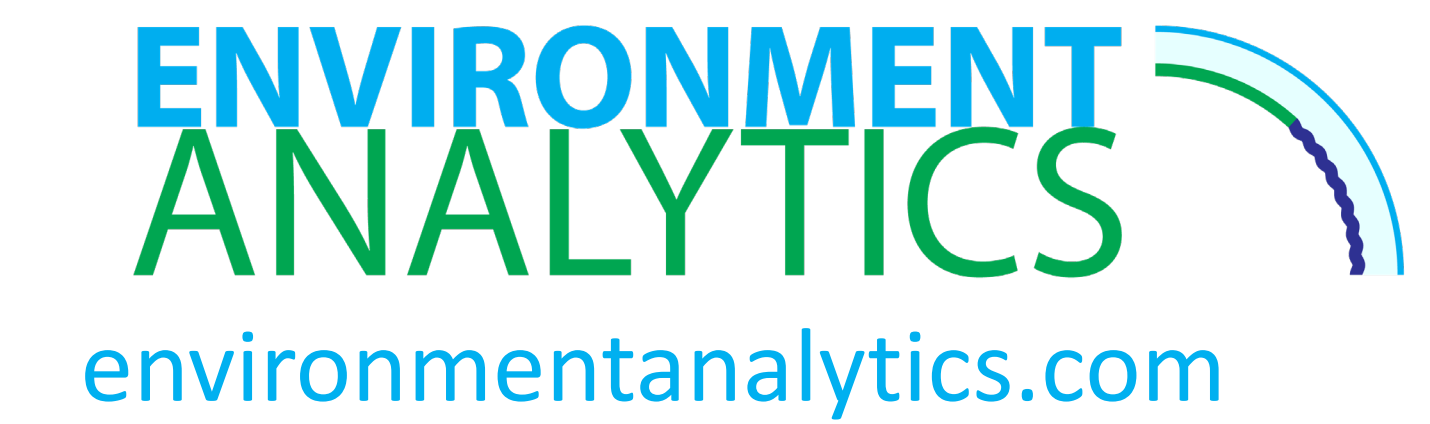


# Atmospheric Measurements of the Lower Atmosphere from Eastern North Carolina

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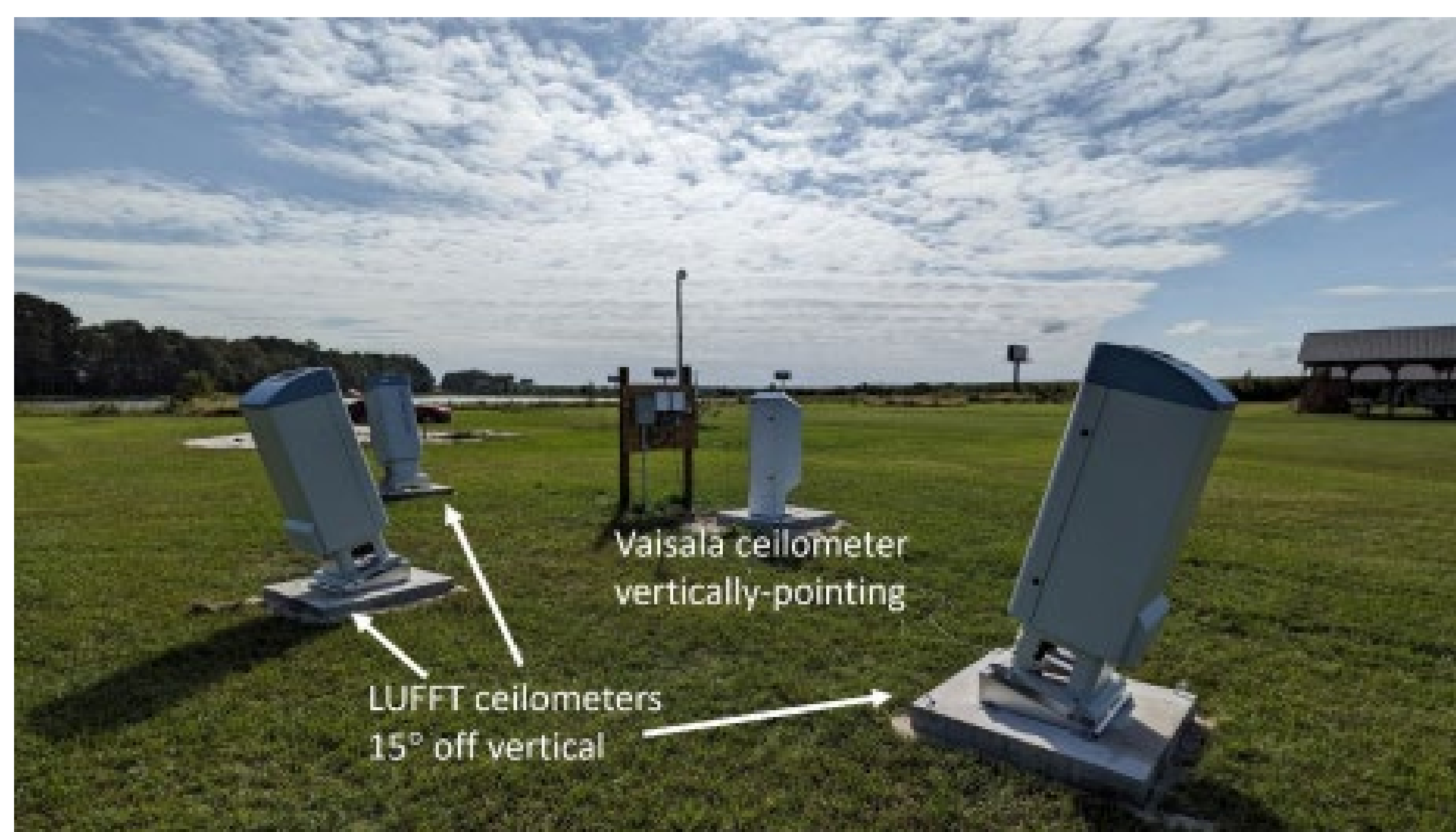
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## Motivation

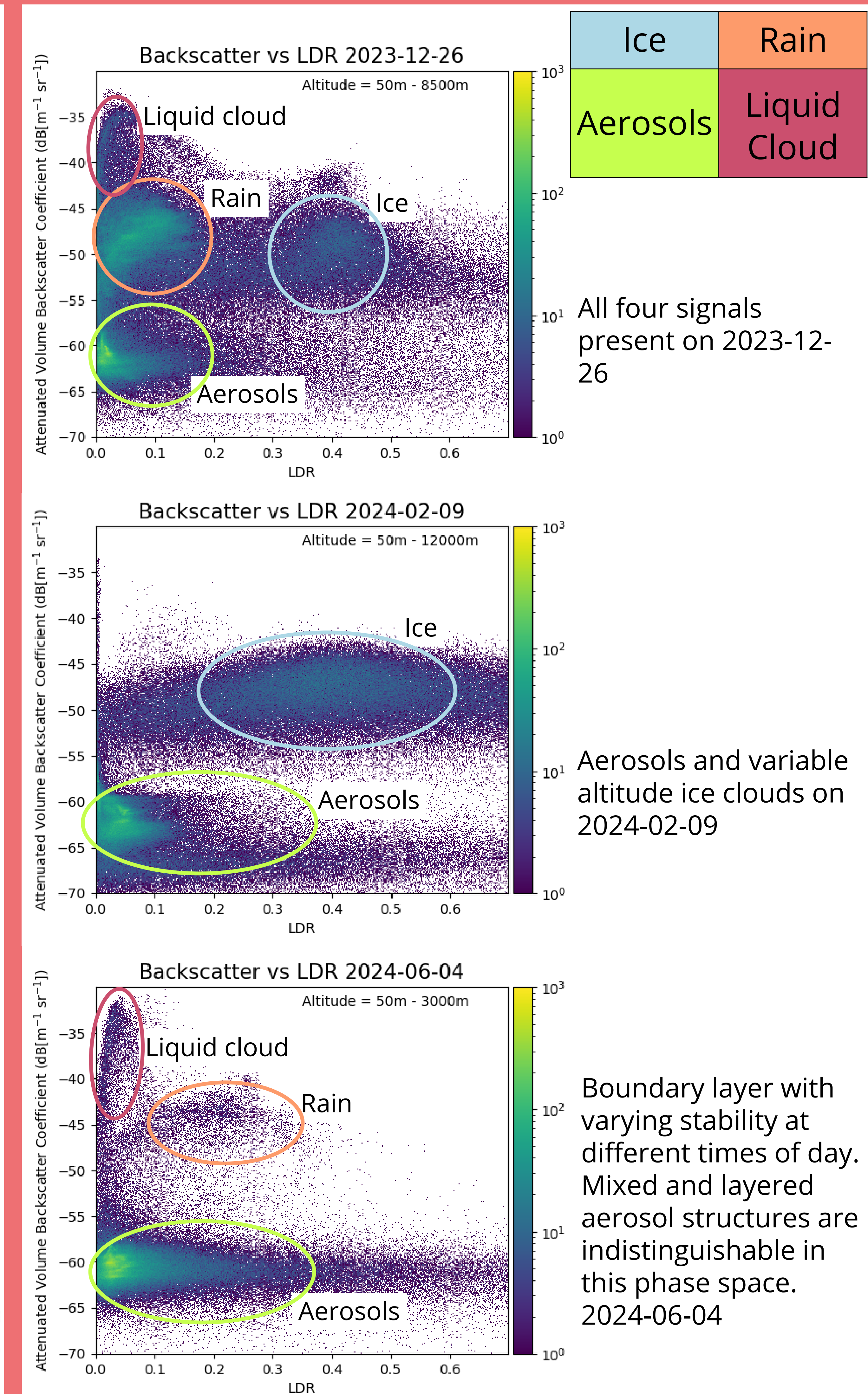
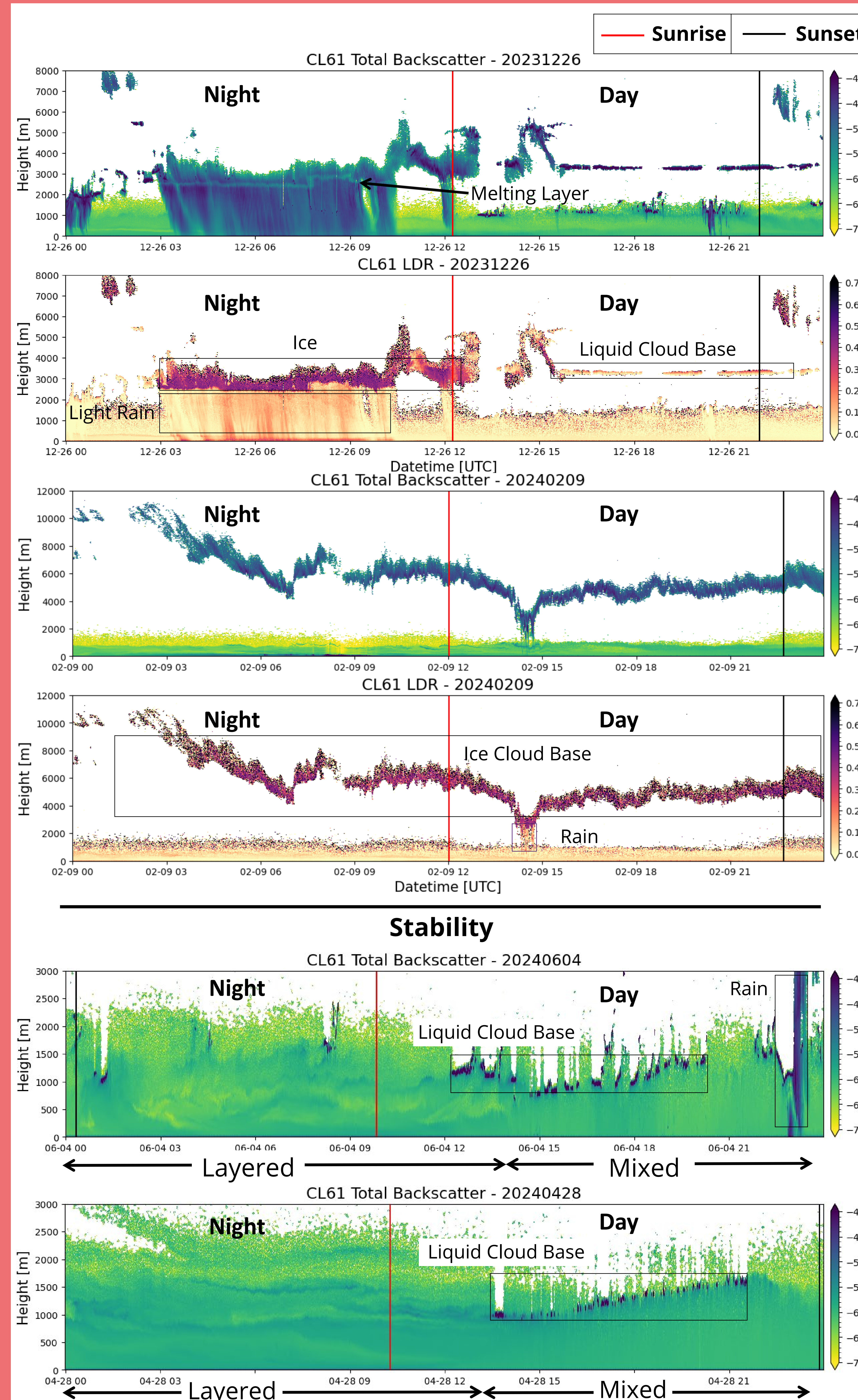
The atmospheric boundary layer, the lowest layer of the atmosphere, is directly influenced by its contact with the Earth's surface. Mechanical interactions from friction of the wind against the surface and thermal interactions from variations in surface temperatures influence the transport of moisture from the surface up into clouds. Hence, the characteristics of the boundary layer control the formation and dissipation of low clouds.

## Methods

Aerosols are small solid and liquid particles suspended in the air. Lidars observe aerosols as well as cloud particles and light precipitation using backscatter and linear depolarization ratio (LDR). Backscatter is a measure of the sizes and numbers of scatterers per unit volume and LDR is related to the roundness of the scatterers. Water drops (liquid phase) tend to be round and have low LDR while ice tends to be irregular in shape and have high LDR. Aerosol LDR values vary depending on type of aerosol and moisture content of the air. A limitation of lidar is the beam cannot penetrate a liquid cloud base or heavy rain. We identify rain, ice, and aerosol signatures by their distinct combinations of parameters in the joint backscatter-LDR phase space. We also investigate stability in the boundary layer. Stable boundary layers have little to no mixing while unstable layers have more vigorous mixing. When there is more mixing, aerosols are more uniformly spread in the vertical as compared to conditions when there is less mixing and distinct aerosol layers form.



Lidar ceilometers in Plymouth, NC.



## Summary and Future Work

Aerosols, liquid particles, and ice particles have distinct clusters in joint backscatter-LDR phase space. To classify the stability within the boundary layer, the next steps in the data analysis include using image processing to devise a texture algorithm to detect layering associated with more stable conditions.

## Acknowledgments

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