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# Observed and simulated turbulence in cumulus and stratocumulus clouds

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Turbulence plays an important role in the evolution of cumulus and stratocumulus clouds. It causes mixing across the cloud-clear air interface as well as within the cloud, and it affects key cloud processes (e.g. entrainment and droplet collisions) and properties (e.g. the liquid water path). However, cloud turbulence is not easily measured, and in-situ high-resolution observational data is scarce. As a consequence our knowledge on the topic is incomplete, and important questions remain open. Here we revisit a number of measuring campaigns and compare observation-based estimates of the turbulent kinetic energy (TKE) dissipation rate ($\varepsilon$) with corresponding values from large-eddy simulations (LESs). The selected cases (e.g. DYCOMS-II flight 1, POST flight 13, and the composite GCSS case based on RICO measurements) include both cumulus and stratocumulus clouds and cover a range of dynamic and thermodynamic atmospheric conditions. Simulations are performed with use of the EULAG model. While LESs typically represent idealized conditions – e.g. lacking the large-scale spatial and temporal variability of the real atmosphere – they provide information not available from measurements and can help us to better understand the role of turbulence in clouds. Improved characterization of cloud turbulence (for instance in terms of $\varepsilon$) will facilitate the development of more accurate cloud parameterizations for use in climate- and weather-models. We use and compare various methods for estimating $\varepsilon$; i.e. we consider estimates based on the LES TKE budget as well as values obtained through use of spectral analysis, structure functions, and zero-crossing methods.