Atmos. Chem. Phys. Discuss.,
doi:10.5194/acp-2015-950-RC1, 2016

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Physics of Stratocumulus Top (POST): turbulence characteristics" *by* I. Jen-La Plante et al.

Anonymous Referee #1

Received and published: 3 February 2016

This study analyzes turbulence properties of the EIL by decomposing it into two sublayers based on the POST observation data. Their analysis confirms existence of shear generated turbulence in the EIL, and suggests adjustment of the EIL so that the bulk Richardson number is maintained near critical value. Also, the authors show anisotropic turbulence in the EIL due to damped vertical fluctuations by static stability. While their analysis is valid, two of these main results are not new, so I think that the authors should perform further analysis so that this study is considered to be published in ACP. For instance, why the algorithm does not successfully divide the EIL into two sublayers for all cases, but only 8 cases? How is the assumption for the characteristic horizontal size of large eddies of the order of approximately 100 m justified? Why the classical cases show long tails in the CTMSL (figure 3). TO14 also has longer tail. Why the theoretically equivalent method to estimate the TKE dissipation rate gives

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Discussion paper

sometimes very different results? What is a better way to incorporate their findings into entrainment parameterization? Another concern is that, although I see some usefulness to study these two sublayers, I am not fully convinced if decomposing the EIL into two sublayers is absolutely necessary, since their main results seem to hold for the bulk of the EIL. In other words, their motivation to study two sublayers is rather weak and the significance of analyzing these two layers is not fully appreciated. This criticism partly comes from the lack of discussion for Tables 2, 3, and 4 and Fig. 6. Size of figures are too small. Showing many plots in one figure is not always a good way.

Specific comments

Correct "turbulent kinetic energy" to "turbulence kinetic energy.

line 45: "...that stratocumulus clouds often persist..." has been reported since Kuo and Schubert (1988) so this is not "recent."

line 57: "wind shear in and above the cloud top is another important ..." is partly comes from the updrafts diverging below the inversion layer, just mentioned previous sentence. At least, remove "another."

line 98: "highly turbulent" but in the abstract, "marginally turbulent." Marginal is not high.

line 150: Is "this model" the classical cases?

line 159: Are TO10 and TO13 "extreme" cases? Are they "well representing" classical or non-classical cases?

line 254: Briefly describe "the EIL structure."

line 314: Define "RMS."

line 341: Reference for "numerical simulations of the TO13..."?

line 349: What is the motivation to estimate the TKE dissipation rate?

line 380: "The second and third..." is unclear.

line 387: "Spectra..." is unclear

line 415: Add "Sn(l) = Cn |l epsilon|^(n/3). Also define l, x, n, Cn.

line 425&426": Are "(4x18/55)" for Ct & "(4/3*4*24/55)" for Cl necessary? Without explanation, they are meaningless.

line 471: "substantially" turbulent so what? generate enough mixing?

Fig. 1: Show only one case with larger size.

Fig. 2: Convert time to height if possible. Add potential temperature, water vapor, and cloud water profiles. Make panels larger, they are too small.

Fig. 3: Add histogram for EIL. Select a few cases (e.g., 2 for non-classical, 2 for classical). Make plots larger, they are too small.

Fig. 4: Panels are too small. In stead of plotting u'2 and v'2, plot horizontal component of TKE, i.e., (u'2+v'2)/2, unless there are notable differences between u'2 and v'2. Also plot the EIL values.

Fig. 5: Select and show one case. The figure is too small. Correct the legend since it overlaps the curves. Also plot the EIL's PSD.

Fig. 6: Fix as suggested for Fig. 5

Fig. 7: Make the figure larger. In stead of plotting the TKE dissipation for u and v, plot the dissipation rate for the horizontal component of TKE. Also, plot the EIL values.

Fig. 8: The figure size is too small. Select a few cases.

Table 1: Add three columns for EIL depth, classical or not, and CTEI or not.

Table 2: Add a row for each flight for EIL values. In stead of listing u and v, can they be combined? These values are similar.

Table 3: List the dissipation rate for the horizontal component of TKE, in stead of u and v component unless notable differences between u and v component exists.

Table 4: Add EIL values.

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