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A large eddy simulation on steam devils in a moist convective mixed layer

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Steam devils which develop in moist convective boundary layers over relatively warm waters during a cold air outbreak are reproduced by a large-eddy simulation model, and their characteristics, formation process and environment are studied. In a non-precipitating case, reproduced steam devils like vortices were similar to dust devils and were found to be phenomena within sub-cloud layer of cell pattern convection, some of their features showing a good agreement with observations. In a precipitating case, cold downdrafts from precipitating cumuli apparently enhanced reproduced vortices by producing local horizontal wind shear and convergence around surface.

Keywords: steam devil, moist convective mixed layer, convection, vortex, atmospheric boundary layer