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| **Section** | **General Purpose** | **Key Messages** |
| Abstract | Summary of why we did this, what we did and how we did it. | We use an **LES** to model a dry shear free Convective Boundary Layer (**CBL**). Ten member ensembles are calculated and a range of Richardson Numbers (**R**i) are achieved by varying **Surface Heat Flux** and Background Potential Temperature Lapse Rate (**Gamma**).  A new measure of Mixed Layer (**ML**) height (**h\_0**) based on the **Potential Temperature Profile** is introduced. **h\_0** serves as the lower boundary of the Entrainment Zone (**EZ**) and shows interesting scaling behavior in particular with respect to **Gamma** while obeying the established **power law relationship** to **Ri**. . To shed light the on resolution required to capture the principal mechanisms of **CBL Entrainment** we compare our results to those of Garcia and Mellado’s **DNS** study and find notable agreement. |
| Introduction | Provide context and introduce what was done. | Predicting **CBL** growth is important and we summarize why.  The **CBL** grows by **Entrainment** and we summarize the current understanding of its mechanism.  We mention some relevant open questions.  We present the definitions of **CBL** height and **EZ** **Depth** which we use.  We give context to our focus on **Surface Heat Flux** and **Gamma** as the two principal parameters governing **CBL Entrainment**.  We introduce and briefly explain the scales, parameters and **power law relationships** used in this study. |
| Tools and Approach | Describe the tools used and how they were set up. Bridge to the Results section. | We describe the **LES**.  We describe the domain and resolution.  We give context to our **Ri** range and present the table of **Surface Heat Flux**(es) and **Gamma**(s).  We describe the local ML height (**h\_0\_l**) measurement method used. |
| Results | Present findings in an organized way. | We find that the distributions of **h\_0\_l** become similar when scaled by CBL height (**h**), except at the lowest values. The lowest (scaled) **h\_0\_l** decrease with decreased **Ri** causing increased negative skew.  We find all our heights (defined in the introduction) scale with the length scale used in Garcia and Melado’s **DNS** study (**L\_0**) apart from **h\_0**.  When we base our lengths on the **unscaled average Potential Temperature** **Profile** the lines representing the **power law relationship** to **Ri** group according to **Gamma**. These lines then collapse together when heights are based on the **scaled Potential Temperature Profile**. This collapse is due a reversal in the relative magnitudes of **h\_0**.  Our **power law relationship** of **Entrainment Rate** to **Ri** is in line with theory and the results of other studies. In particular we reproduce the slopes predicted by Garcia and Mellado’s **DNS** study. However we note a change in slope with increased **Ri**. |
| Conclusions | Bridge results to the discussion in the literature. | We find a regression/curve fitting method of determining local ML height (**h\_0\_l**) less problematic than the **Gradient Method**.  We find the **Potential Temperature profile** to be a valid framework for defining **ML height** and **EZ** **Depth** since our results produce **power law relationships** seen in other studies and supported by theory.  Dependence of **EZ Depth** and **Entrainment Rate** on **Ri** changes with increased **Ri** number as evidenced by the curves representing the corresponding **power law relationships**.  **Gamma** is a critical scaling parameter in **CBL Entrainment**. |