Diurnal vraibility of thermodynamics and carbon dioxide at CABAUW

Jordi Vilà-Guerau de Arellano[(1)], and C. van Heerwaarden [(1)]

(1) Meteorology and Air Quality Section
Wageningen University (The Netherlands)

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1 Introduction

We present surface and upper air observations and the numerical experiments using the mixed-layer model at Cabauw. The two cases have been extensiveley described at Vilà-Guerau de Arellano et al. (2004) and Casso-Torralba et al. (2008).

2 Case 1: 27^{th} July 2002

Table 1 shows the initial and boundary conditions for the Cabauw case.

Table 1. The initial and prescribed values used for the mixed-layer model to calculate the boundary layer height, the thermodynamic and the carbon dioxide evolution on 27^{th} July 2002 at Cabauw.

Boundary layer height at 5 UTC	250 m
Large scale subsidence velocity (w_s)	0.0 m/s
Potential temperature	
$<\theta>$ at 5 UTC	291.5 K
$\Delta\theta$ at 5 UTC	3.5 K
$\overline{(w\theta)}_o$	0.1 $\sin(\frac{\pi t}{t_d})$ K m/s
β_{θ_v}	0.4
γ_θ	0.0055 K/m
Specific humidity	
$<q>$ at 5 UTC	10.5 (g/Kg)
q_{FT}	9.0 (g/Kg)
Δq at 5 UTC	-1.5 (g/Kg)
$\overline{(wq)}_o$	0.087 $\sin(\frac{\pi t}{t_d})$ (g/Kg) m/s
γ_q	0 (g/kg)/m
Carbon dioxide	
$<co_2>$ at 5 UTC	390.0 ppm
co_{2FT}	360.0 ppm
Δco_2 at 5 UTC	-30.0 ppm
$\overline{(wco_2)}_o$	-0.38 $\sin(\frac{\pi t}{t_d})$ (ppm) m/s
γ_{co_2}	0 ppm/m

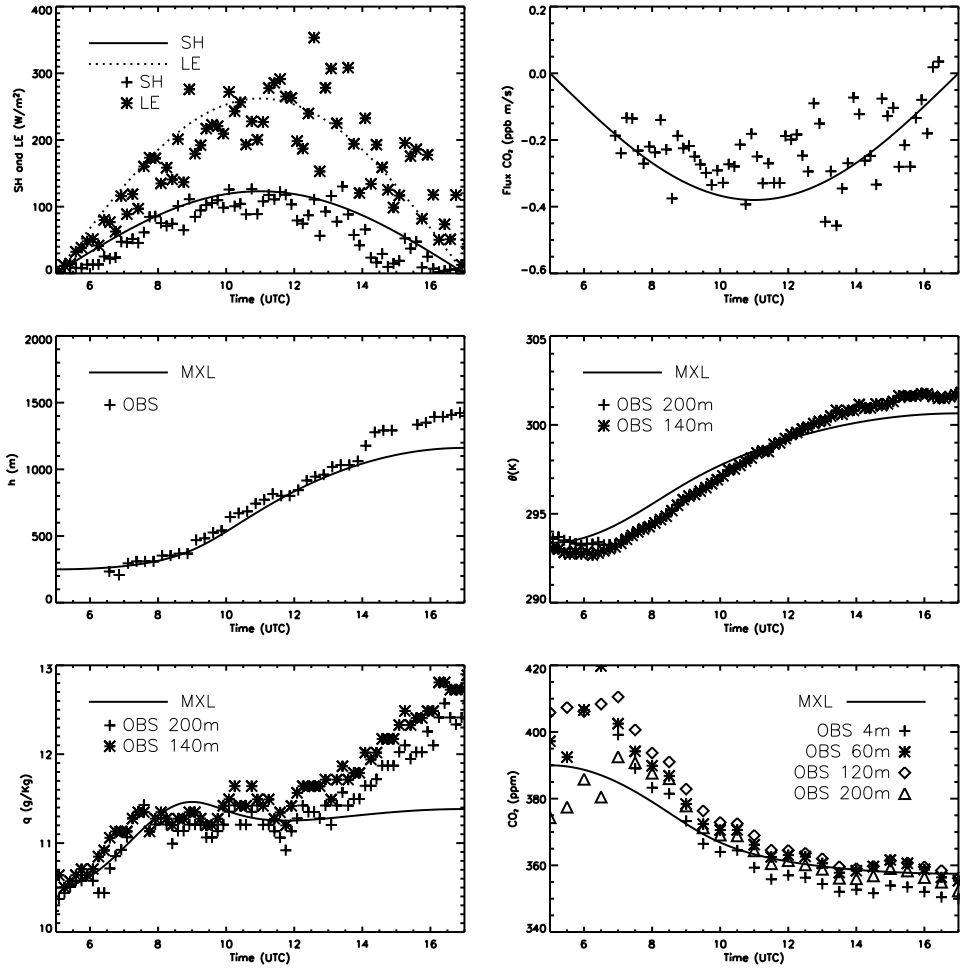

Figure 1: Diurnal evolution of the (a) surface fluxes, (b) carbon dioxide flux, (c) boundary layer height, (d) virtual potential tempartaure, (e) specific moisture and (f) carbon dioxide mixing ratio.

3 Case 2: 25^{th} September 2003

Table 2 shows the initial and boundary conditions for the Cabauw case for 25^{th} September 2003.

Table 2. The initial and prescribed values used for the mixed-layer model to calculate the boundary layer height, the thermodynamic and the carbon dioxide evolution on 25^{th} September 2003 at Cabauw.

Boundary layer height at 6 UTC	120 m
Large scale subsidence velocity (w_s)	0.0 m/s
Potential temperature	
$<\theta>$ at 6 UTC	285.0 K
$\Delta\theta$ at 6 UTC	1.2 K
$\overline{(w\theta)}_o$	0.11 $\sin(\frac{\pi t}{t_d})$ K m/s
β_{θ_v}	0.4
γ_θ	0.006 K/m
Specific humidity	
$<q>$ at 6 UTC	4.5 (g/Kg)
q_{FT}	3.5 (g/Kg)
Δq at 6 UTC	-1.0 (g/Kg)
$\overline{(wq)}_o$	0.083 $\sin(\frac{\pi t}{t_d})$ (g/Kg) m/s
γ_q	0 (g/kg)/m
Carbon dioxide	
$<co_2>$ at 6 UTC	410.0 ppm
co_{2FT}	378.0 ppm
Δco_2 at 6 UTC	-32.0 ppm
$\overline{(wco_2)}_o$	-0.13 $\sin(\frac{\pi t}{t_d})$ (ppm) m/s
γ_{co_2}	0 ppm/m

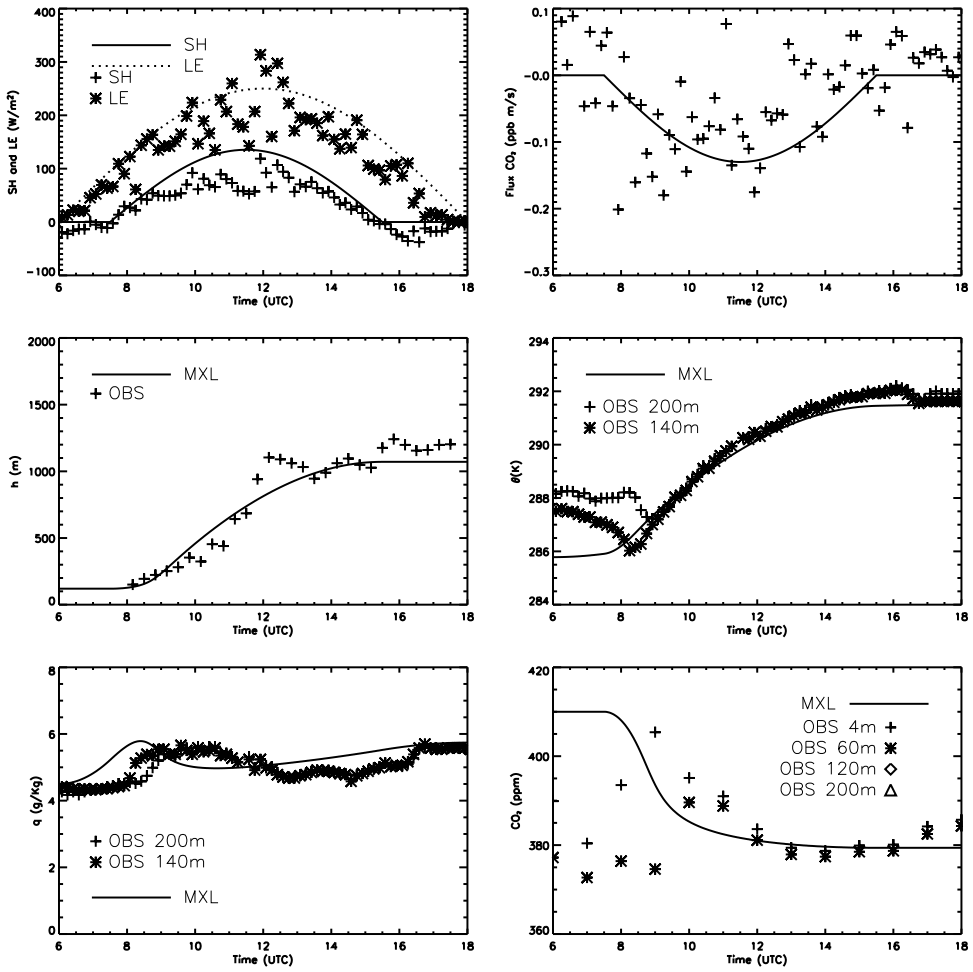

Figure 2: Diurnal evolution of the (a) surface fluxes, (b) carbon dioxide flux, (c) boundary layer height, (d) virtual potential tempartaure, (e) specific moisture and (f) carbon dioxide mixing ratio.

References

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