**Genesis and Features of Dust Devil Like Vortices in Convective Boundary Layers – A Comparative Study using DNS/LES and Laboratory Experiments**

Intense vortices with vertical axes frequently form in the near surface atmospheric boundary layer (ABL) under dry convective conditions and in flat terrain. They are known as dust devils and are believed to significantly contribute to the production of continental aerosol. Only little is known about the origin and features of these atmospheric vortices, since they are extremely difficult to measure in their natural environment. The project aims to perform systematic numerical studies, accompanied - for the first time - by laboratory experiments, to determine the mechanism and minimum conditions under which the vortices occur, and how they contribute to the vertical transport of heat and dust. Based on the simulation software PALM (PArallelized LES Model) developed at the Institut für Meteorologie und Klimatologie of Leibniz Universität Hannover both, LES and direct numerical simulations (DNS) will be carried out. The LES studies for the ABL with Rayleigh numbers will achieve Rayleigh numbers up to $Ra=10^{18}$ insuring that results from DNS and laboratory experiment can be transferred to the turbulent atmospheric regime. Concurrently, laboratory experiments will be undertaken in the convection experiment “Barrel of Ilmenau” - an eight meters high and seven meters wide, cylindrical test cell operated at the Institute of Thermodynamics and Fluid Mechanics at Technische Universität Ilmenau. In this classical Rayleigh-Bénard experiment in which confined air is heated from below and cooled from above (similar as in the atmosphere), intense vortices with vertical axes have been already observed in the past. These vortices will be measured and characterized in this project. For the first time, this experimental data permits a direct comparison with and an evaluation of the results obtained in the DNS for Rayleigh numbers up to $Ra=10^{12}$.

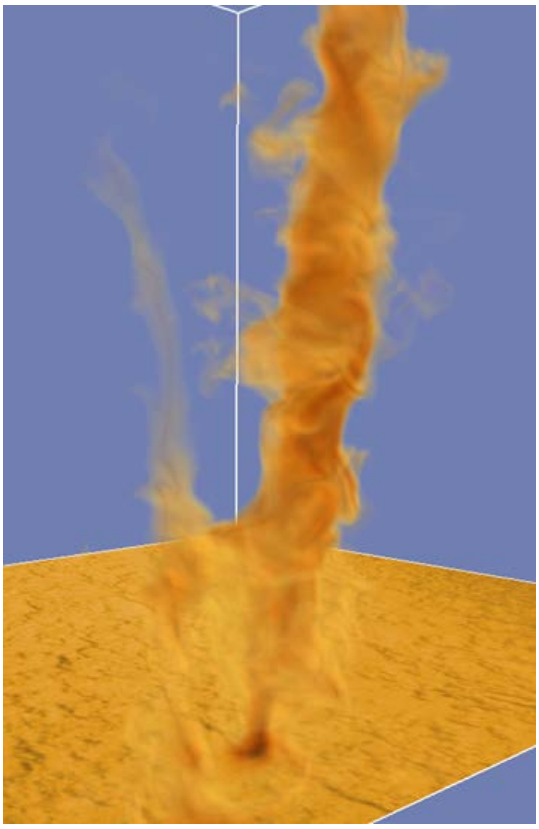

Figure: Dust Devil simulated by PALM