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CNRM-GAME stratified water flume: sensing the atmospheric boundary layer in a large water channel

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The geophysical fluid dynamics laboratory of the French meteorological service research center (CNRM-GAME, URA1357 Météo-France and CNRS) provides facilities for fundamental and applied study of homogeneous, stratified and/or rotating flows. The research activities of the team focus on atmospheric boundary layers and internal waves. Two recent experiments related to the atmospheric boundary layer are presented here.
The CNRM-GAME stratified water flume is a unique facility to study neutral or stratified atmospheric boundary layer (e.g. [1]). It is in particular very well designed to generate accurate and exhaustive datasets on flows similar to the atmospheric ones under perfectly controlled conditions. It is thus a good extension of field experiments limited by the fact that data are scattered and conditions are not well controlled. This 30 m long, 3 m wide and 1.6 m deep water flume can operate with up to three layers of different densities and velocities. A continuous density stratification is possible. The flume can also be operated as a towing tank filled with water or with a density-stratified mixture of water and brine.
Experiments have been recently carried out in order to investigate vertical eddy fluxes under stable conditions in the atmospheric boundary layer (see [2] and [3]). A well developed boundary layer has been observed, and results are expected to bring new clues into understanding of the atmospheric stable boundary layer.
Another experiment is currently in progress to characterize the wind field in the atmospheric boundary layer over a large airport. In situ measurements and numerical modeling are also included in the project. This combined approach will allow to get new insights into various questions, in particular about strengths and weaknesses of numerical and physical modeling for this kind of applied study nowadays.

References

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