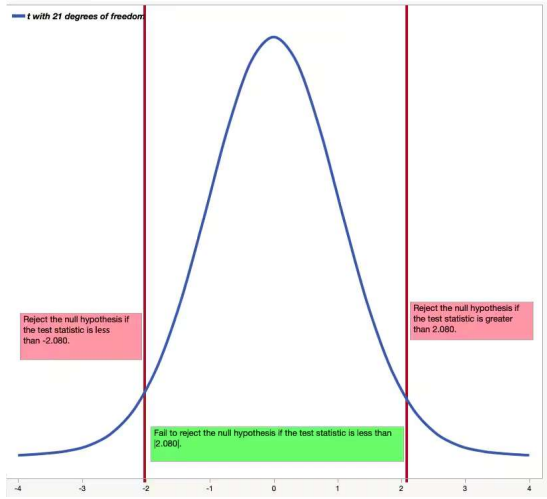
Additional Information

- For the stability calculations, the Richardson Number was used. This is a dimensionless number that uses temperature, change in potential temperature with height, change in mean horizontal wind speed with height and the gravity constant.
  - This value if positive, indicates a stability; if negative, indicates an instability; and if zero, indicates a neutral atmosphere.
  - From this, $(\Phi_M \Phi_H)^{-1}$ was calculated which represents the dimensionless stability function to account for curvature and heat (respectively)
- To quantify the PBLH, the Gradient Method was used. This method locates the maximum gradient of potential temperature to determine where the PBL ends, and free atmosphere begins.
- **Potential Inaccuracies**:
  - Birds resting on 4m tripod arm near the anemometer can skew wind speed measurements
  - Water spray from nearby turf grass experiment can skew relative humidity measurements
  - Light winds were not picked up by the anemometers due to cup weight
- **Results**:
  - For Statistical Analysis: Spearman Rank Correlation was used along with t-distribution
    - This Spearman rank correlation is used to determine the relationship between 2 variables for data that is not normally distributed or has significant outliers
    - The t-distribution helps us figure out how far a sample's average might be from the true average of a group when we don't know the group's exact variability.
    - The two tailed test helps determine significance of the correlations. It is a hypothesis test that defines 2 critical regions which groundwork the 2 ends of the curve for rejecting the null hypothesis (see image to the right).
      - Null Hypothesis: The correlation between the two variables is due to random chance
    - The sample size for each day was 720 except for October 8th which was 247. At a confidence level of 95%, the t-values were:
      - ± 0.1244 (Oct. 8th)
      - ± 0.0731 (All other days)
  - Highest observed PBL Heights were Oct. 8th (2000m), 10th (1600m), and 16th (2000m)
  - Lowest observed PBL Heights were Oct. 11th (1000m), 19th (1100m), and 21st (1000m)
  - Precipitation Day: This day showed no changes in the PBL height as seen in figure **h** on the front side.
    - The region received approximately 0.12 inches of rain throughout the day which were accompanied by large decreases in wind speeds and temperature.
  - Overall, there was an association with wind speeds and PBLH with the days with higher PBLH having higher wind speeds.
  - There was also generally larger observed fluxes on the days with the highest PBLH compared to the lower PBLH days.
  - The day with rainfall had the lowest fluxes, but highest wind speed maxima (right before rainfall), and showed a stable PBL through the vertical profile of potential temperature.
  - Similar Studies found higher correlations with a longer-term (decadal) dataset with the use of the partial derivative approach (Li et al. 2024).
    - The study emphasized the importance of other factors such as vegetation greening and topography (in N. China).
  - Another study done by Liu et al. (2022) found that wind speeds were direct factors in PBLH, include this study. They found higher wind speeds lead to more homogeneous mixing in the PBL.



- **Importance**:
  - This study represents a first step in understanding the influences of heat fluxes on PBLH laying the groundwork for further research into these complex interactions.
  - Direct applications include weather forecasting, air quality forecasting, and laser propagation.
    - **Severe Weather Forecasting:** Development of severe storms is directly related to the amount of energy available at the surface, in the form of latent heat, for the storm to use as fuel. The vertical transport of this energy is important to understand how strong a storm may develop as well as how long it may persist (Zhang et al. 2017).
    - **Air Quality Forecasting:** Air quality is greatly affected by the PBLH and is therefore imperative to understand factors affecting the PBLH. Stronger mixing within the PBL (higher PBLH) decreases the concentration and dispersion of the pollutants affecting human health and environmental impacts (Lin and McElroy 2010).
    - **Laser Propagation:** Optical turbulence in the PBL greatly impacts how much energy is lost during the propagation of lasers. Sensible heat flux directly influences optical turbulence, while latent heat flux impacts the laser beam through thermal blooming; a phenomena where moisture in the PBL cause refraction of propagated energy (Fiorino et al 2024; Shuto 2022).