

Radar Morphology For Severe and Non-Severe Thunderstorm Days in Northern New England

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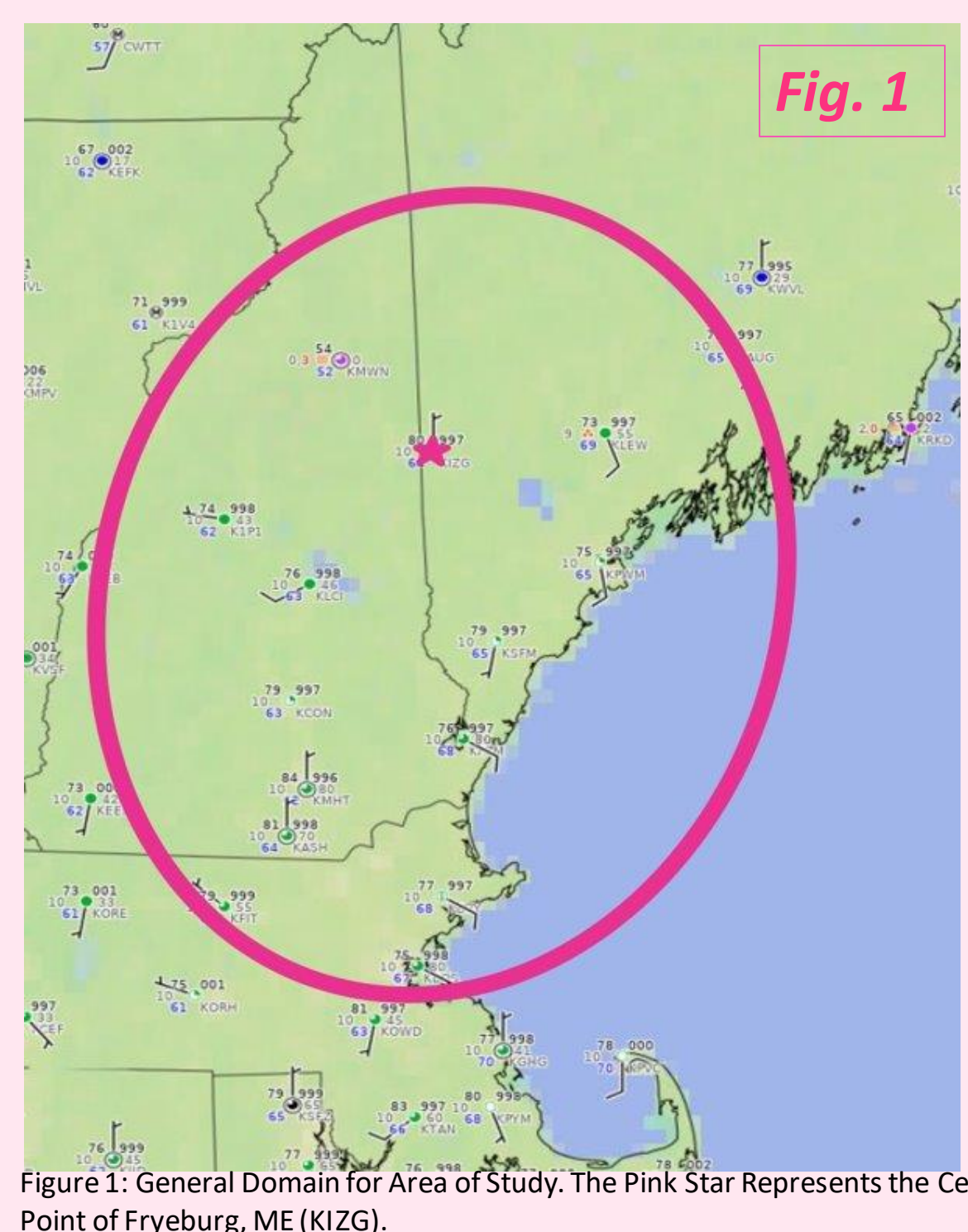


1. Introduction

- Lowery (2008) examined the relationship between thunderstorms and large-scale flow in a five-year climatology.
- Southwest flow at 700 mb was most frequent.
- Gallus et al. (2008) created a radar morphology index associate with severe weather events.
- **Goal: Update Evan Lowery's thesis and examine radar morphologies to improve forecasting.**

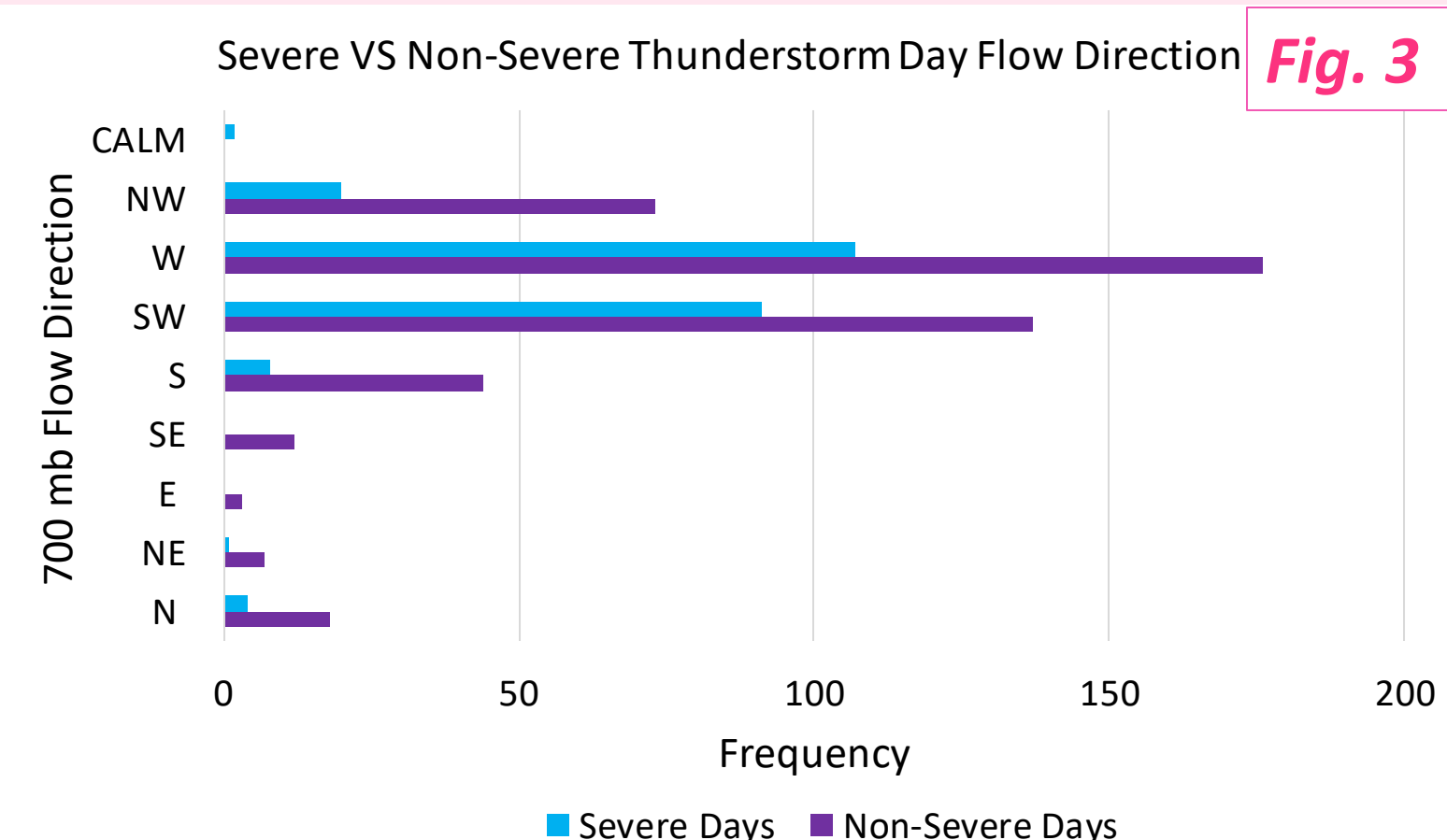
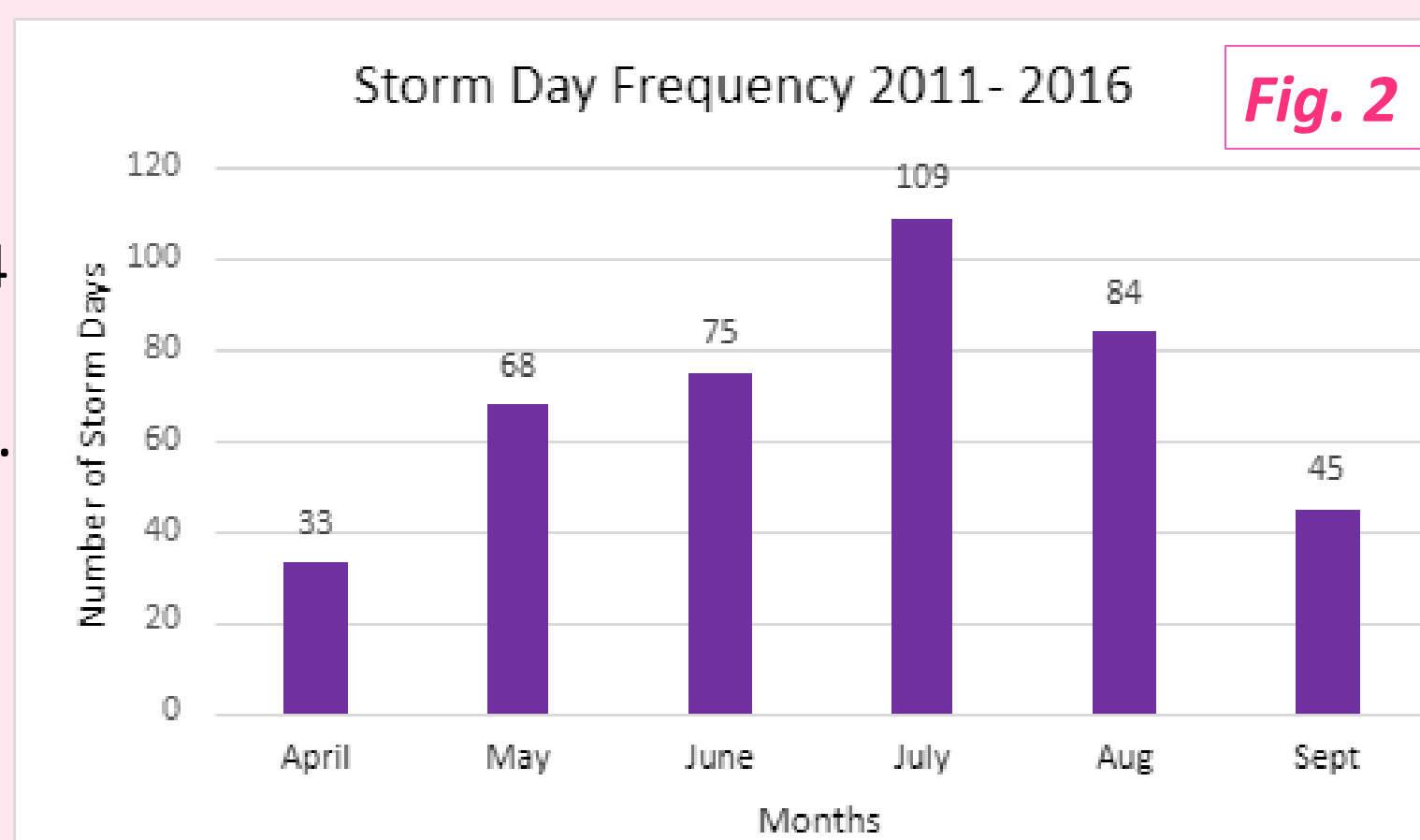
2. Five-year Climatology Methodology

- 21 METAR station reports from 2011-2016
- **Thunderstorm Days:** METARs containing TS, LTG, or LTG DSNT
- **Severe Days:** SPC severe weather event report



3. Climatology Results

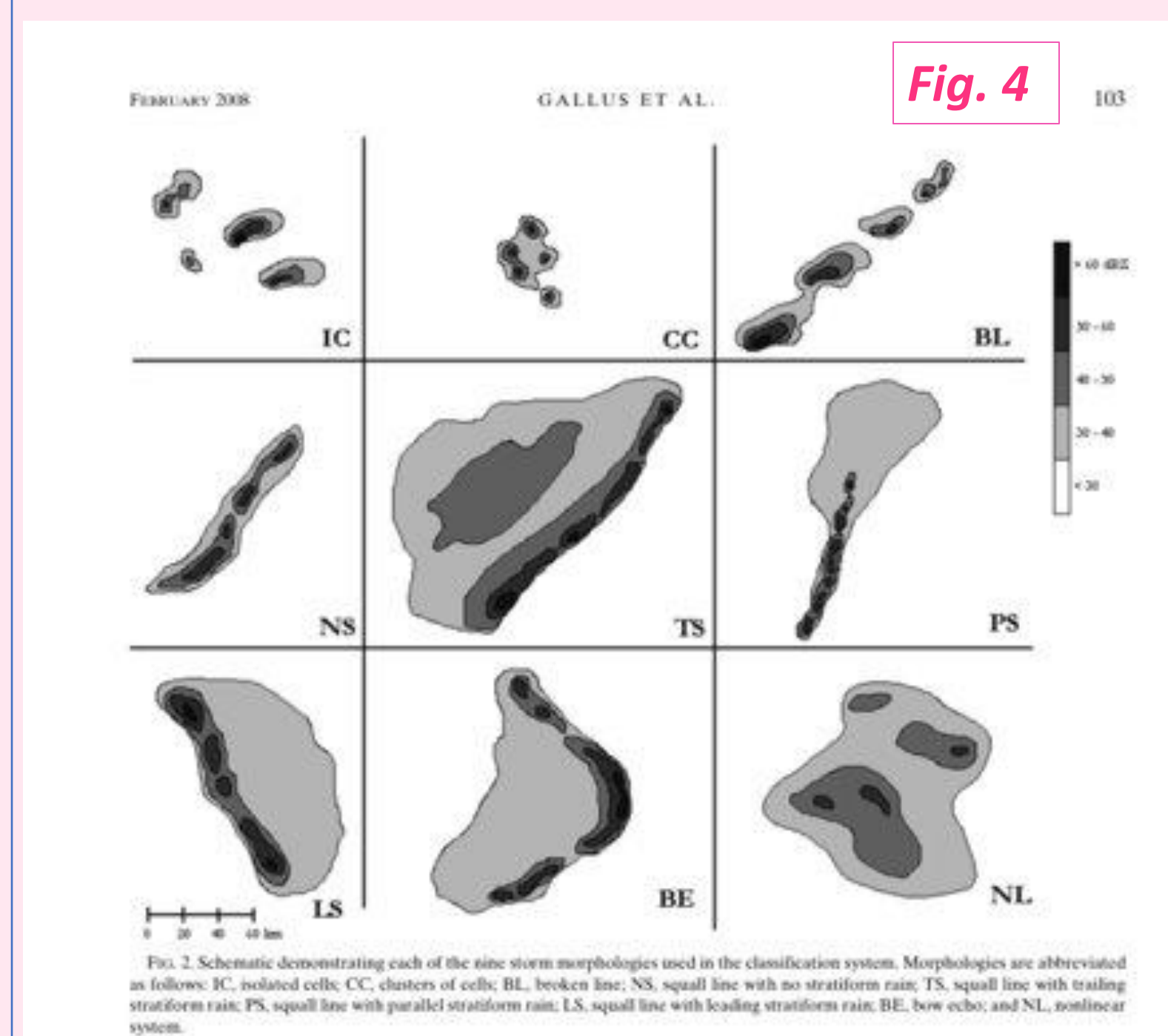
- Thunderstorm Days: 414
- Maximum thunderstorm days were in July (Fig. 2).



- Southwest and West flows had the highest distribution on severe and non-severe days (Fig. 3).
- East and Southeast flows only occurred on non-severe days.

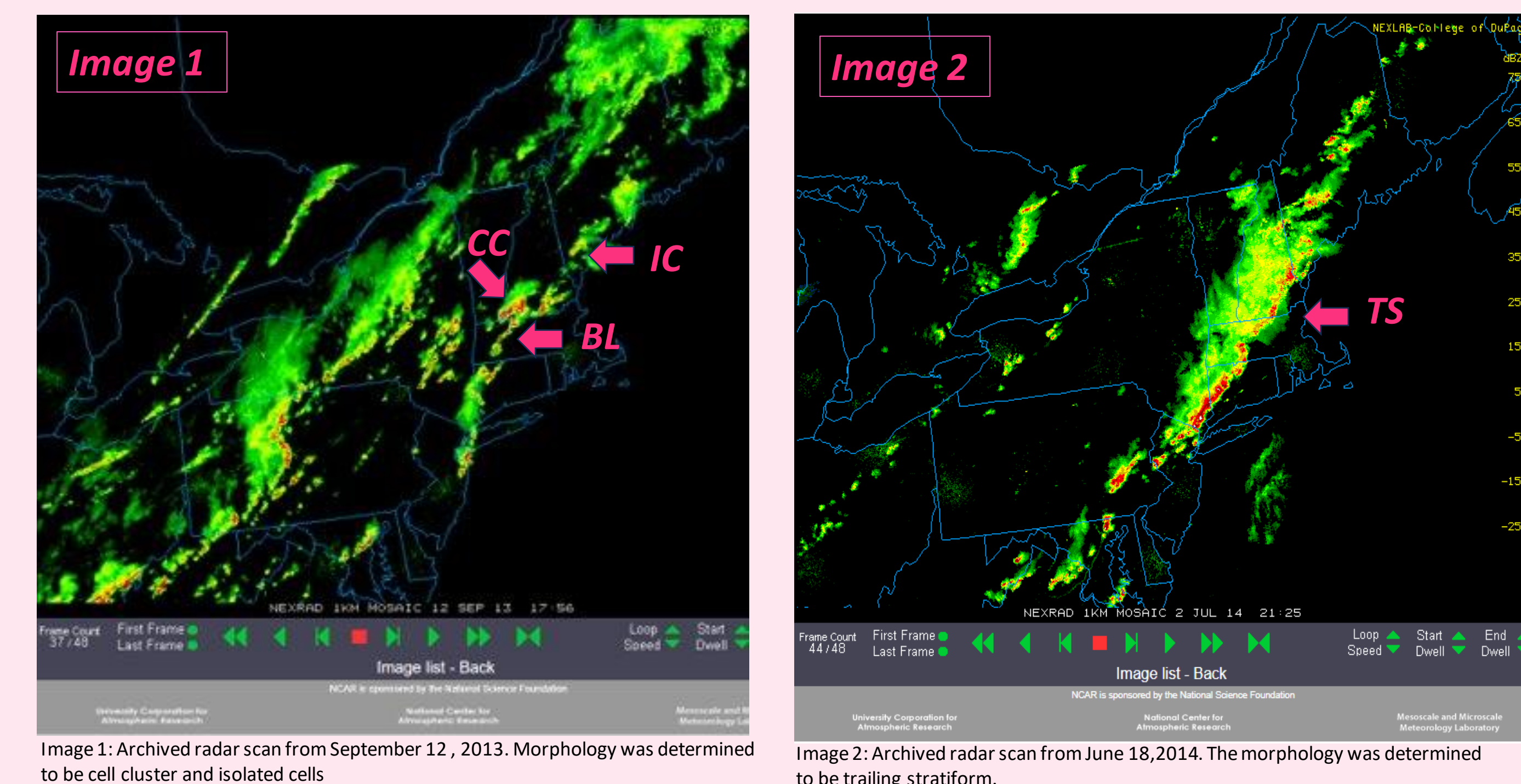
Is the severity of thunderstorms associated with their morphologies? Do morphologies shift based on their 700 mb wind direction?

4. Methodology: Morphology Identification and Wind Direction Assignment



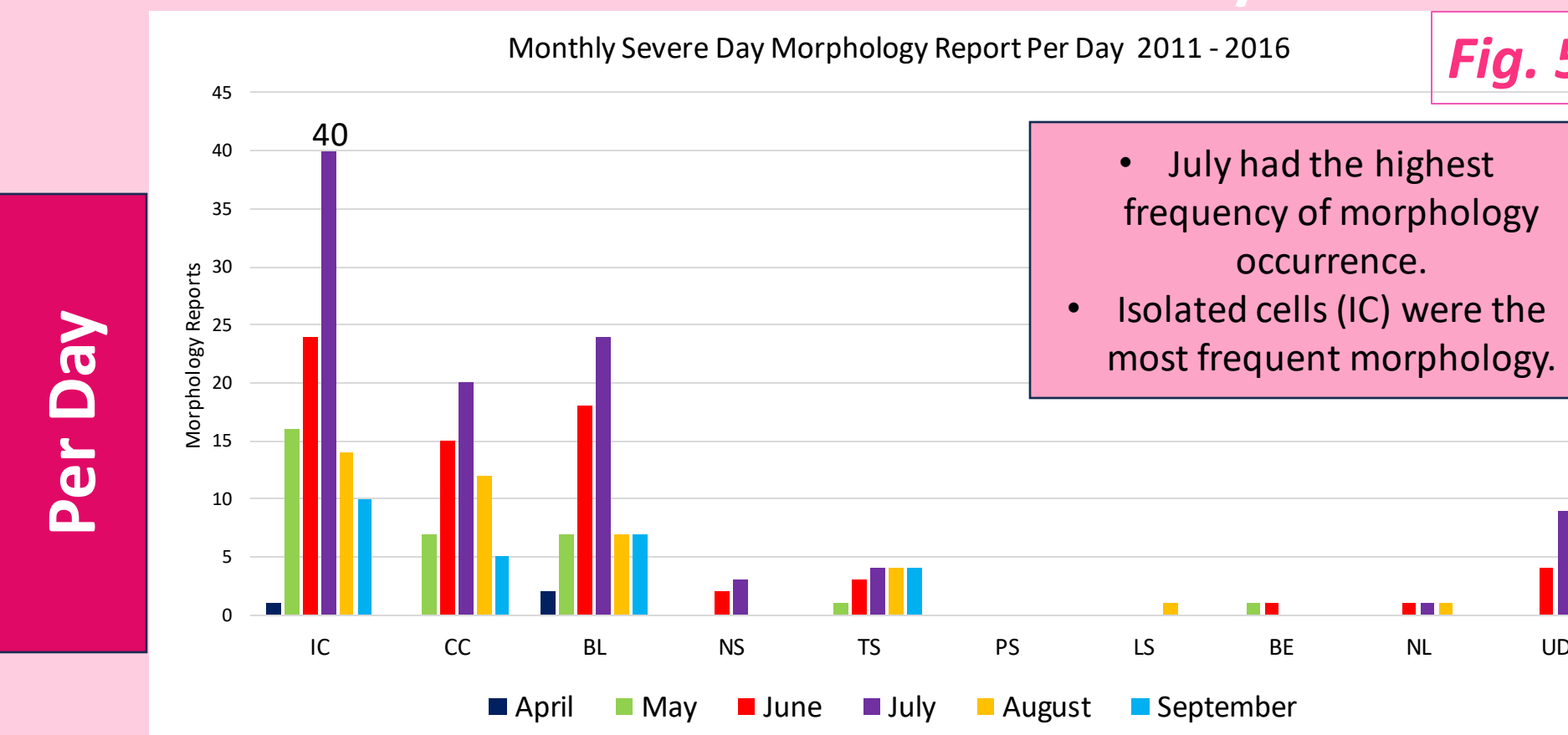
- Radar Archive Source: NCAR MMM Archive and NCEI NEXRAD Level-II Archive
- For every METAR report, a convective morphology using the Gallus et al. (2008) index (Fig. 4) was assigned.
- For broken lines, Rinehart's (2019) criteria of four cells with reflectivity of 35 dBz was used.
- Thunderstorm days were also assigned one or more morphologies.
- The 700 mb flow at 00z was assigned to each thunderstorm day.

5. Morphology Examples

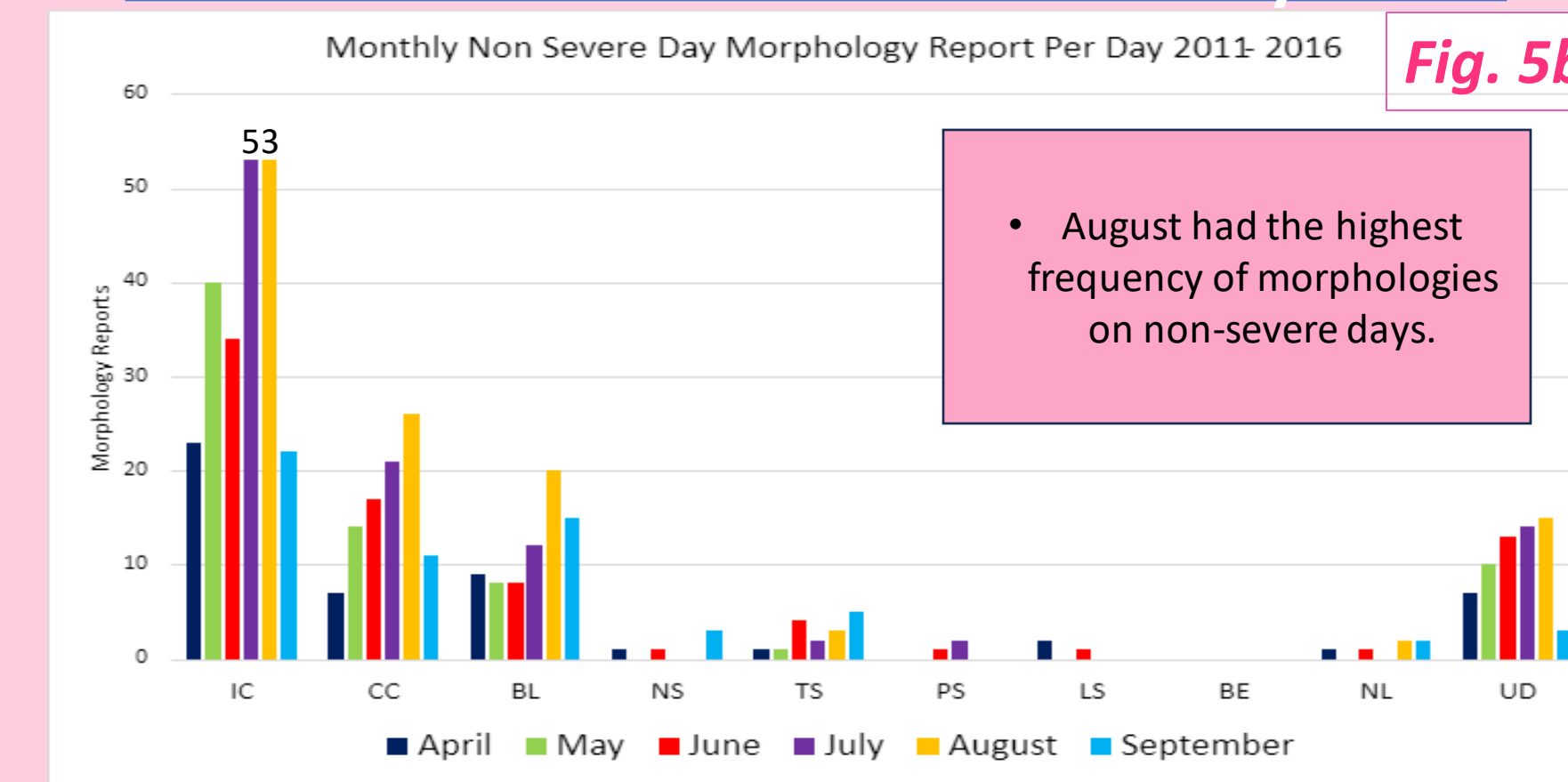


5. Morphology Identification and Wind Direction Results

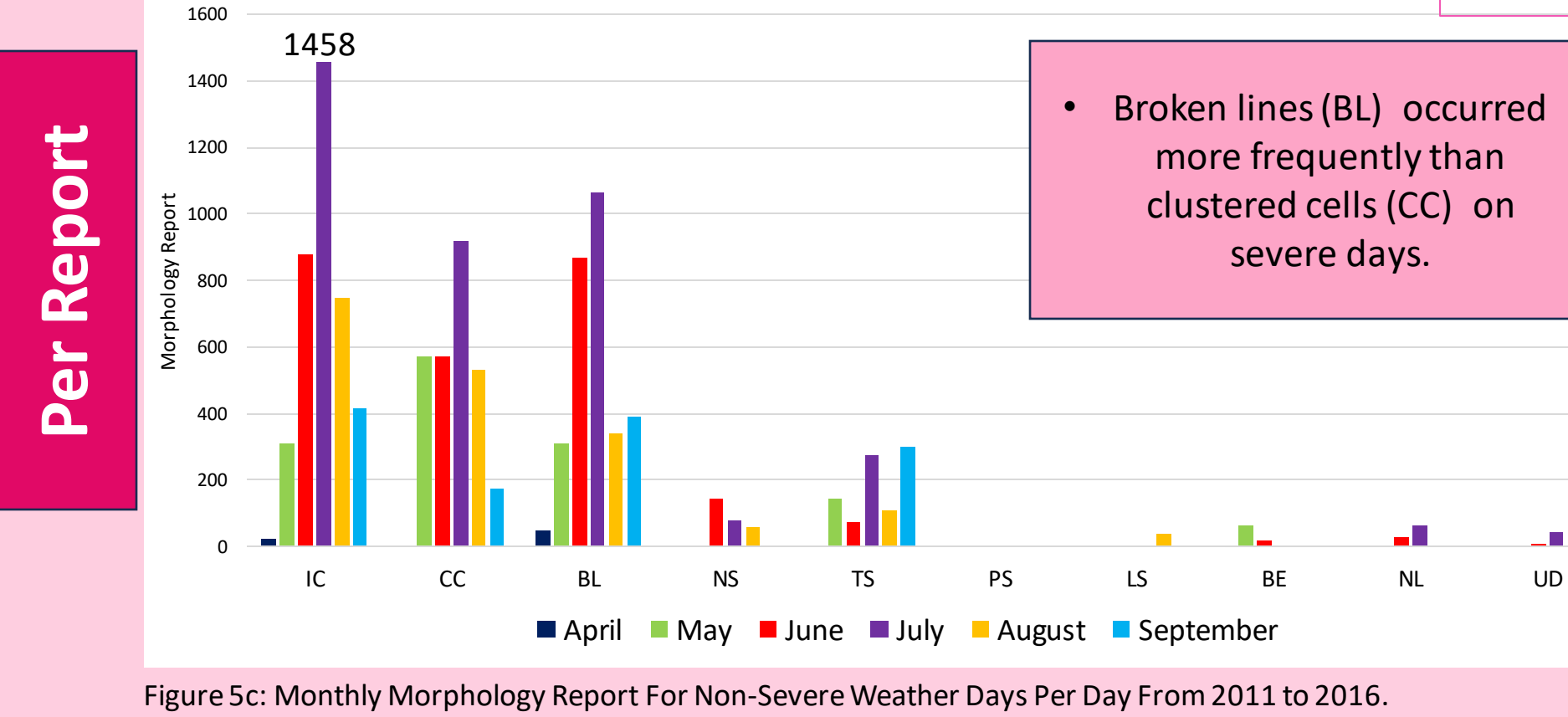
Severe Thunderstorm Day



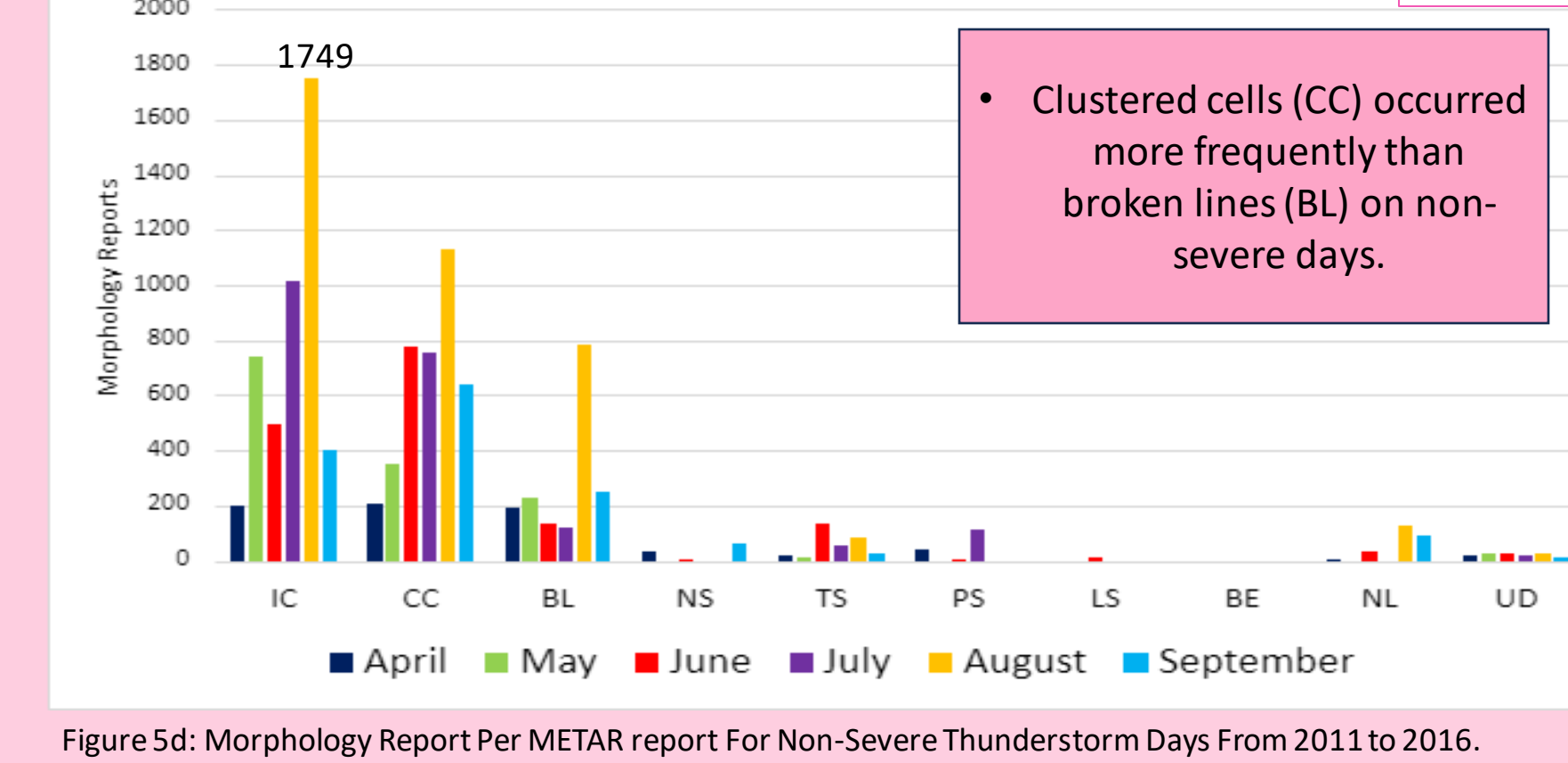
Non-Severe Thunderstorm Day



Monthly Severe Weather Day Morphology Report Per Report 2011-2016



Monthly Non Severe Morphology Report Per Report 2011-2016



6. Conclusions

- Isolated cells were the most frequent morphology on both severe and non-severe days and most likely to form on days with west flow.
- There were more reports of clustered cells on non-severe days when reports were counted by day and not by METAR report.

7. Future Work

- Aligning dates of dataset with sounding dates in order to get a more accurate distribution of flow and morphology occurrence.
- Determine if there is any relationship between flow direction and severity of morphology.

8. Acknowledgment

- This project was supported by the National Science Foundation REU program AGS-1947706.

9. References

Gallus, W. A., N. A. Snook, and E. V. Johnson, 2008: Spring and summer severe weather reports over the Midwest as a function of convective mode: A preliminary study. *Wea. Forecasting*, **23**, 101-113.

Lowery E. M, 2008: Using the WSR-88D Storm Structure Product to Develop a Climatology of Northern New England Thunderstorms as a Function of Large-Scale Flow, M.S thesis, Dept. of Chemical, Earth, Atmospheric, and Physical Sciences, Plymouth State University, 136 pp.

Rinehart E, 2019: A Climatological Study of Linear Convective Systems in Northern New England, M.S thesis, Dept. Of Chemical, Earth, Atmospheric, and Physical Sciences, Plymouth State University, 127 pp.

10. Link to poster

