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Multiple scales asymptotics for stratocumulus clouds

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We discuss how multiple scale asymptotics framework for meteorological modelling, as developed by Klein and colleagues (see Klein (2004) or Majda & Klein (2003)) can be used to advance our understanding of cloud topped boundary layer structure. Our study is motivated by the need to capture the dynamics and thermodynamic mechanisms that lead to the formation and breakup processes of stratocumulus clouds.

Our derivation addresses the scale interaction of three dimensional flow near the ground at a characteristic spatioscale of the order of 1500m and resolving horizontal scales of 1km and 200km. The asymptotic analysis reveals how the velocity fields are affected by moist thermodynamics variables. We finally conclude by showing how the results obtained from the analysis may provide a systematic framework for parameterization schemes used in numerical modelling.

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