1. **Introduction**

Stable ABLs are difficult to simulate due to the existence of intermittent turbulence within them. Here we present a case study evaluation of intermittent turbulence in a stable ABL observed during the ERASMUS (Evaluation of Routine Atmospheric Sounding Measurements using Unmanned Systems) field campaign. We ask:

- Are downward cascades of intermittent turbulence observed in the stable ABL?
- What is the vertical extent of these layers of intermittent turbulence?
- How are these layers propagating and what is their propagation velocity?

2. **Methods**

- 5 UAV (DataHawk2) flights on 10/19/16
- Oliktok Point, Alaska
- 57 profiles
- 3.2 hours of measurements
- 800Hz temperature (T) & wind (U)
- Clear, cold conditions
- Strongly stable ABL

Turbulent layers were identified using the **Bulk Richardson Number** - a ratio of buoyancy forces measured with T profiles and shear forces measured with U profiles:

\[ R_B = \frac{g \Delta \theta_v \Delta z}{\theta_v \left[ (\Delta U)^2 + (\Delta V)^2 \right]} \]

3. **Results**

Potential temperature profiles showed variation both within flights (~40 minutes) and throughout the day. U profiles showed that shear was generally strongest below the inversion separating the ABL from the free atmosphere. Dots on the U profiles represent the height of minimum shear, the majority of which occurred above the ABL.

4. **Conclusions**

- Turbulent layers exist within the stable boundary layer
- Turbulent layers propagate both upwards and downwards
- Vertical extent of turbulent layers ranged from 1 – 45 m
- Majority of turbulent layers < 2 m deep
- Half of all turbulence existed as independent layers < 7 m deep
- Layers propagate vertically at a median speed of ±1.4 cm s⁻¹
- Turbulence within the ABL was generally initiated by shear, while above the ABL it was often buoyancy driven

5. **Future Work**

- Use high frequency T & U data to obtain more direct measurements of turbulence:
  - Temperature Structure Function Parameter (Cₚ²)
  - TKE Dissipation (ε)
- Use spectral characteristics of 800Hz T & U data to confirm Ri-identified turbulent regions
- Investigate the processes responsible for the vertical propagation of turbulence within stable boundary layers
- Investigate the relationship between wind speed, ABL height, and turbulence

---

**References**


**Acknowledgements**

Funding for Northern Alaska site science project provided by Department of Energy (Award # DE-SC0013306). Brian Butterworth and Gijs de Boer were additionally supported by the NOAA Physical Sciences Laboratory.