

Interactive comment on “On the parameterization of turbulent fluxes over the tropical Eastern Pacific” by G. B. Raga and S. Abarca

G. B. Raga and S. Abarca

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We would like to thank the reviewer for the many helpful comments, suggestions and questions. We have included more information and figures to clarify the analysis.

We respond point by point to the reviewer's specific points:

1. Section: Measurements and methodology: i) We have now included an extra figure (Fig.1a-c) that shows the region of study as well as a couple of typical aircraft flight patterns. A paragraph has been added with the relevant regional information. ii) The range of observed wind speeds, temperature differences and specific humidity differences are shown in the horizontal axis of the new figures 2, 3 and 4, so we don't feel that frequency distributions would be needed in the paper. iii) p: 5254: some clarification of the methodology has been now introduced, in particular about the detection of

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outliers. The numbers of total segments for the flux calculation and the excluded outliers are now explicitly included in the text. No filters were applied to the high frequency aircraft data used. The largest effect in the determination of an outlier was the large directional shear associated with precipitation, as stated in the text. The aircraft flew between 30-60m above the sea level.

2. Section: Results and discussion Subsection 3.1 i) In order to relate better the parametrizations (based on the best fits to the observations) and the budget equations, we have included a couple of sentences in the subsection. But more importantly, we have now included several new figures that we believe will help clarify the results (details below). ii) p 5256 line 15: A more detailed description of the figures (now 2a and 2b) is now included in the text. Two new figures (Fig. 3a and 3b) have now been included to present the observations of the LHF. The variation with wind speed (Fig3.a) and with the difference in specific humidity (Fig. 3b) are now presented and discussed in the text. iii) p 5257 line 6: Since now several figures are presented, the full range of the fluxes and TKE, as well as the range of the horizontal wind and the temperature and specific humidity differences are all shown, and we consider that an extra table may not be needed. iv) p 5257 line 7: Two new figures (Fig. 5 a and b) have now been included, with the SHF estimates from the observations. The figures show the variation of the SHF with the horizontal wind speed (now Fig. 5a) and with the temperature difference (now Fig. 5b). Text to describe these figures has now also been included in this subsection.

Subsection 3.2 i) We have included some more details of each of the parametrizations at the beginning of this subsection. The sequence in which each parametrization is described in the text, now follows with the natural order (a,b, c) of the figure. ii) p 5257 line: 25: Figures are now quoted often in the text, to support statements. iii) p 5258 line 4: The original text was wrong, as was pointed out by the reviewer and has now been corrected. iv) p 5258 line 12: A sentence is now included that may be related to the observed variability in the estimated fluxes, but there is no real explanation that we

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can provide. v) A couple of more details are now included about the parametrizations, but for full details the readers are referred to the publications. vi) Since we propose a parametrization of the SHF in terms of ΔT , a figure should be included Figure included (Fig. 5b) vii) p 5259 line 15: SHF instead of SFH (misspelled acronym corrected) viii) p5259 line 15: "The reason?" are SST measurements available to prove this statement? Show SST measurements ix) p 5259 line 20: We have now included one more Table , so that there are 3 in total, with the statistics for latent, sensible and horizontal momentum fluxes. The Tables are now quoted often in the text. x) It is possible that as the reviewer suggests, the iterative process in F96 could account for the better performance in the estimate of the horizontal momentum flux. F96 uses Monin-Obukhov theory to estimate the transfer coefficients in the surface layer and we believe this iterative method leads to a more accurate estimate of the momentum flux. As it is rightly pointed out by the reviewer, the calculation of the momentum fluxes is the simpler than the estimated for latent and sensible heat fluxes. The momentum transfer coefficients in these parametrizations have a quadratic dependence on the wind speed in K02 and depend on the Richardson number in M97. These expressions are empirically derived and have several numerical constants in them. It is possible that the momentum transfer coefficients used by M97 and K02 may not have the correct constants for this region of the East Pacific.

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 5251, 2006.

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