

ERA5 vs ASOS: Verifying Reanalysis Accuracy in the Fort Pierce EF3 Tornado

Anastasia Vosinakis

Advisor: Dr. Milla Costa, Dept. of Ocean Engineering and Marine Science, Florida Institute of Technology

INTRODUCTION

- October 9th, 2024, Hurricane Milton made landfall in Florida (NHC, 2024).
- Just before Milton made landfall, tornadoes were being produced on the East Coast of Florida.
- The tornado being studied is the EF3 tornado which occurred in Fort Pierce, Florida.
- Six people tragically lost their lives.
- Focus of project: to see the correlation of wind reanalysis data when studying tornadoes.

Hurricane and Tornado Background

- Hurricanes are low pressure systems that form in the Atlantic, Central Pacific, and Eastern Pacific Oceans.
- Hurricanes have the potential to produce tornadoes (Agee & Hendricks, 2011).
- The Saffir-Simpson scale uses windspeed to classify hurricane intensity.
- Tornadoes, or mesocyclones, are columns of air that extend from thunderstorms that rotate violently.
- Tornadoes are rated on the Enhanced Fujita scale (EF scale, 2024).
- Tornadoes in Florida have different characteristics than those that occur in the Midwest of the United States (Hagemeyer, 1997).

Method

- Location: Fort Pierce, Florida
- Lat/Lon: 27.4467 N, 80.3256 W
- Time: 21:00 UTC (5:00pm EDT)
- Data: FPR ASOS data (Iowa State) and ERA5 Reanalysis data (ECMWF)
- Type of Data studied: Wind data
- Why: Hurricanes and Tornadoes are rated using wind speeds

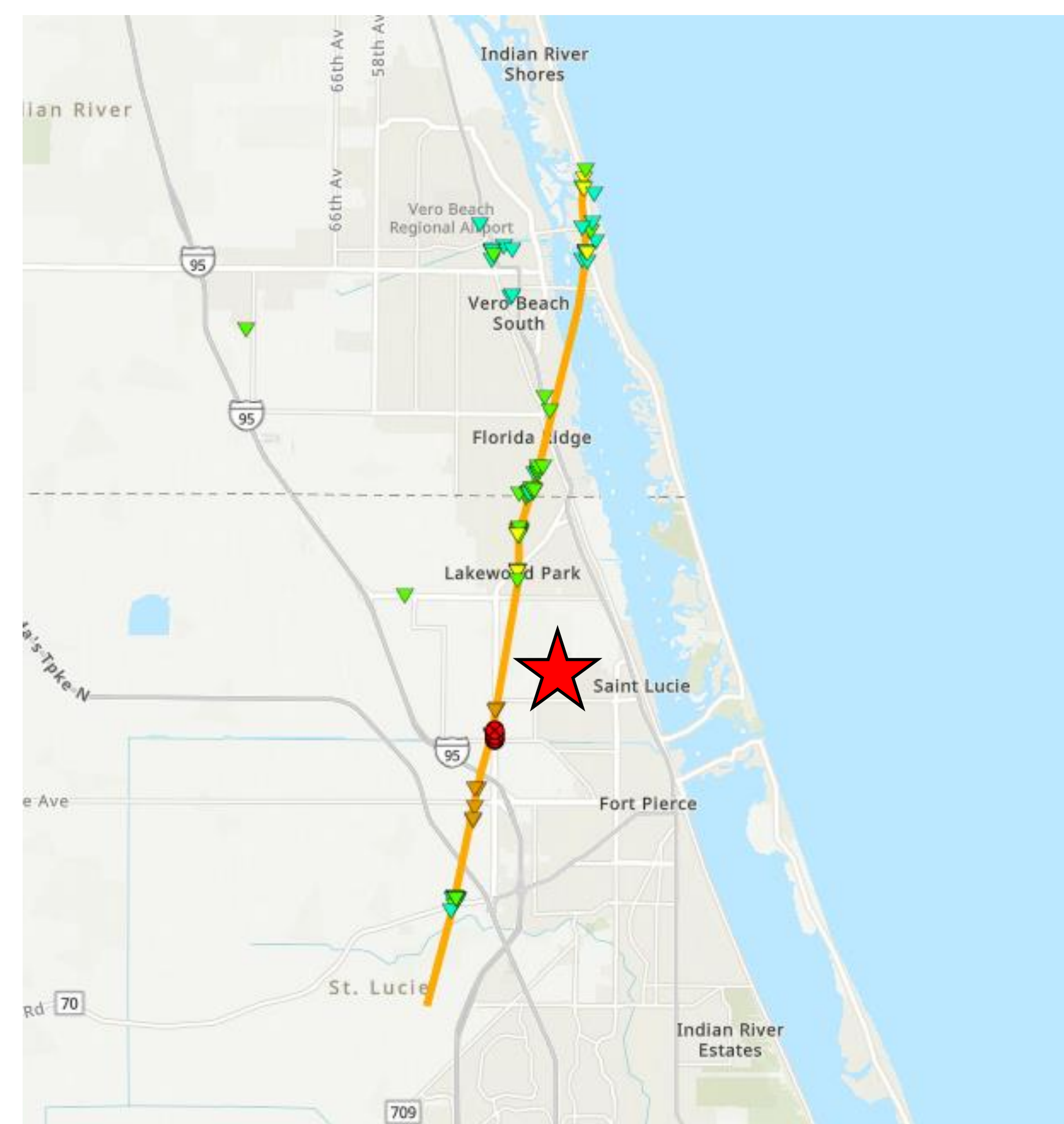


Fig. 1: Fort Pierce EF3 tornado path, Star: FPR location (NWS, 2024)

SAFFIR-SIMPSON HURRICANE WIND SCALE		
Category	Winds (mph)	Damage Summary
1	74 – 95	Some damage.
2	96 – 110	Extensive damage.
3	111 – 129	Devastating damage.
4	130 – 156	Catastrophic damage.
5	> 156	Catastrophic damage.

Table 1: The Saffir-Simpson Scale (Florida Climate Center, 2025)

Enhanced Fujita SCALE	
EF Rating	3 Second Gust (mph)
0	65-85
1	86-110
2	111-135
3	136-165
4	166-200
5	Over 200

Table 2: The Enhanced Fujita scale (NWS, 2024)



Fig 2: Picture of tornado with satellite imaging (Convective Chronicles, 2024)

Results

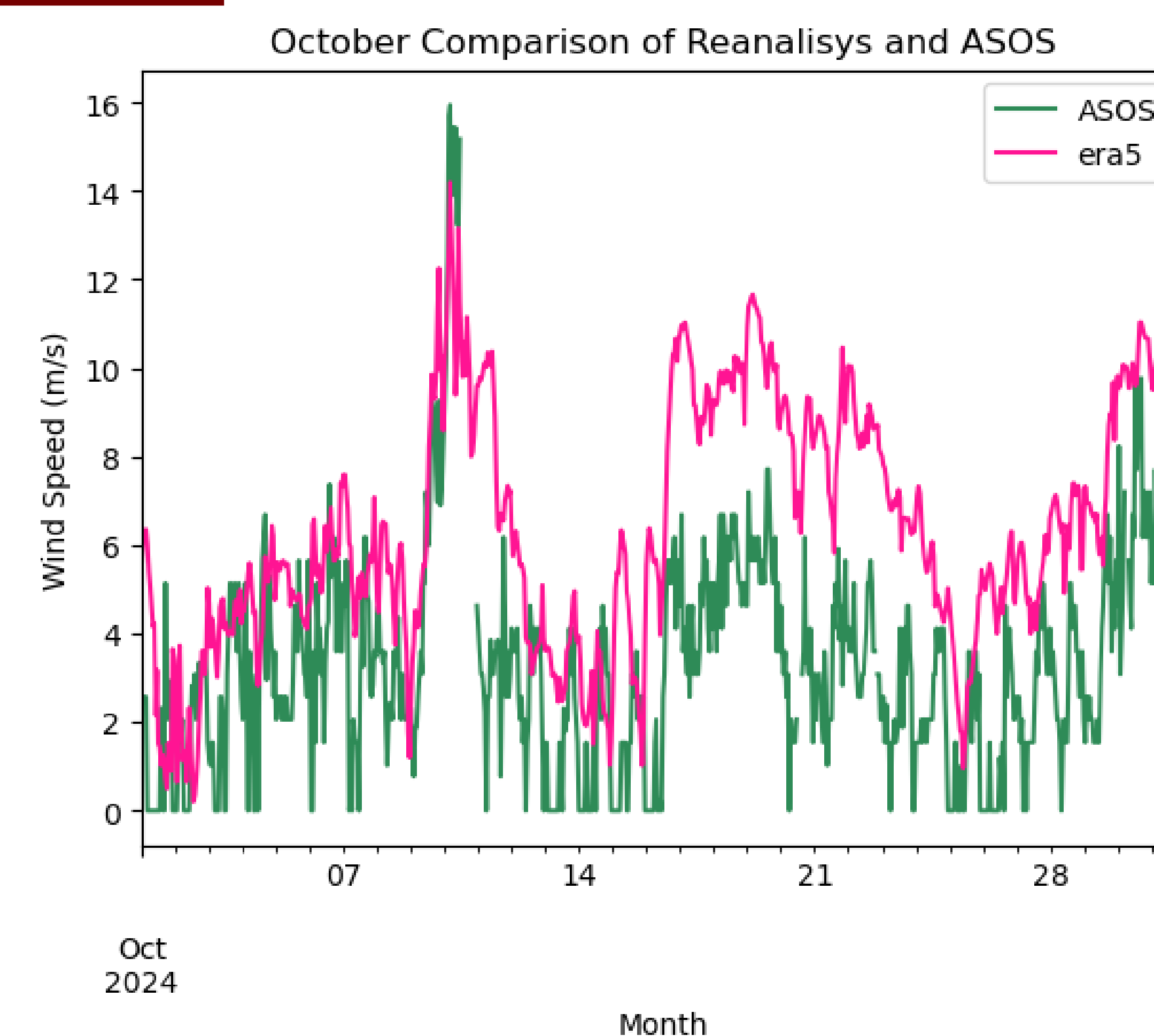


Fig 3: Wind Speed Data October 2024 Comparison

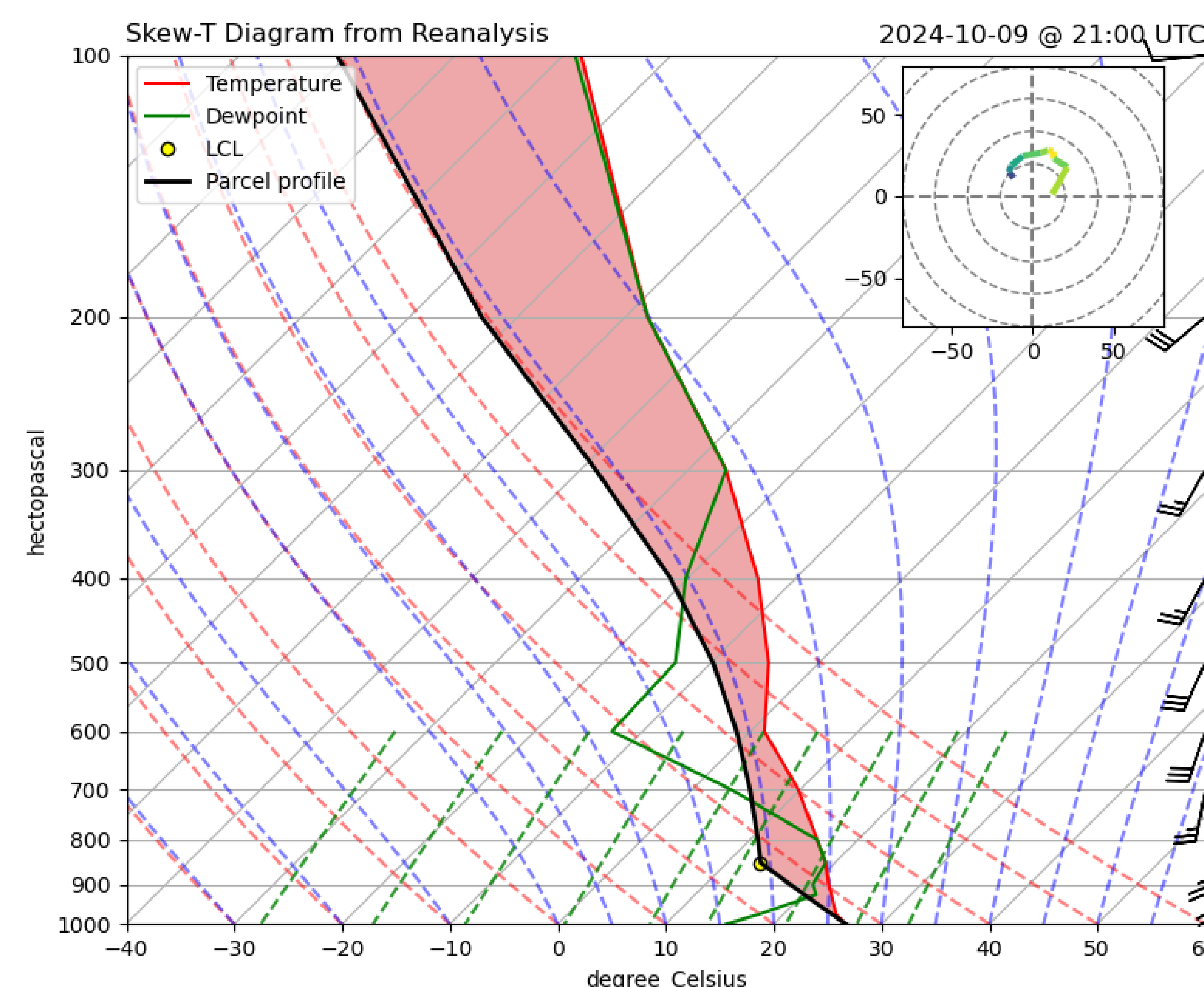


Fig 4: Skew-T Chart generated using reanalysis data

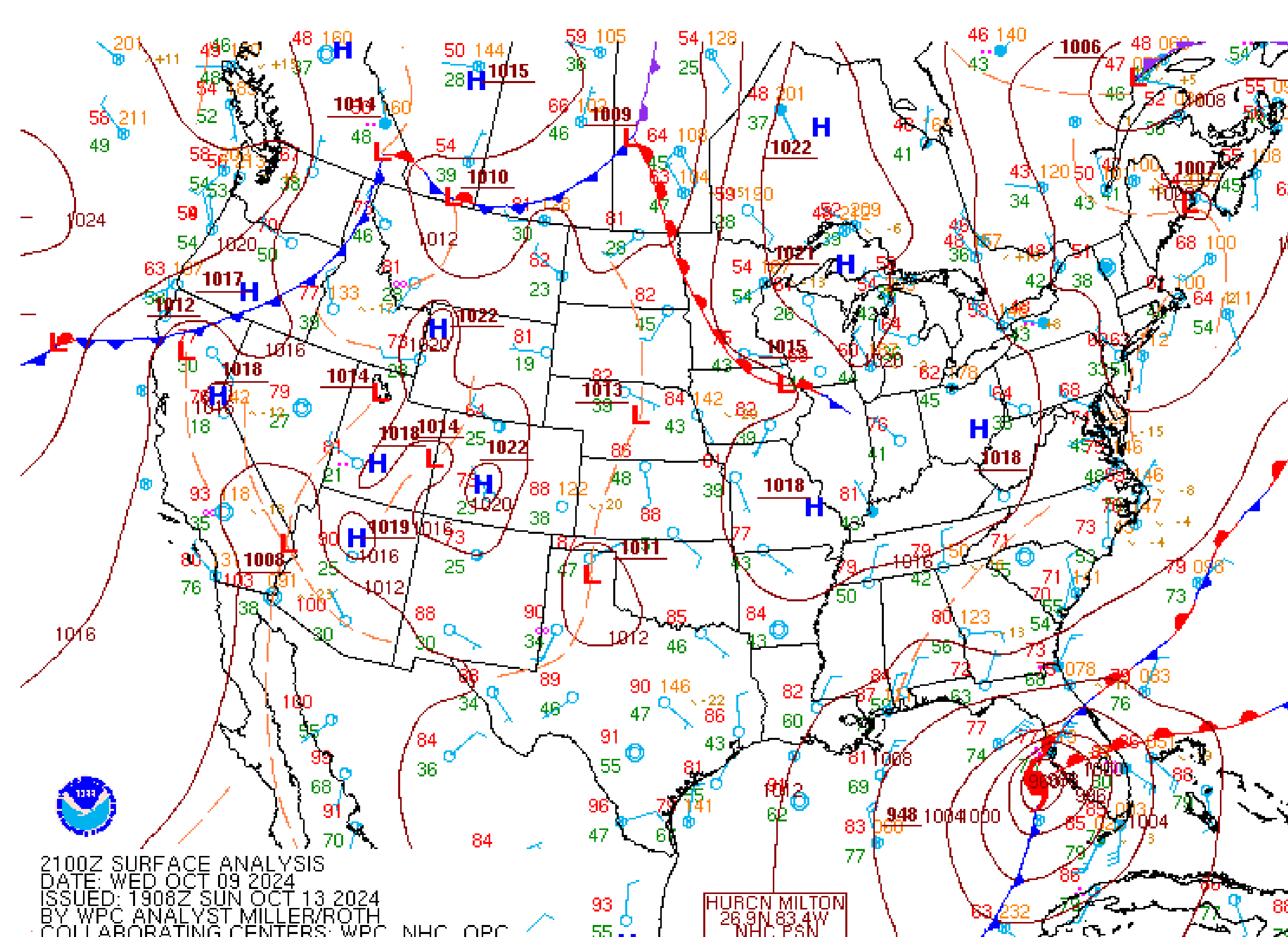


Fig 5: Surface analysis map (NOAA, 2024)

Discussion/Conclusion

- October 2024 Wind: 39.61% (Figure 3)
- 2024 Year Wind: 17.5% (Not Shown)
- 2024 Temperature: 76.26% (Not Shown)
- There is a gap in ASOS data indicating a loss in data
- ERA5 wind data underestimated and overestimated throughout the data.
- ERA5 has a better correlation for a single month than the year.
- ERA5 wind data seems to follow the trends of ASOS but is not measured in the same magnitude.
- Although the Skew-T indicates favorable conditions for a tornado, it is not accurate due to the correlation being 39.61%

References



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