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Simple but realistic cases from Cabauw for GABLS

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The aim of GABLS is to improve the representation of the stable boundary layer (SBL) in weather forecast and climate models. To achieve this two intercomparison studies have been performed so far. One study covered an academic case with moderate geostrophic forcing and prescribed surface temperature over ice (Cuxart et al, 2006, Beare et al, 2006), and the second case was based on CASES-99. From those studies we learned that LES confirms the local scaling hypothesis, and that single column model results diverge strongly.

GABLS is now moving from highly academic cases of the SBL towards more realistic and more difficult cases. These new cases may allow for interaction with the land surface which is known to be essential for a correct description of the SBL and may allow for inertial oscillations which results in Low Level Jets (LLJ). LLJ's are of importance for the SBL dynamics and the transport of atmospheric constituents. Moreover these jets may influence the morning time transition. Since the inertial oscillation is part of the prognostic equations of Single Column Models, these models are in principle capable to simulate this. However simulating the details of decoupling around sunset and the mixing during the morning time transition is still a challenge.

The Cabauw site with its 200 m meteorological tower is situated in a very flat environment dominated by grassland. As such it has a relatively simple land surface. On many nights a low level jet develops due to decoupling and inertial oscillation. Currently the observational program includes profiles of wind speed, wind direction, temperature, humidity and CO2 along the tower, the full surface radiation budget and the full surface energy budget. Moreover the tower is equipped with turbulence instruments at 4

heights which gives profiles of the turbulent fluxes of momentum, heat, water vapour and CO2. A wind profiler/RASS system allows for observations of wind speed, wind directions and virtual temperature at levels exceeding the tower. Radio soundings 2 times a day are available from the nearby (25 km) synoptical station De Bilt.

In this presentation we will propose some potential GABLS cases. Focus will be on decoupling around sunset, the development of a LLJ and the morning time transition. A selection is made on relative constant external forcings. To avoid 3D influences we will look for cases with small baroclinicity and small advection.