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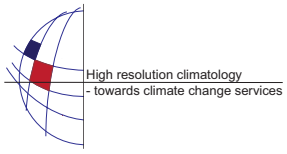

Simple parameterisations of mixing induced by drainage flows in a steep valley

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This talk will focus on the analysis of the mixing properties of the katabatic flow which develops at night or in winter on the slopes of a valley. An idealized topography is considered, the initial Brunt-Väisälä frequency N_0 having a constant value. Large Eddy Simulations (LESs) with the Advanced Regional Prediction System (ARPS) numerical code are performed. According to the classification proposed by Mahrt (1982), we found that the katabatic flow is *non stationary* and very similar to the *tranquil flow* regime. Mixing is analyzed with the method proposed by Winters et al. (1995) and is quantified by a turbulent diffusivity. Values of this diffusivity between 0.01 and 2 m^2/s are obtained, depending on the stability of the atmosphere, in agreement with measurements from field campaigns.

Two different parameterizations of mixing are found, depending upon whether the features of the katabatic flow are known or not. We thus show that the turbulent diffusivity evolves as the square of a Froude number associated with the katabatic flow. Interestingly, such a parameterization was also obtained in various weakly turbulent stably-stratified flows using direct numerical simulations (Staquet & Bouruet-Aubertot, 2001). We also found that the turbulent diffusivity evolves linearly with time and as the fourth power of $1/N_0$, this law remaining unchanged when a different subgrid scale model is used. This law may provide a practical parameterization accounting for the mixing in a deep valley when the grid size is larger than the width of the valley (Largeron, Staquet & Chemel, 2010).

References

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