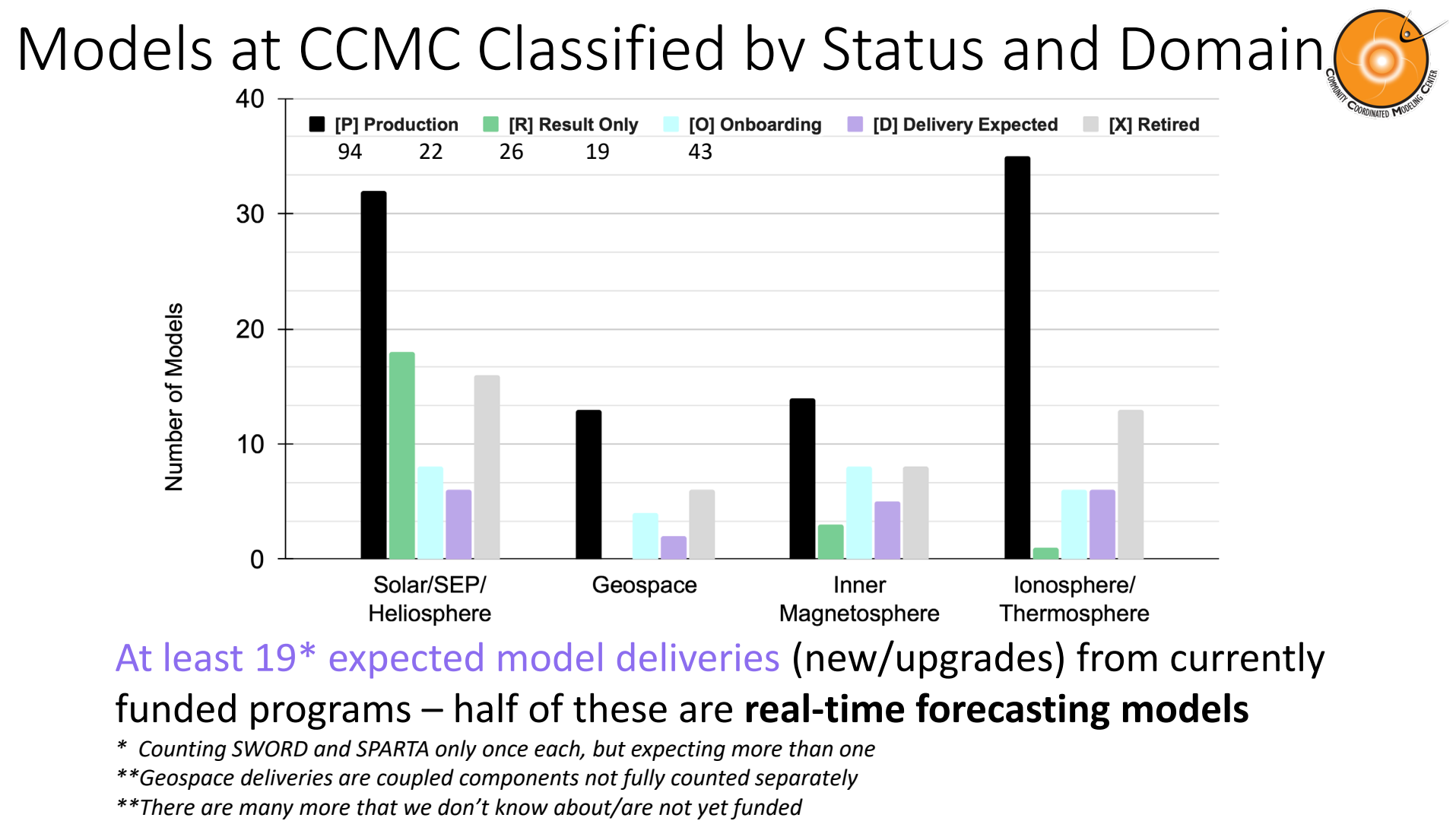
Instantly executing models. Select a model and see the results instantly in your browser.

25 (18%)

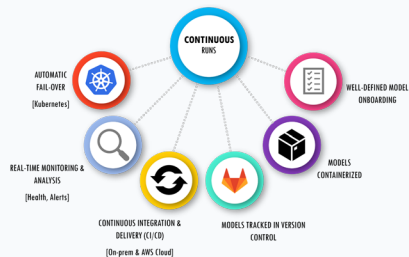
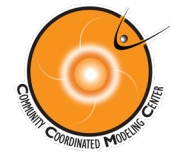
Result-Only: 22 (16%)

— *of these* → 9 Real Time feeds



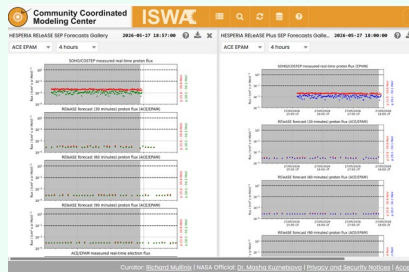


CCMC Real-Time Model and Data Pipelines



Continuous Runs System

Automated real-time model execution and monitoring



ISWA

Integrated Space Weather Analysis system for data ingest and display



CCMC Scoreboards

Visualization of model results and data



DONKI

Database of Notifications Knowledge and Information

CCMC provides open access to near real-time model outputs and data products via its public facing web apps.

The process of providing these services for public consumption involves a **complex** set of software frameworks and infrastructure working together

Continuous/Real-time Runs System (CR)



Dynamic system, uniquely different from data centers. Consists of the following pluggable **processes** and **components**:

Processes:

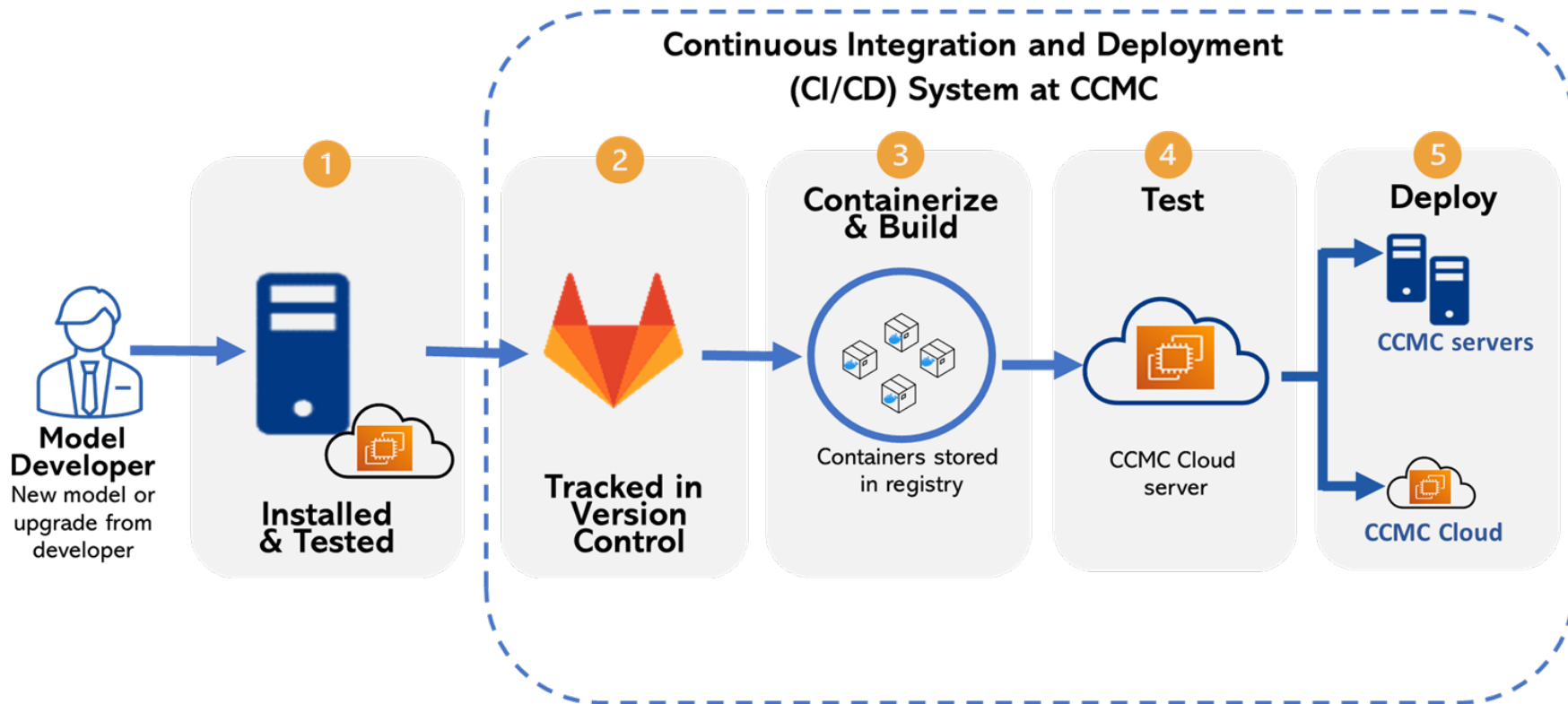
- Model onboarding and integration
- Build and release engineering

Components:

- Model systems
- Health checks
- Real-time monitoring and analysis
- Real-time model run status database

Continuous/Real-time Runs System: Processes

Model Onboarding to Production





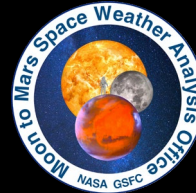
Integrated Space Weather Analysis (ISWA)

A flexible user-configurable system for space weather monitoring, forecasting, anomaly analysis event analysis and system science (since 2010)

A tool for ingesting and disseminating real-time space weather information (low latency observations, real-time simulations)

<https://iswa.ccmc.gsfc.nasa.gov/>

CCMC Interfaces with Operational Partners for Transition



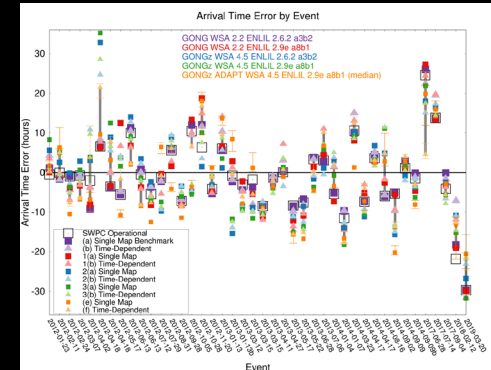
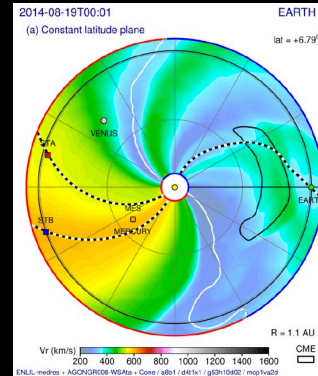
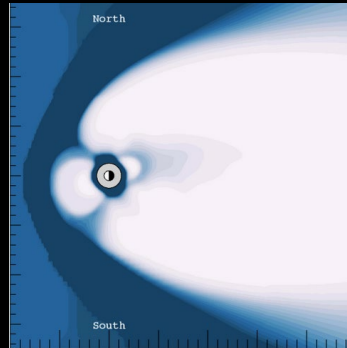
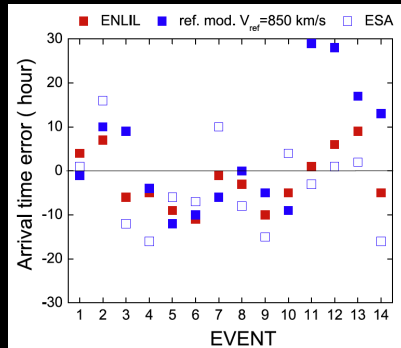


CCMC & NOAA SWPC Collaborations

25+ year partnership

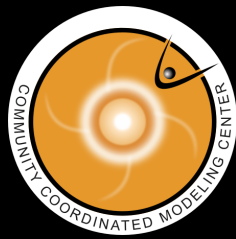
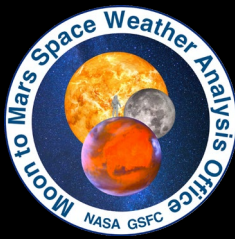


- Demonstrated potential of Enlil for operational forecasting (2006 - 2009)
- Geospace model transition to operations at NOAA/SWPC (2013 - 2015)
- NASA-NOAA space weather MOU on space weather modeling capabilities: MOU Annex to validate model upgrades (2017 - 2020)
- CCMC-SWPC ACE Proving Grounds (2020-present)
- UMASEP transition to ACE proving grounds/Testbed for SWPC evaluation (2022-present)
- WAM-IPE Validation (2022-2023)
- Artemis II Testbed Exercise (2025) and future Testbed activities





Space Weather Testbed Exercise in support of Human Space Exploration and the Artemis-II Mission (2025)





CCMC-SWPC Partnership



- CCMC-SWPC Proving Grounds (Architecture for Collaborative Evaluations – ACE): a central component of the CCMC-SWPC Research to Operations (R2O) Pipeline.
- CCMC is an important stage in the R2O process, that demonstrates potential of new capabilities to SWPC (in addition to other user groups).
- Results of open validation and real-time prototyping at CCMC can be used by SWPC to select models/applications to transition to ACE and/or Testbed for evaluation

CCMC Strategic Vision for a Continued Successful Partnership:

- Facilitate the transition of space weather program and research grant deliverables to real-time production on CCMC ISWA and Scoreboards to demonstrate operational potential to SWPC
- Perform validation based on SWPC needs, host validation platforms
- Provide comprehensive model pipeline assessments for SWPC (robustness, dependencies, issues)
- Listening and responding to SWPC's specific current and emerging needs, throughout

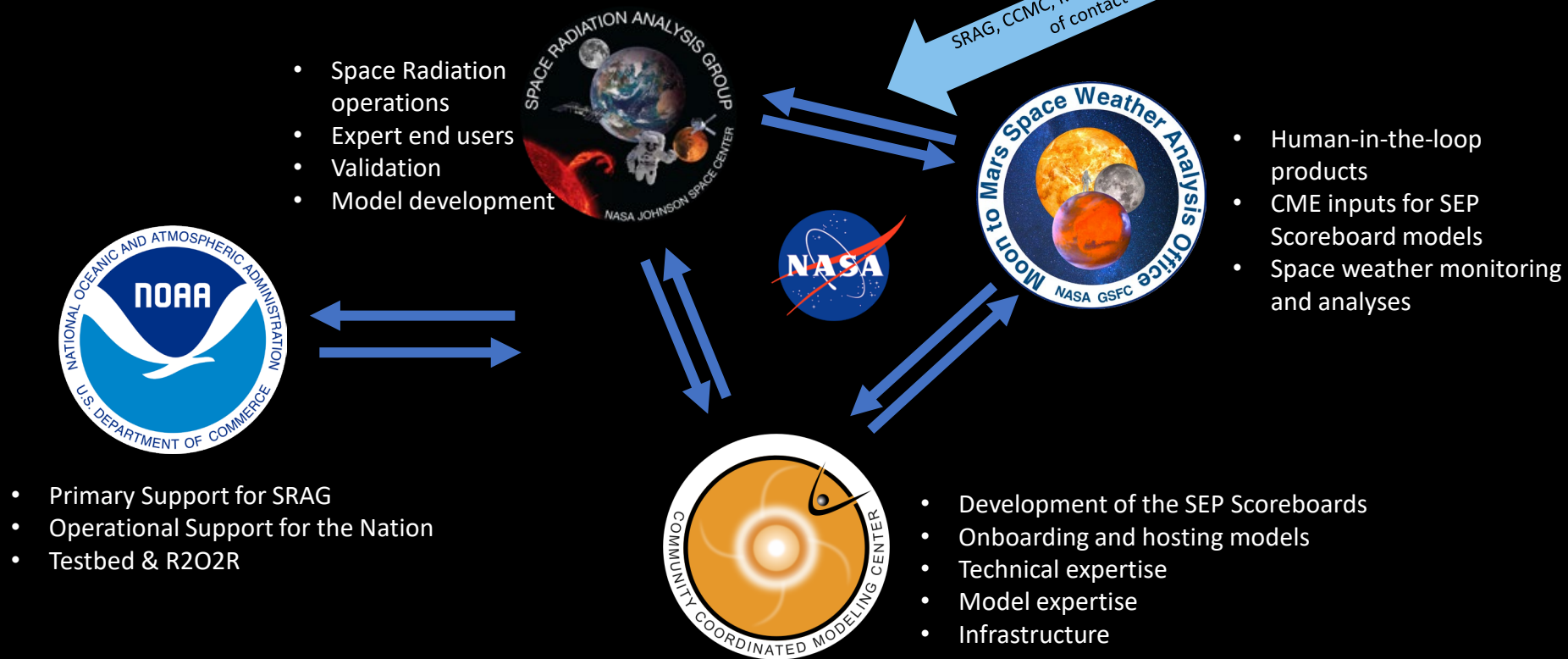
Integrated Solar Energetic Particle project

Collaboration between CCMC, SRAG and M2M SWAO

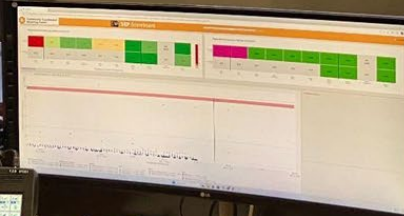
- Began in 2018, in anticipation of Artemis
- ISEP Project goals:
 - **Identify, onboard, and evaluate** new SEP models
 - Develop tailored **SEP Scoreboard software**
 - **Implement** these capabilities within CCMC as a non-operational prototype
 - **Deliver capabilities from CCMC to M2M SWAO** for prototyping and support of NASA SRAG
 - **Validate** model performance
- CCMC has successfully implemented 10+ real-time models and built the **SEP Scoreboard** application
- The SEP Scoreboard is actively used by SRAG and M2M for **ISS and Artemis support**



Space Weather Teamwork Across Agencies to support Human Exploration



SRAG Multi-Purpose Support Room Console





CCMC & M2M Partnership



- SRAG Console Operators and M2M SWAO Analysts use CCMC tools to monitor observations and models. Main forecasting tool: SEP Scoreboard.
- M2M SWAO Analysts create model inputs using CCMC (and other) tools and run models.
- CCMC provides infrastructure, and CCMC Staff are on call to provide ASAP best-effort support to M2M SWAO and SRAG.

Scoreboards: world-wide ensemble forecasts

Primary CCMC
tool used by
M2M SWAO
and SRAG

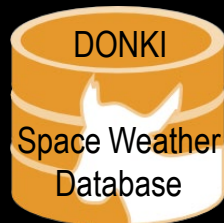


ISWA
Primary forecasting and anomaly
assessment tool used by M2M

CCMC staff
responsive to
outages
across all
tools



Tool used by
M2M for most
anomaly
assessments



CME measurement tool
used by M2M SWAO

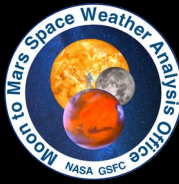


Continuous/
Real Time Runs
displayed in ISWA
and Scoreboards

Complete FREEZE:
37 on-premise servers
8 AWS instances
52 codes(models/tools)



CCMC & M2M Partnership



- CCMC and SRAG worked closely with the CLEAR Center of Excellence, in particular, their Artemis II real-time pipeline, monitoring outputs, and briefing M2M on prototyping procedures and usage.
- In addition to SEP models, CCMC identifies other models of interest to M2M for real-time prototyping, provides recommended procedures and model training, e.g. OSPREI IMF Bz forecast model
- CCMC routinely makes new real-time model and observational data products available to M2M based on their needs and deliveries we receive
- CCMC regularly updates tools and adds features based on M2M and other user feedback



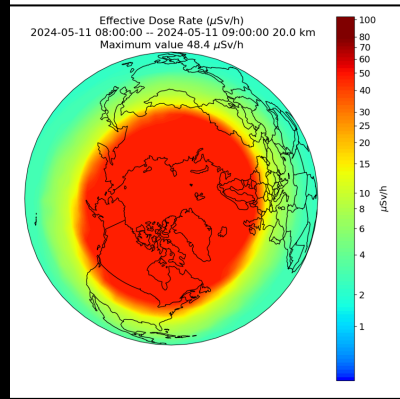
CCMC & USSF Partnership



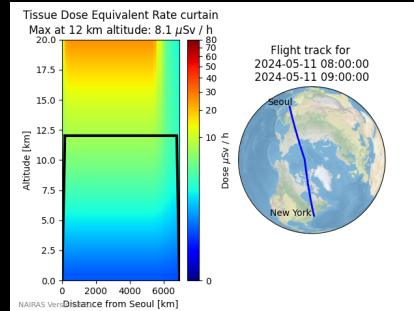
Nowcast of Aerospace Ionizing RAdiation System (NAIRAS)

- U.S. Space Force (USSF) using NAIRAS predictions at 20 km in operations to support U2 pilot exposure.
- USSF used NAIRAS predictions to recall operational U2 flight during the May 10-12, 2024, Nov 2025, and Jan 2026 SEP events
- **CCMC is prototyping the new forecasting mode:** 3-7 hours SEP forecast of peak dose after event onset by coupling NAIRAS with UMASEP.
- In discussion with USSF for transitioning the PHarLAP tool

May 10-12, 2024 SEP Event



Commercial Altitude



Thank you