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Relationship between drizzle rate, liquid water path and droplet concentration at the scale of a stratocumulus cloud system

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Abstract. The recent ACE-2, EPIC and DYCOMS-II field experiments showed that the drizzle precipitation rate of marine stratocumulus scales with the cloud geometrical thickness or liquid water path, and the droplet concentration, when averaged over a domain typical of a GCM grid. This feature is replicated here with large-eddy-simulations using state-of-the-art bulk parameterizations of precipitation formation in stratocumulus clouds. The set of numerical simulations shows scaling relationships similar to the ones derived from the field experiments, especially the one derived from the DYCOMS-II data set. This result suggests that the empirical relationships were not fortuitous and that they reflect the mean effect of cloud physical processes. Such relationships might be more suited to GCM parameterizations of precipitation from shallow clouds than bulk parameterizations of autoconversion, that were initially developed for cloud resolving models.

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