

### Introduction Where are chain aggregates observed?

•Elongated chain aggregates comprised of ice crystals and frozen droplets are observed (in-situ) in upper-level clouds from various summertime convective systems over Florida during the CapeEx19 campaign. It is believed that strong electric fields are important for chain aggregate formation. Similarly, in-situ observations of chain aggregates comprised of ice crystals and frozen droplets were observed in the upper-levels of nor'easter winter storms during the IMPACTS campaign (winter of 2022). The nor'easters are less electrically active compared to summertime Florida convection yet these chain aggregates are still observed.

•An investigation between the two data sets is performed in order to improve our understanding of the chain aggregation process.



# **Chain Aggregate Particles in Upper-tropospheric Clouds** Christian Nairy (christian.nairy@und.edu), David Delene, and Andrew Detwiler University of North Dakota, Department of Atmospheric Science



Electric Field



cores in cirrus anvils. Also observed up to 170 km from the storm cores.



**Nor'easter Observations** KBOX Reflectivity [dBZ] Jan. 29<sup>th</sup> 2022 - 20:39:51 UTC

•Chain aggregates most observed in the outer-stratiform region (7 km AGL) adjacent to the main convective snow/mix precipitation bands.

### **Conclusions and Future Work**

observations into the analysis.

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•Chain aggregates observed in both Florida (summertime) convectioninduced cirrus anvils (CapeEx19) and in the outer-stratiform region nor'easter winter storms (IMPACTS 2022). Both cases show similar chain aggregates (plates and columns) with the nor'easter case having more rimed ice and frozen water droplets. The Florida cases show that chain aggregation is occurring in the main convective regions, the over-shooting tops, and possibly continuing in the cirrus anvil regions.

•Future work includes investigating more winter (nor'easter) cases and incorporating electric field, lightning, and additional microphysical

## Acknowledgments