The UFS Student Experience: Accomplishments, Challenges, and Recommendations

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The UFS Student Ambassador Program

Goal: Get students interested in earth systems modeling

Technical Path

- Created a tutorial using the SRW to model severe weather
- Provided feedback to the UFS development team
- Created a post-tutorial survey

Engagement Path

- Created a social media campaign to promote the UFS and NOAA internships to students
- Helping host the UFS workshop this fall and presenting my work

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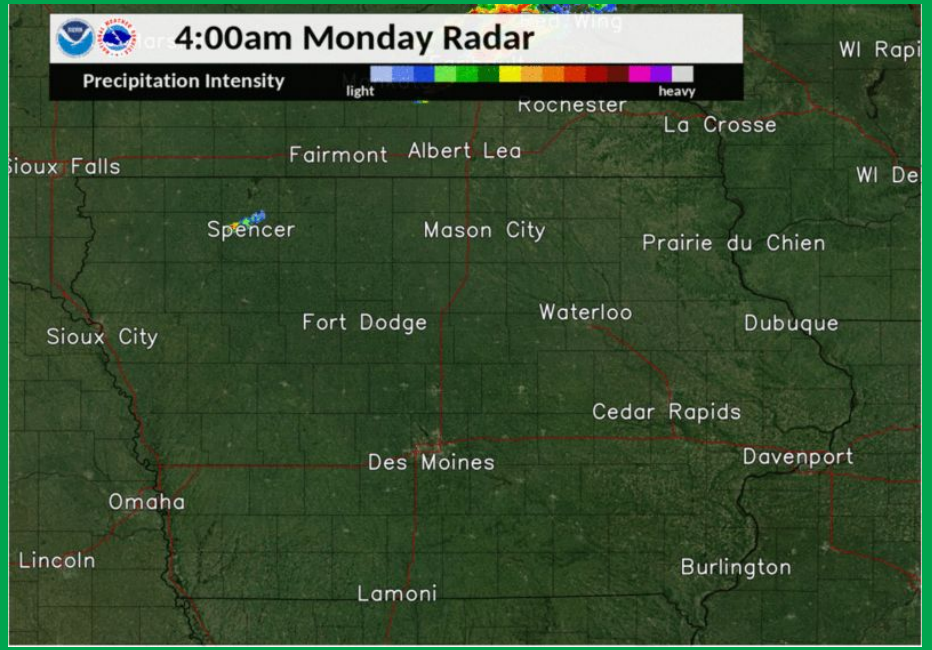
Overview of Test Case

- Chose to use a derecho
- Based on work done in (Gallus Jr. and Harrold 2023)



above: radar loop of the August 10, 2020 derecho

The SRW App Tutorial

- Uses the Short Range Weather model
- Four different test cases
- Users will then be able to run their own forecast cases
- Includes a feedback survey

Tutorial – Simulating the August 10 2020 Derecho

In this Article

Overview

This tutorial provides a structured walkthrough for simulating the August 10, 2020 derecho using the Unified Forecast System (UFS) Short Range Weather Application (SRW App) across multiple physics suites and grid scales. The test case chosen for the development of this tutorial is based on Gallus Jr. and Harrold, (2023).

After completing this tutorial, users will be able to:

- Install and build the SRW App
- Configure SRW App test cases
- Use user-downloaded data in the SRW App
- Run the SRW App workflow across multiple test cases
- Plot and evaluate model output

Thanks to Alison Gregory, John Ten Hoeve, and Jose Henrique-Alves for mentoring this project.

This test case is based on Gallus Jr. and Harrold (2023). Thanks to the authors for providing the HRRR input data for this test case.

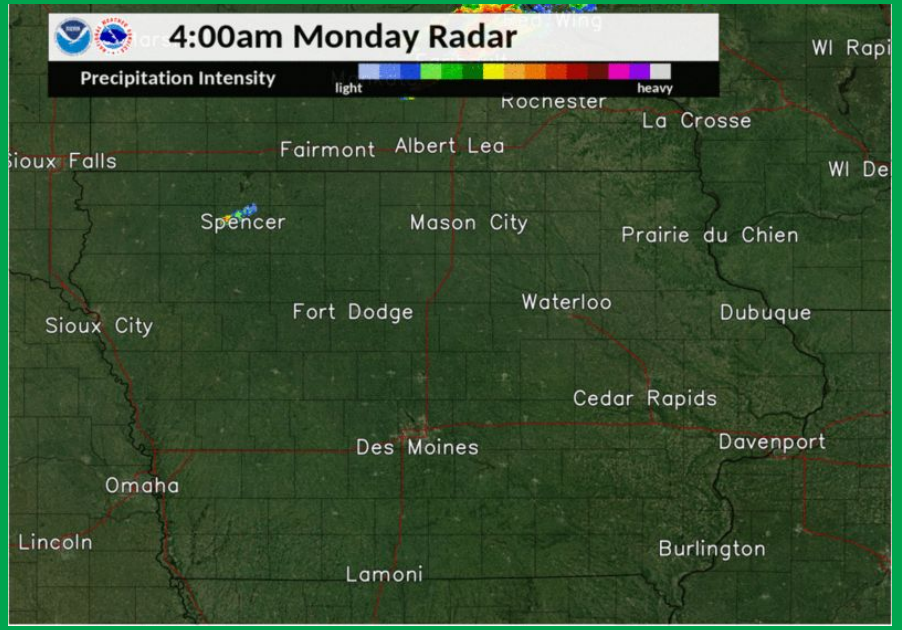
The Unified Forecast System

The UFS is a suite of community-based earth system models created with the goal of simplifying and improving NOAA's operational weather models. The common framework shared between the models allows for easier coupling and the ability to streamline the Research to Operations pipeline. Operational successes of the UFS include the Hurricane Analysis and Forecast System (HAFS), NOAA's operation hurricane forecasting model.

The SRW App is a weather model within the UFS that is meant for making short-range forecasts (hours to a few days) at regional scales (CONUS or smaller). Its temporal and spatial range makes it particularly suited to forecasting convection such as in severe thunderstorms and heavy rainfall events. In the latest version, the SRW also gained the ability to make smoke and air quality forecasts.

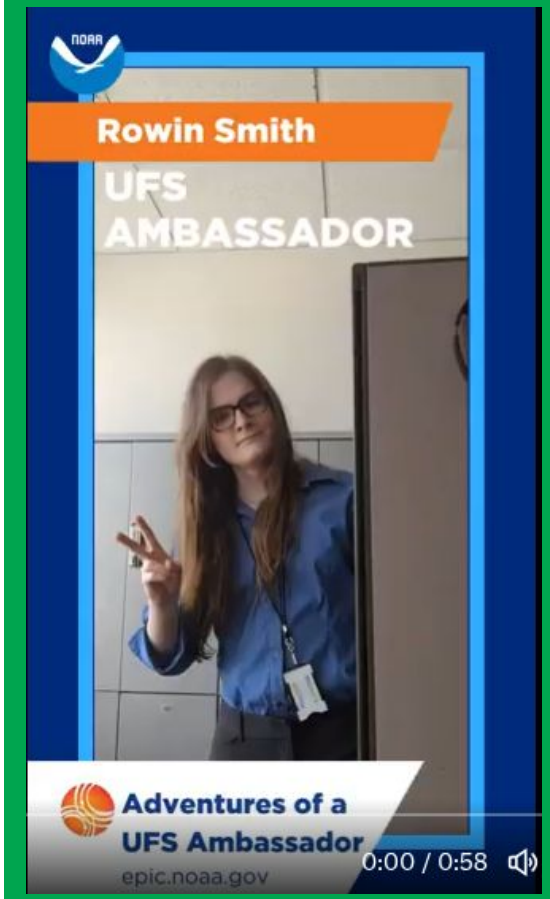
A derecho is "a widespread, severe windstorm characterized by a family of destructive downbursts containing multiple 75+ mph gusts associated with an extratropical, cold-pool driven Mesoscale Convective System" (Corfidi et. al., 2025).

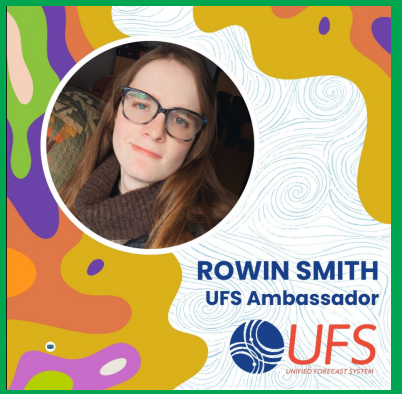
The SRW App Tutorial



Social Media Campaign

- ‘Lapenta Live’ theme
- Weekly series of posts
- Promotes both the UFS and NOAA internships





Challenges

Technical Path

- Complexity of the UFS software
- Unexpected bugs
- Limited configurability
- Container portability

Engagement Path

- Limited reach of EPIC social media
- Lack of peers engaging with the UFS

Lessons Learned

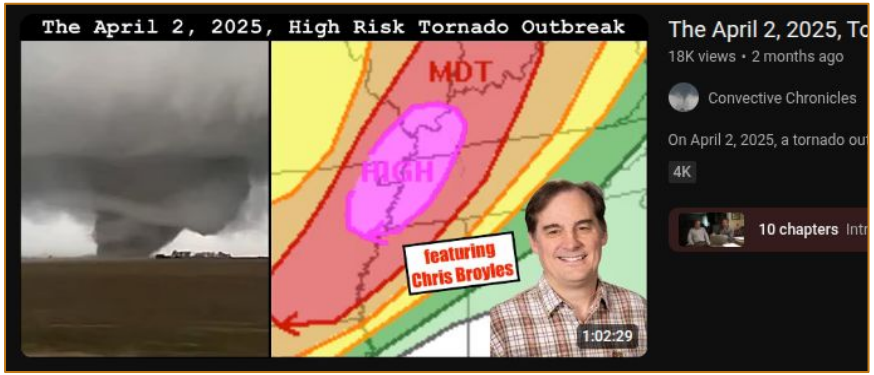
Technical Path

- Students need direct support
- Cleaner code and more extensive documentation

Engagement Path

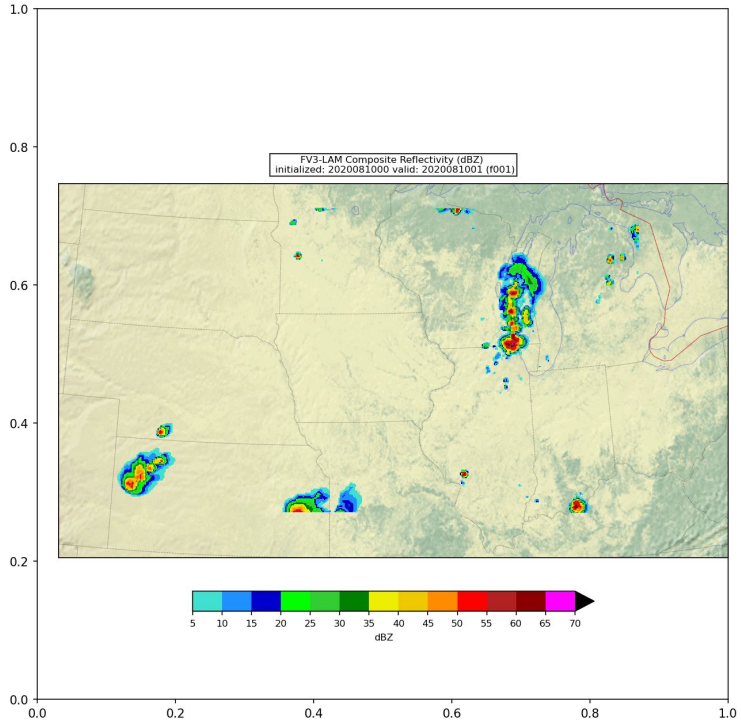
- Work with existing influencers
- Increase direct engagement with departments

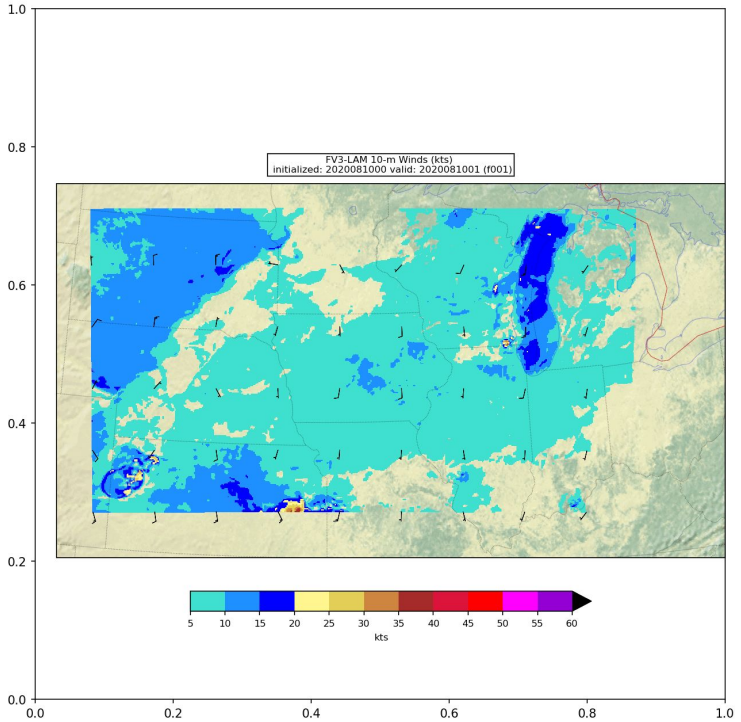
```
# 500 mb height, wind, vorticity
try:
    z500 = data1.select(name="Geopotential Height", level=500)[0].values * 0.1
    z500 = ndimage.gaussian_filter(z500, 6.89)
    vort500 = data1.select(name="Absolute vorticity", level=500)[0].values * 100000
    vort500 = ndimage.gaussian_filter(vort500, 1.7225)
    vort500[vort500 > 1000] = 0  # Mask out undefined values on domain edge
    u500 = data1.select(name="U component of wind", level=500)[0].values * 1.94384
    v500 = data1.select(name="V component of wind", level=500)[0].values * 1.94384
    # Rotate winds from grid relative to Earth relative
    u500, v500 = rotate_wind(Lat0, Lon0, lon, u500, v500, "lcc", inverse=False)
except:
    u500 = None
    v500 = None
```



Personal Impact of UFS

Using the UFS has empowered me to do further research





Acknowledgements

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UCAR

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