An Investigation of Latent and Sensible Heat Exchange in the DYNAMO Program

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An objective of the DYNAMO program is to improve our understanding of heat and moisture exchange in the tropics through direct estimates of the fluxes and their related mean variables. The flux of heat across the coupled boundary layers is primarily accomplished by small-scale processes that are parameterized in numerical models. A primary goal of our research is to improve the surface flux parameterization for latent and sensible heat used in these models and observational process studies. This was accomplished by the successful deployment of 3 flux packages on the forward mast of the R/V Revelle. This included a new version of a closed path infrared hygrometer that continued to measure the moisture flux through rain events. These packages operated successfully during the Legs 2 through 4 collecting approximately 65 days of fluxes and their associated means. The starting point of our investigation is the comparison of the directly measured transfer coefficients of sensible heat and moisture known as the Stanton and Dalton numbers, with the COARE 3.0 algorithm. In COARE 3.0 the coefficients of sensible heat and moisture are assumed to be the same, suggesting similarity in the transfer of heat and mass. We investigate whether it is more accurate to model the fluxes of heat and moisture with separate formulae, and test the consistency of these results with previous estimates of the Stanton and Dalton numbers from the CBLAST, CLIMODE and GASEX programs. The ultimate goal of this research is the development of the COARE 4.0 algorithm.