

## Roll Vortices in the Atmospheric Boundary Layer

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Despite being quite turbulent, the atmospheric boundary layer shows forms of organized vortices with horizontal axis orientated in the mean flow direction. The secondary circulations (lateral and vertical) can be identified by clouds organizing themselves as parallel lines in the updraft regions between pairs of counter-rotating roll vortices. Those kind of horizontal roll vortices are well known from laminar boundary layers over rotating disks or Ekman layers in rotating fluids. In the atmospheric boundary layer, the origin of roll vortices is also attributed to classical Ekman layer instability for unstratified flow and to buoyancy-induced instability in unstably stratified cases. Both mechanisms are known for laminar flows from linear theory and laboratory experiments. But as the atmospheric boundary layer is always turbulent, one might wonder, how large scale structures can still form. To investigate this problem, we have conducted numerical simulations with a parallelized large-eddy simulation (LES) model. Results of the simulations will be presented with emphasis on the structure of organized vortices and their impact on surface wind stress over the oceans.

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