Atmos. Chem. Phys. Discuss., 6, S4657–S4658, 2006
www.atmos-chem-phys-discuss.net/6/S4657/2006/

Atmospheric Chemistry and Physics Discussions

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

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Received and published: 16 November 2006

Overall I think this is an interesting paper and I think it should be published. The data set from GOTEX is extremely valuable because it contains so much flux information at the higher wind speeds. However, I am a little concerned about the focus on the apparent lack of correlation of the sensible heat flux on wind speed. I wonder if the authors are confusing the behavior of the flux with the transfer coefficient. The issue is that if you think about the SHF in terms of bulk formulae as shown in Kraus and Businger's book (although these bulk formulae are available many other places), the sensible heat flux is the product of the potential temperature difference (not the air-sea temperature difference as purported by the authors, see more detailed discussion below) and the heat transfer coefficient written in terms of C_Q, the bulk transfer coefficient for sensible

heat, and U, the horizontal wind speed. The situation is directly analogous to gas exchange, where there is not a direct linear dependence of the flux on wind speed since the air-water concentration difference is independent of wind speed, fixed mainly by chemical considerations. It would be more correct, and possibly clearer in terms of the physics, to plot the sensible heat transfer velocity calculated as the sensible heat flux divided by the potential temperature difference and plotting that as a function of wind speed. This would provide a great data set to test the assumption in the bulk formula for the SHF that the product of U and C_Q (scaled by the density and heat capacity of air) is equal to the sensible heat transfer velocity. There are plenty of empirical and theoretical relations around for C_Q to use in this effort.

Secondly, the authors use the air-sea temperature difference as a correlate for the SHF. This is not strictly accurate since the bulk temperature difference is the scaling for the *net* heat flux, not the SHF. The correct temperature difference for the SHF is difference in potential temperature, which can be somewhat different than the bulk temperature change across the air-water interface.

My opinion is that if both of these issues are addressed in terms of the analysis of the SHF, the authors might see a very nice correlation between the sensible heat transfer velocity and wind speed. This would be a very interesting result since there are so few measurements of fluxes at wind speeds above 15 m/s.

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

ACPD

6, S4657–S4658, 2006

Interactive Comment

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