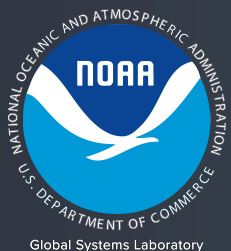


NOAA Global Systems Laboratory

# Community Engagement

Ligia Bernardet  
Deputy Division Chief  
Earth Prediction Advancement Division

**Subject-Matter Experts:** Dom Heinzeller,  
Evan Kalina, and Daniel Nietfeld



# GSL Community Engagements

- Earth Prediction Innovation Center (EPIC)
- Developmental Testbed Center (DTC)
- Hazardous Weather, Hydrometeorology, and Aviation Testbeds
- Joint Center for Satellite Data Assimilation (JCSDA)
- UFS Community Governance
- Community Engagement via Social Science
- Leadership of Collaborative Programs (Dave Turner)

# NOAA Global Systems Laboratory

# EPIC



Global Systems Laboratory



# The Earth Prediction Innovation Center (EPIC)

## *Hot off the press*

The EPIC contract was awarded to Raytheon Intelligence and Space on April 26

### Expected post-award

- Launch of the EPIC website
- 3rd Annual Cloud Workshop
- 2nd Annual EPIC Community Workshop
- Release finalized EPIC Strategic Plan
- EPIC Symposium at AMS 102
- Assessment of UFS related activities
- Project management plan for the EPIC Contract
- Release community-based UFS Medium Range Weather application



## Community Engagement



## Cloud-based

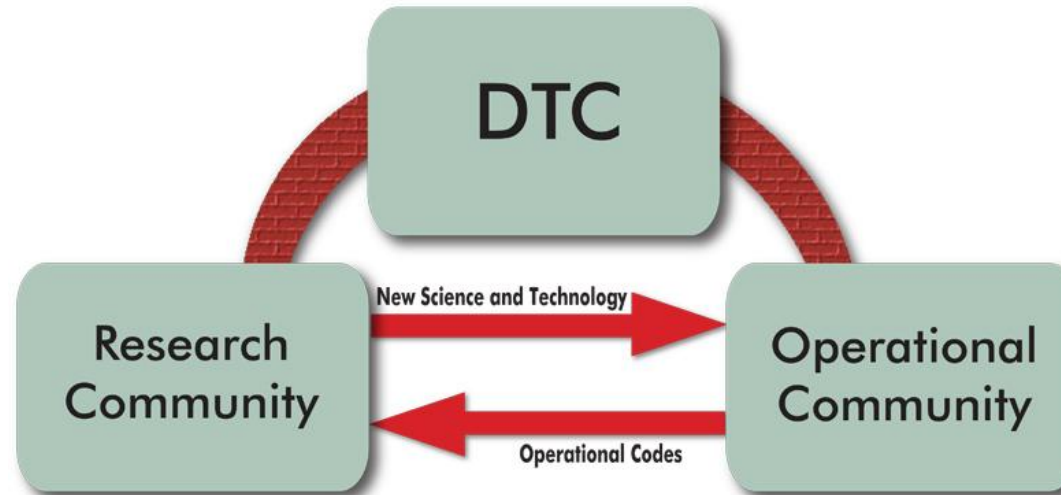


NOAA Global Systems Laboratory

# Developmental Testbed Center

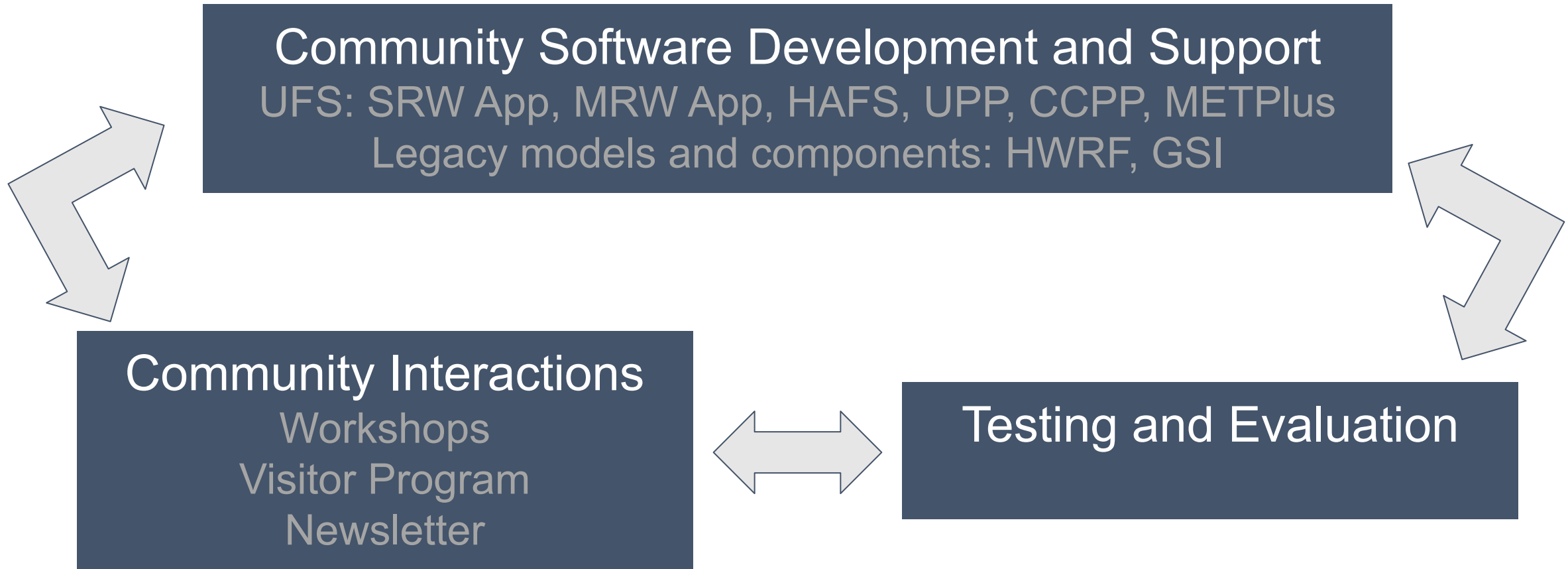


# The DTC Is...



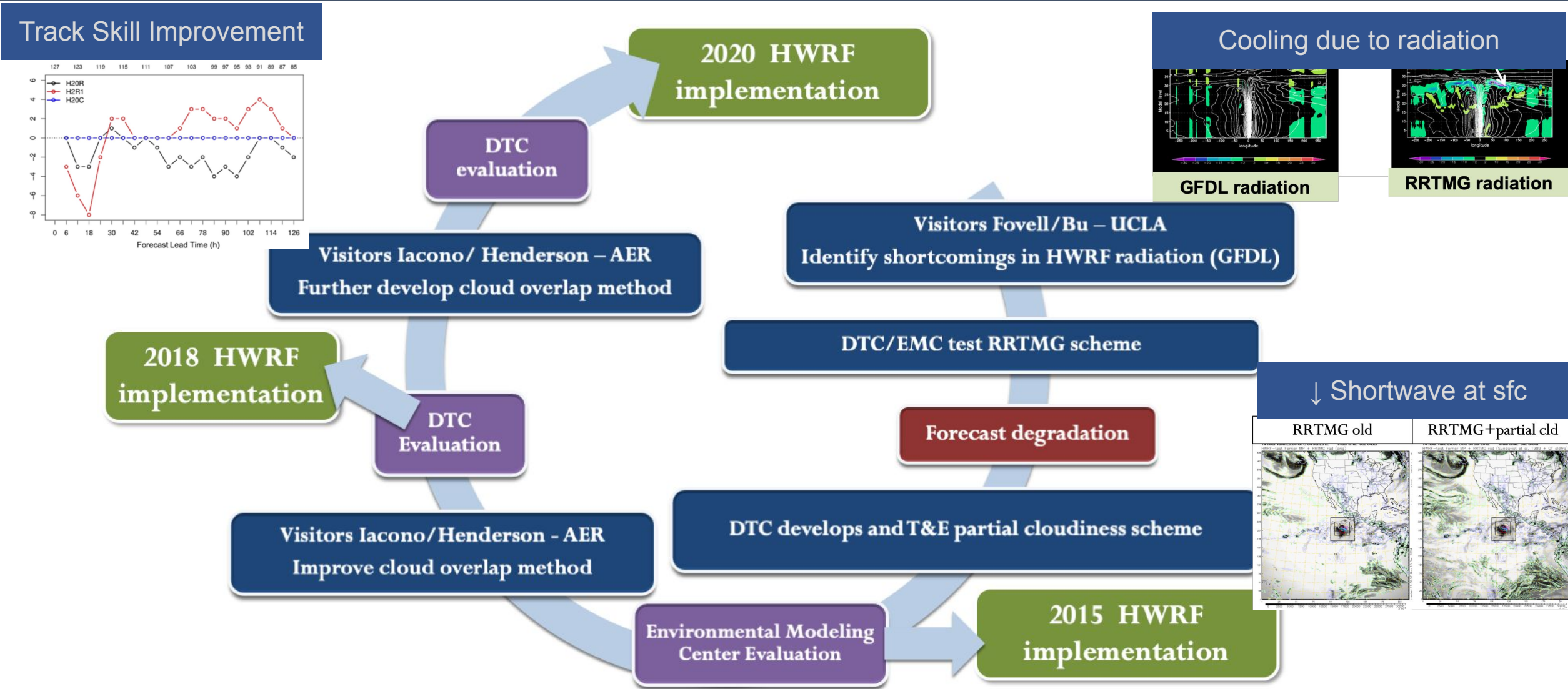
- A NOAA Testbed whose mission is to connect the research and operational communities working on NWP
- Jointly sponsored by NOAA, the Air Force, NSF, and NCAR
- Comprised of staff at GSL and NCAR
- Well aligned with GSL in model improvement and evaluation

# Overview of DTC Activities



**Addresses Review Recommendation C4.1:** Identify core competencies within NOAA and the broader community and develop a strategy for how it can best utilize this expertise to improve the research and operational NWP suite.

# A Cycle of R2O2R2O2R2O



# Collaboration with Hazardous Weather Testbed

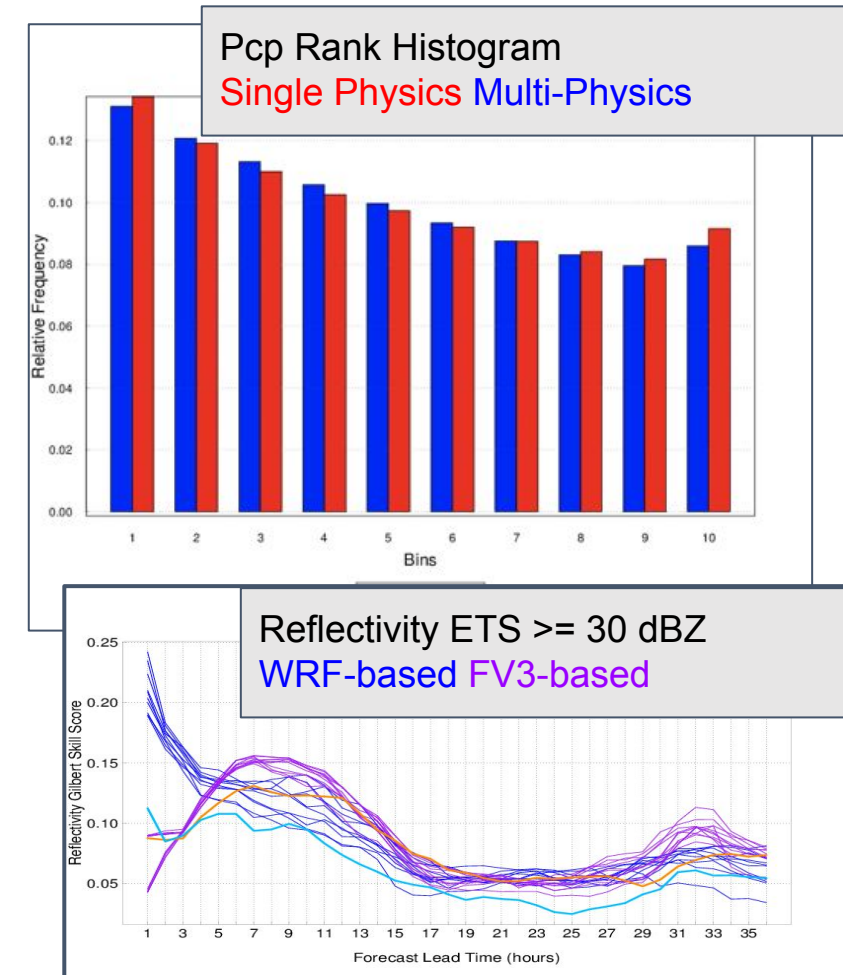
## DTC evaluations leveraged datasets from the Spring Experiment and helped inform future ensemble design

**2016** - Multi- and single-physics ensemble precipitation forecast performance within the Community-Leveraged Unified Ensemble (CLUE)

- Single-physics has advantages but performance lagged from multi-physics

**2018** - UFS ensemble compared against ensemble based on the WRF model

- UFS ensemble performance was comparable or better than WRF ensemble



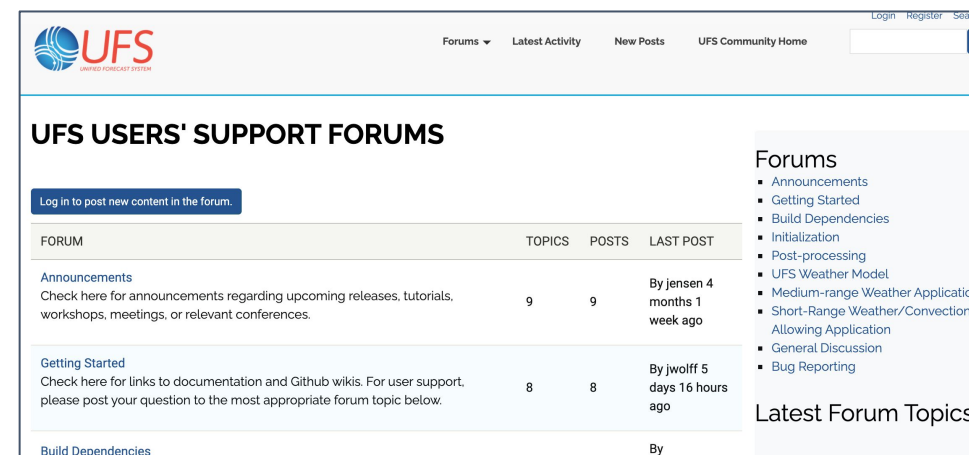
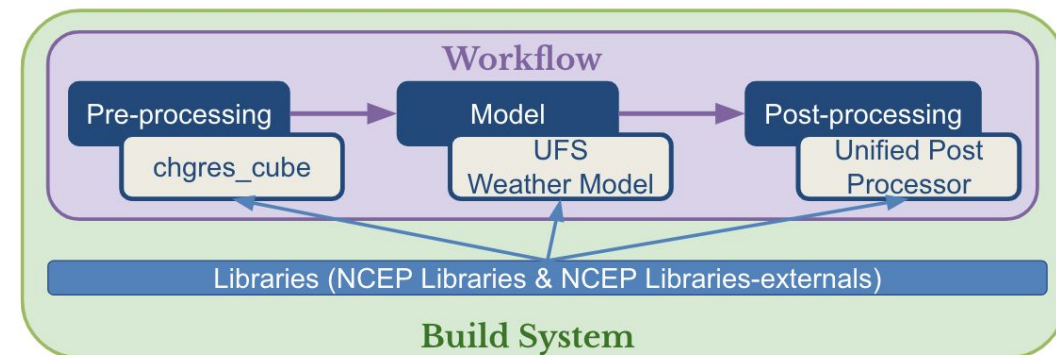
# UFS Application Releases

**UFS MRW App - v1.0 (March 2020) and v1.1 (October 2020)**

**UFS SRW App - v1.0 (March 2021)**

## DTC responsibilities for releases

- Co-lead the preparations
- Develop workflow (SRW only)
- Create test cases
- Port and test the code on various platforms
- Prepare documentation
- Provide user support via the UFS Forum



For more information, visit <https://ufscommunity.org/science/code/> and [dtcenter.org](https://dtcenter.org)

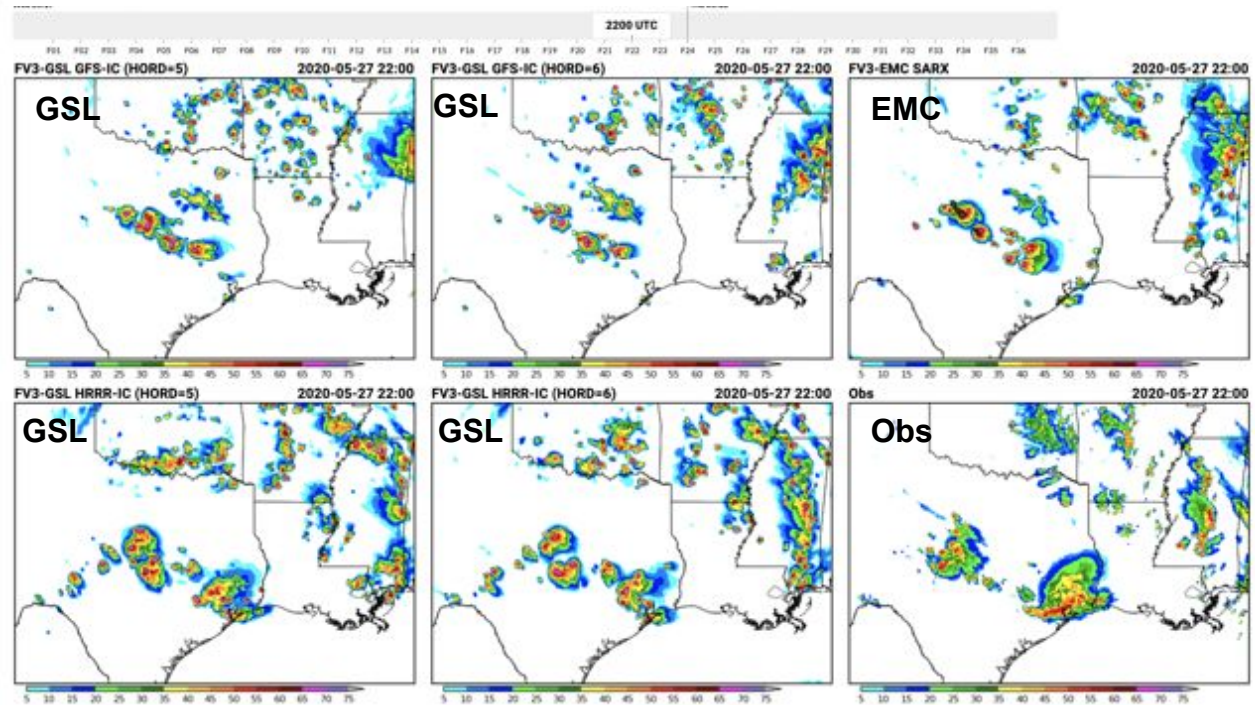
NOAA Global Systems Laboratory

# Hazardous Weather, Hydromet, and Aviation Testbeds



# Hazardous Wx and Hydrometeorology Testbeds

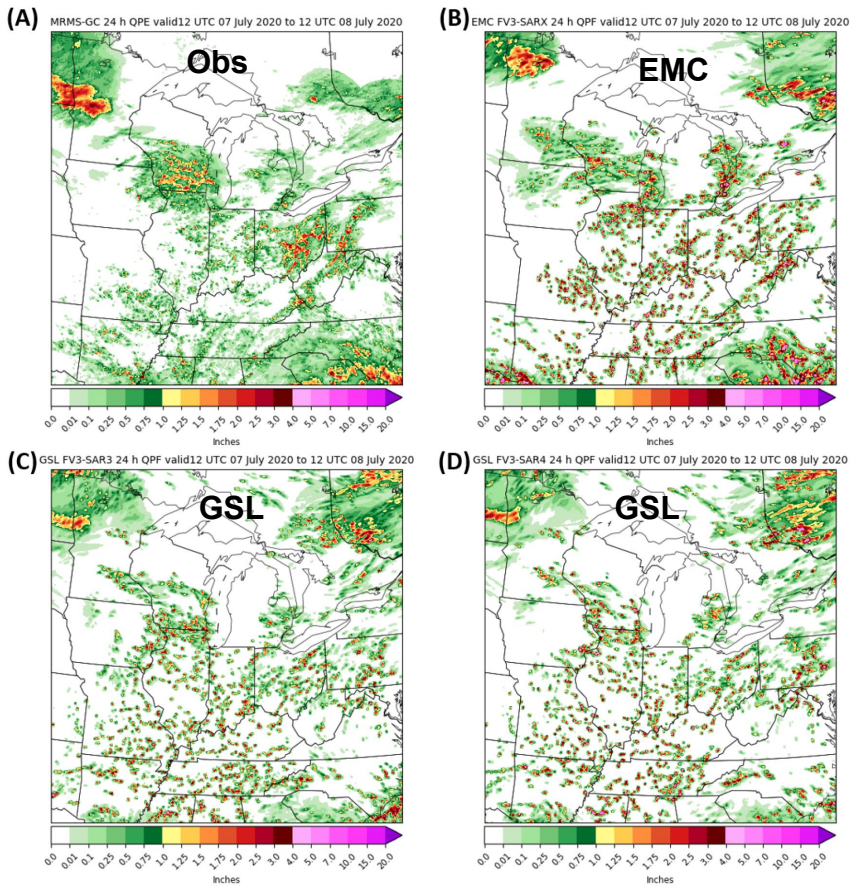
## Hazardous Weather Testbed (HWT) 2020 Spring Forecast Experiment



Data processed and plotted at NOAA-NSSL/NWS SPC • Part of the NOAA Hazardous Weather Testbed

GSL demonstrating FV3 LAM convective forecast sensitivity to differences in initial/boundary conditions (GFS top and HRRR bottom) and use of different horizontal advection options (less diffusive left, more diffusive middle) at 22 UTC 27 May 2020

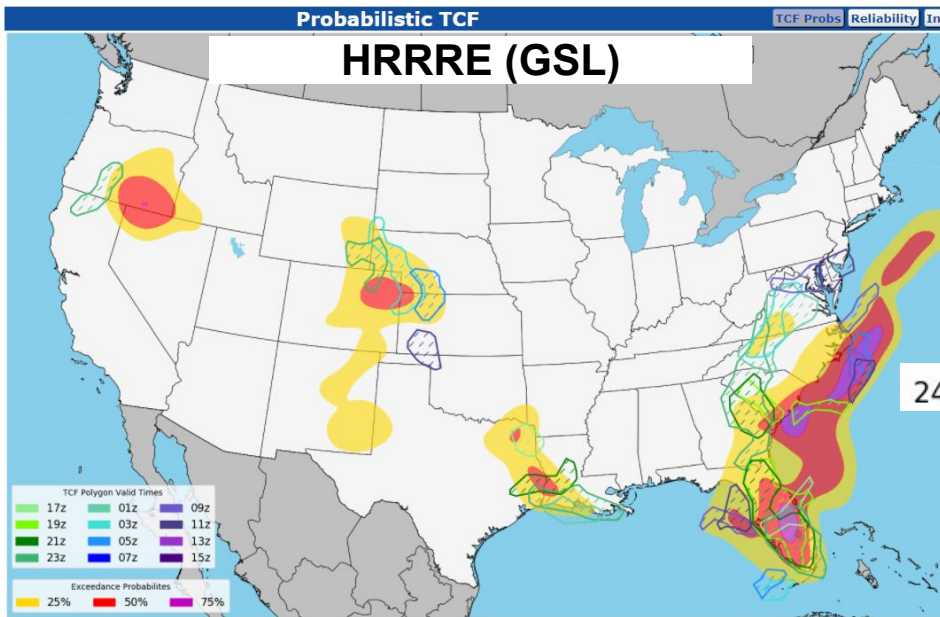
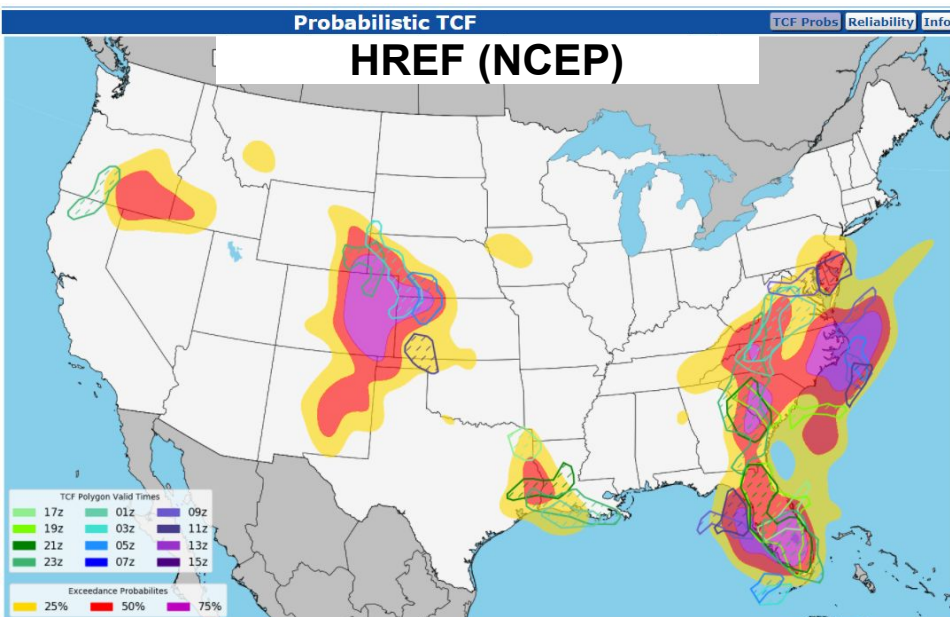
## Hydrometeorology Testbed (HMT) 2020 Flash Flood and Intense Rainfall Experiment



GSL demonstrating FV3 LAM 24-hr precipitation forecast sensitivity to differences to use of different horizontal advection options on 7-8 July 2020

# Aviation Weather Testbed

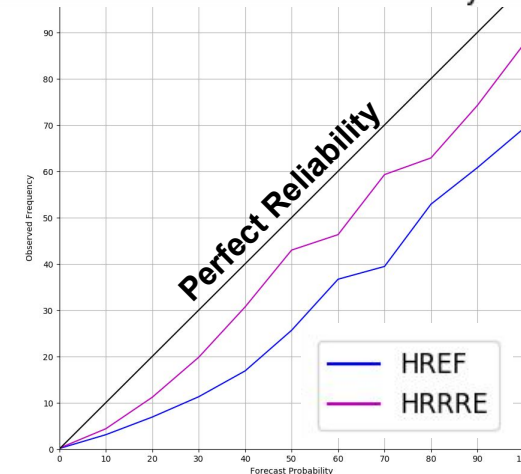
## Aviation Weather Testbed (AWT) 2020 Probabilistic Convection Experiment



24 HR TCF Exceedance Probs Reliability - Sparse



24 HR TCF Exceedance Probs Reliability - Medium

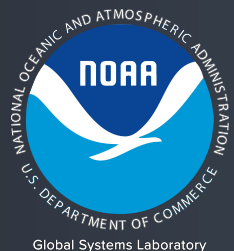


GSL demonstrating HRRRE forecast probabilities (color fill) for sparser coverage of convection (tops  $\geq 25$  kft and 40 dBZ) on 8 Aug 2020 compared with MRMS radar observations (polygons)

Statistical comparison of HREF (blue) and HRRRE (pink) forecasted probabilities of sparse (top) and medium (bottom) convective coverage

NOAA Global Systems Laboratory

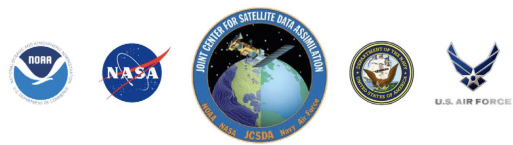
# Joint Center for Satellite Data Assimilation (JCSDA)



# JEDI Development Contributions



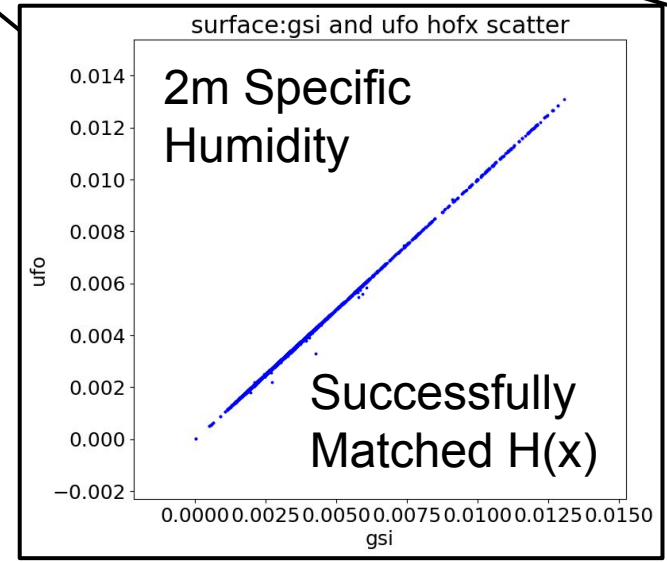
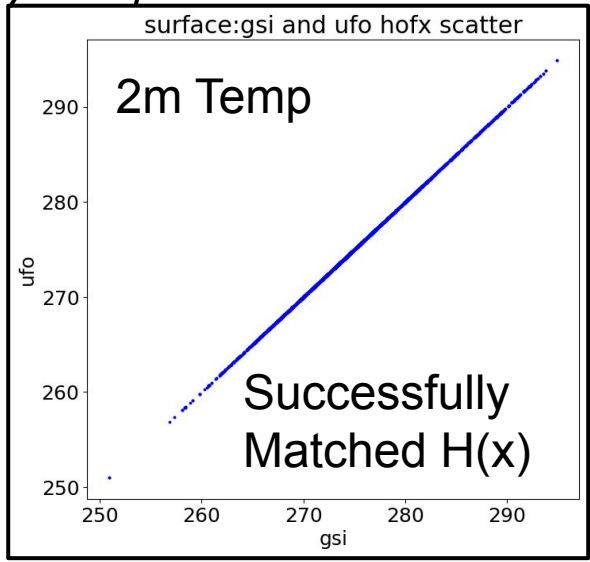
Joint Center for Satellite Data Assimilation  
Operating Plan 2020



- GSL 1-2 FTE in-kind contributions
- Assimilation of regional conventional observation
- Development of Unified Forward Operators (UFOs) i.e.  $H(x)$

AOP2020		Aircraft Data						Surface Data Land			Surface Data Marine				Sonde Data			RASS	Wind Data (non-Satwinds)		GPS-PW
	Source Datatype (itype)	AIREP (130,230)	AMDAR (131,231)	MDCRS (133,233)	TAMDAR (134,234)	PIREP (130,230)	Canadian (135,235)	METAR (187)	SYNOP (181)	Mesonet (188)	Ship (180)	Buoy (180)	C-MAN	Tide-Gauge	Rawin	Drop (182)	PIBAL		VadWind	Windprof	
	vars_now	t, u, v	t, u, v	t, q, u, v	t, u, v	/	/	ps	ps	/	ps, sst, [t, q, u, v if ps avail]				ps, t, q, u, v			t	u, v	u, v	pw
	var_later							t, q, u, v, vis, ceil, snowdepth									u, v				
IODA	BUFR->IODA	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	GSI-ncdiag->IODA	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
H(x)		V-I	V-I	V-I	V-I	V-I	V-I	sfc	sfc	sfc	sfc	sfc	sfc	sfc	V-I	V-I	V-I	V-I	V-I	V-I	V-I
Near RT																					
	PrepObs																				
	AssignError																				
	InflateError																				
UFO	BackgroundCheck	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	BiasCorrection																				
	TrackCorrection																				
	FinalSteps4Usage																				
Fully Test																					
Acceptance																					
JEDI-Usage																					

New JEDI UFO



Legacy GSI Observer

NOAA Global Systems Laboratory

# UFS Community Governance



Earth System Prediction: Community Engagement

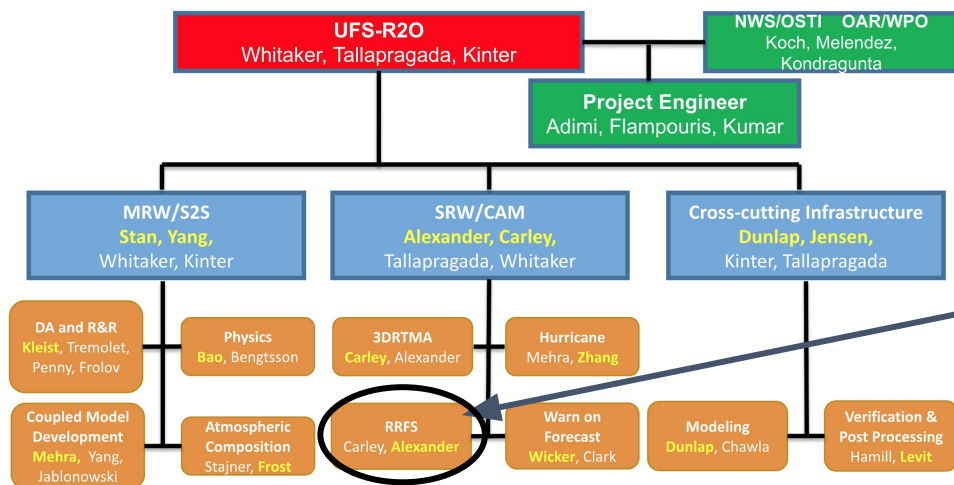


# UFS Is a Community Effort

## GSL role in the UFS governance

- **Steering Committee:** Ligia Bernardet (member)
- **SRW/CAM App Team:** Curtis Alexander (co-lead)
- **Physics WG:** Georg Grell, co-lead
- **System Architecture:** Dom Heinzeller (co-lead)
- **Atmospheric composition, physics, verification WGs:** GSL staff (members)

## GSL role in the UFS-R20 Project governance



**RRFS: Curtis Alexander, lead**

NOAA Global Systems Laboratory

# Community Engagement via Social Science



# From Model Output to Improved Decision Making

## ***A Role for Social Science in Weather Research!***

Ensemble model development to generate probabilistic output / information

- PDFs
- methods
- post processing



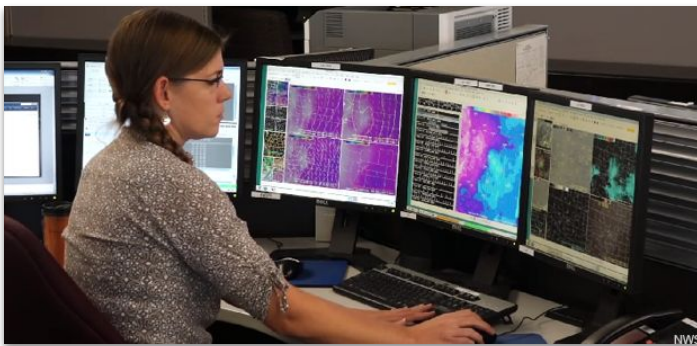
Forecasters receive this probabilistic information and provide Decision Support Services (DSS)

- Do they understand?
- Can they properly communicate probabilistic info?
- Confidence informed by verification



Core Partners receive this information from the forecasters

- Do they understand?
- Does it help them make more informed and better decisions?

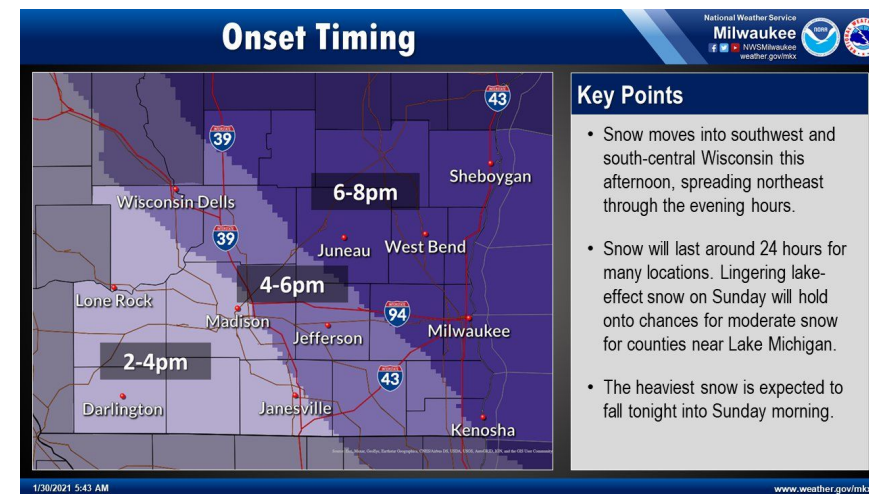
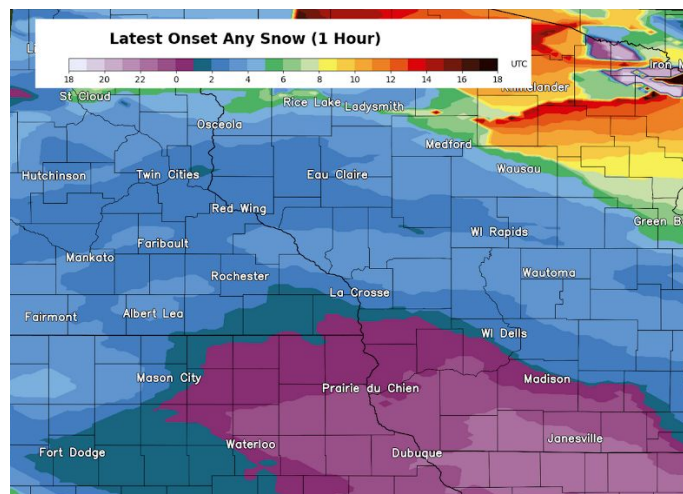
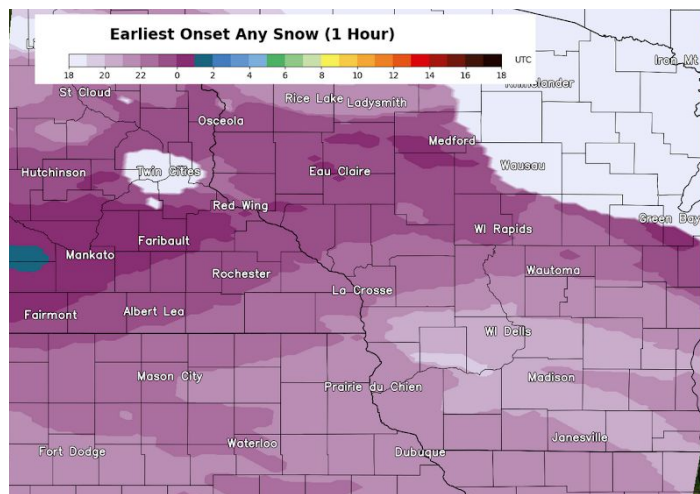


NWS

# Deriving Timing Uncertainty from Ensembles

**Goal of 2 Projects:** Help better assess and communicate hazardous weather risks for Impact-based Decision Support Services (IDSS) through 3 integrated, iterative R&D threads:

- Social science research (interviews & surveys) with NWS forecasters and core partners (EMs, Fire Officials, etc.) *to identify their key informational needs*
- Derivation of ensemble *timing guidance* for winter and fire weather parameters
- Development of forecaster-oriented verification of ensembles to quantify confidence

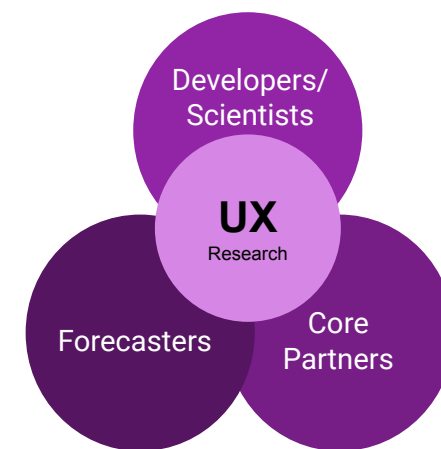
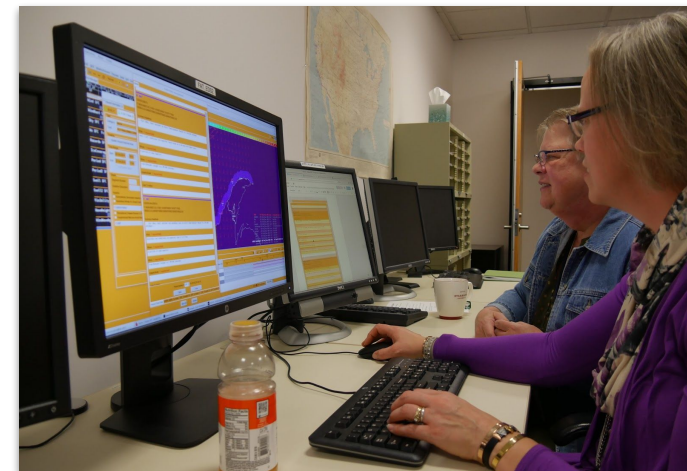


Recommendation D4.2

# User Feedback and Involvement at GSL

## Hazard Services Development

- Forecaster involvement over the past 12 years:
  - Dozens of in-person, week-long, Forecaster Assessment Tests
  - Weekly calls/demos with Forecasters / focal points
  - Hazardous Weather Testbed experiments



# Summary of Community Activities

## Performance

- DTC management
- Participation in UFS Governance
- Tutorials and community workshops
- Engaged in the R2O process via testbed participation and DTC

## Quality

- Improved models and decision support systems for the weather enterprise
- Release of NOAA models to the community, including UFS Apps
- Several multi-institutional papers authored

## Relevance

- Cross-line office, cross-agency to improve NOAA R2O
- Engagement with community, forecasters, and end users
- Responding to national needs