Analyzing Lake Effect Snow Events with Satellite Observations

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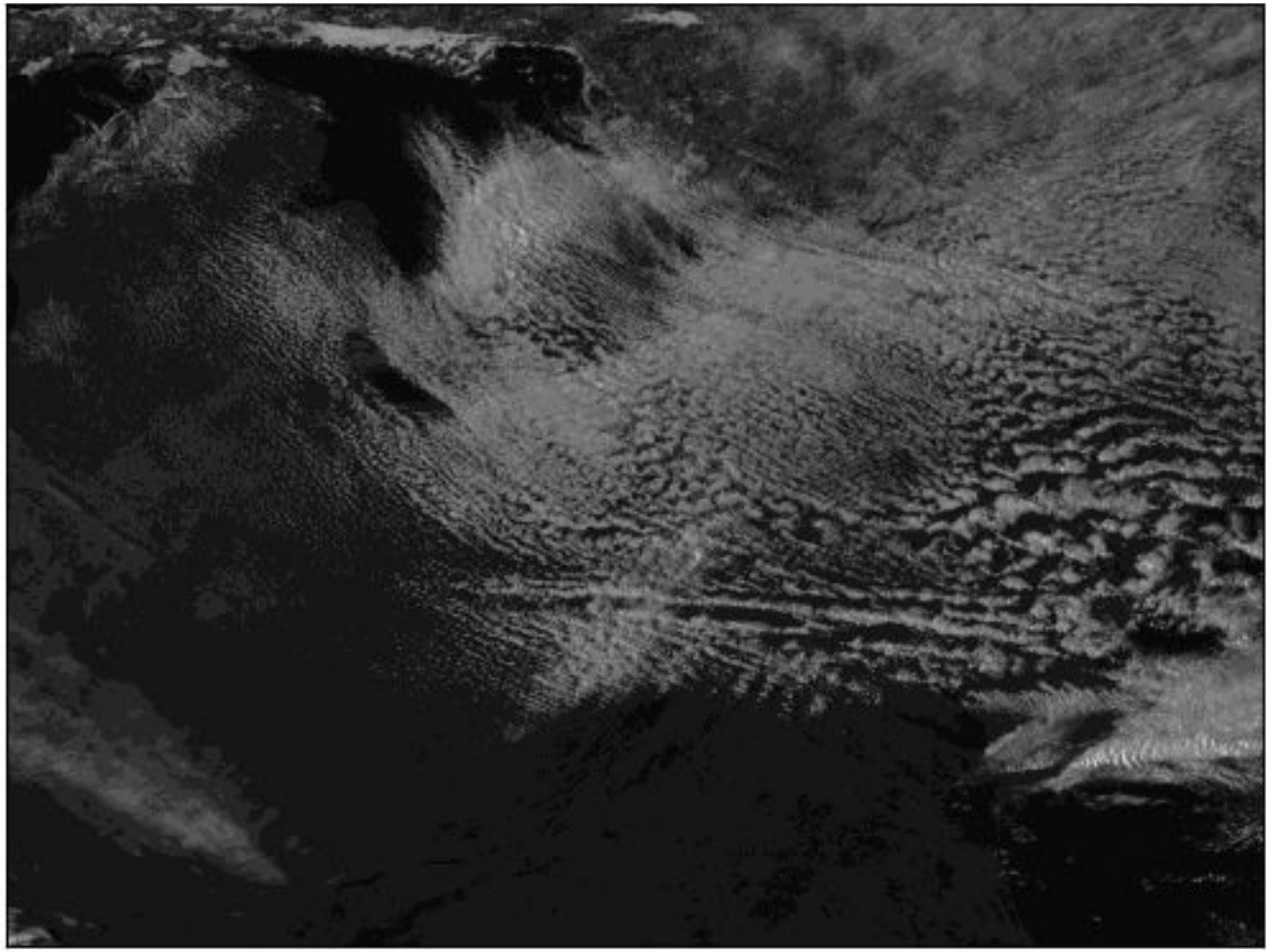
Lake Effect Snow (LES)

- Occurs during winter and early spring in the Great Lakes Region
- Studied to improve weather forecasting accuracy
- Can cause severe weather that socioeconomically affects ~34 million people
- Passive microwave (PMW) sensors are able to detect snowfall events due to snowflake scattering in the microwave, but it is still difficult for LES due to large spatial resolution of the sensor

Lake Effect Snow Over the Great Lakes Region (March 22, 2022, 17-18 UTC)



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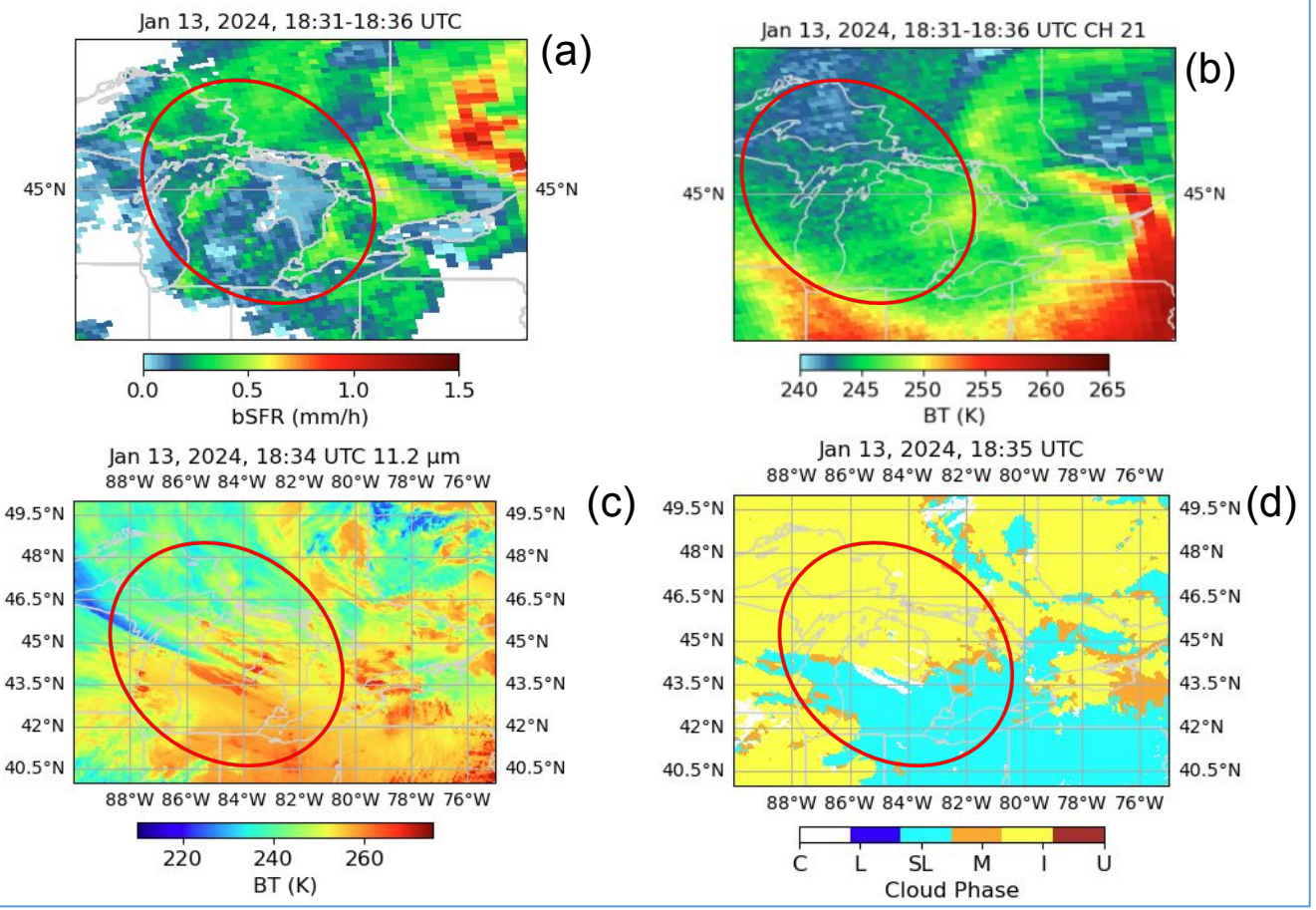
Objectives

- Use PMW and GOES data to observe lake effect snow properties
- Statistically analyze the relationship between snowfall rate and various lake effect snow properties

Methodology

- Identify 17 LES cases from 2021 - 2024 and graph LES properties
- Match PMW and GOES files based on smallest difference in time
- Colocate between PMW and GOES data
- Graph relationship between SFR and GOES variable

Figures



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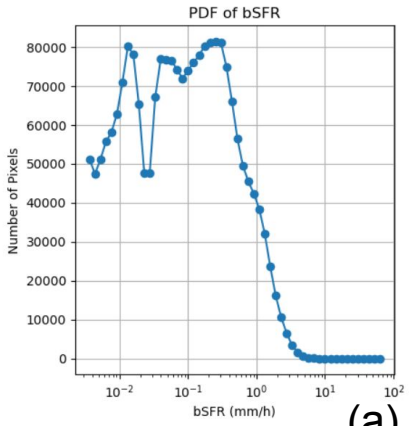
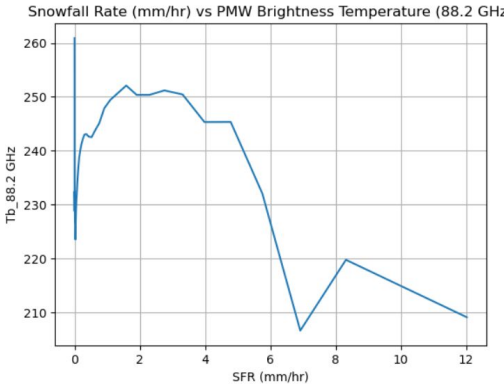
Results

- Snowfall rate (SFR) peaks between 0.1 and 1 mm/h but heavy snow events with SFR > 1 mm/h occur frequently
- As SFR increases, BT at 88.2 GHz decreases
- As SFR becomes larger, the portion of ice phase increases which leads to more snow scattering signals
- For smaller SFR values, there is a large portion of clouds in the supercooled liquid phase which makes accurate PMW SFR retrievals difficult

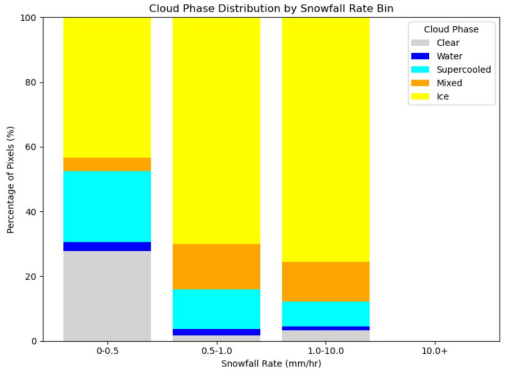
Figures



(a)



(b)



(c)

Conclusion

- Analyzing GOES data alongside PMW data helps us understand LES cloud properties, which can help improve LES detection
- Studying the relationship between LES properties is useful for more in-depth LES analysis