Numerical simulations of 1st and 2nd July with mixed-layer model and large eddy simulation
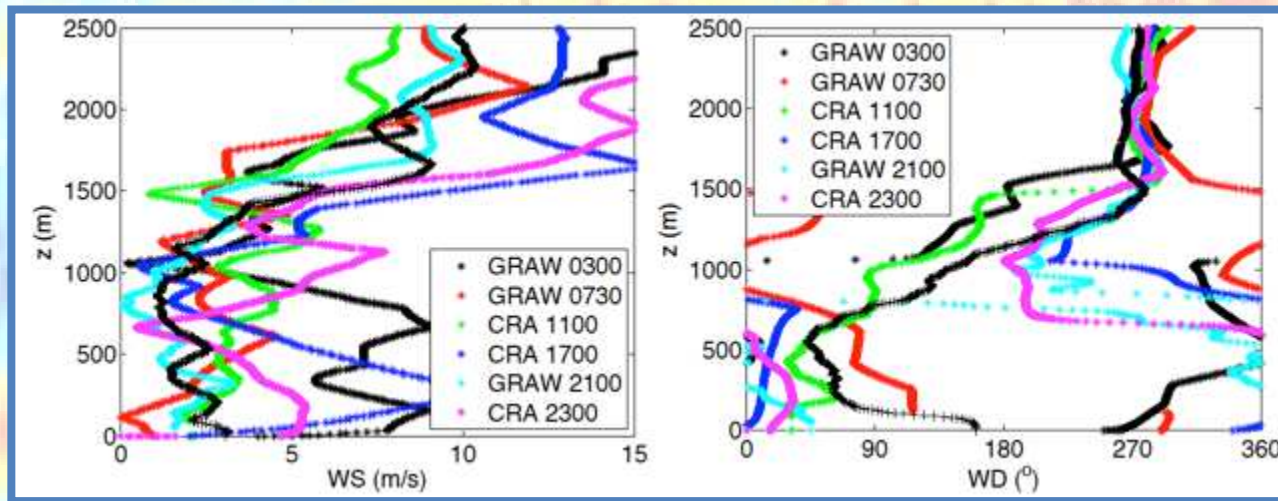
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Motivation

- To analyze by using observations MXL model the main physical phenomena that drives the boundary layer growth during two IOPs.

UPC

01st July 2012

- **Summary of general conditions:** nice weather, **no clouds**, **weak wind N** turning E in the low levels, W above, 24°C in Lannemezan during daytime.

1st July 2012

- **MXL and LES Initial Conditions:**

$zi_0 = 200.0$ m

Subsidence $= 0$ s^{-1}

$w\theta_{smax} = 0.08$ K m/s

$\gamma_\theta = 0.005$ K/m

$\theta_0 = 289.5$ K

$\Delta\theta = 1$ K

$wq_{smax} = 0.06$ (g/kg) m/s

$\gamma_q = -0.00035$ (g/kg)/m

$q_0 = 7$ g/kg

$\Delta q = -1$ g/kg

$q_{adv} = 0$ (g/kg)/h

$\theta_{adv} = 0.8$ K/h

1ˢᵗ July 2012

- <u>LES domain information:</u>
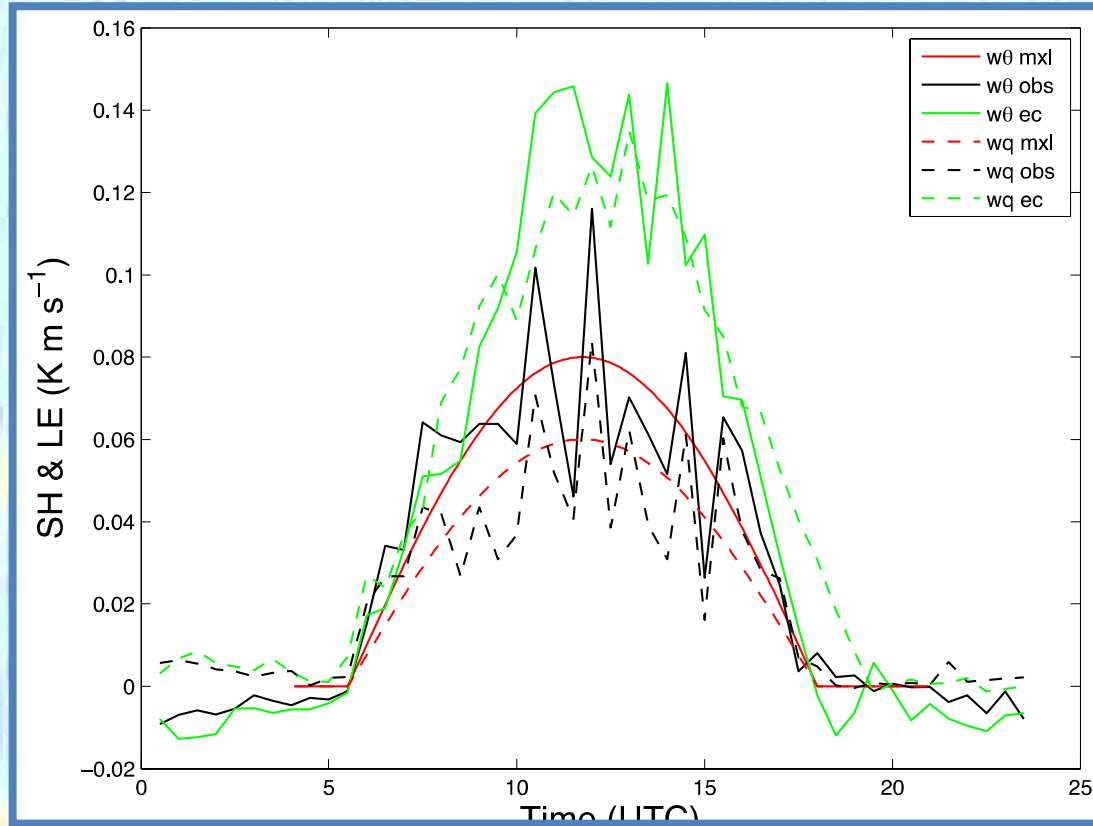
  256 points 3 axis

  12800 m x and y axis

  3000 m z axis

  No Advection/Subsidence

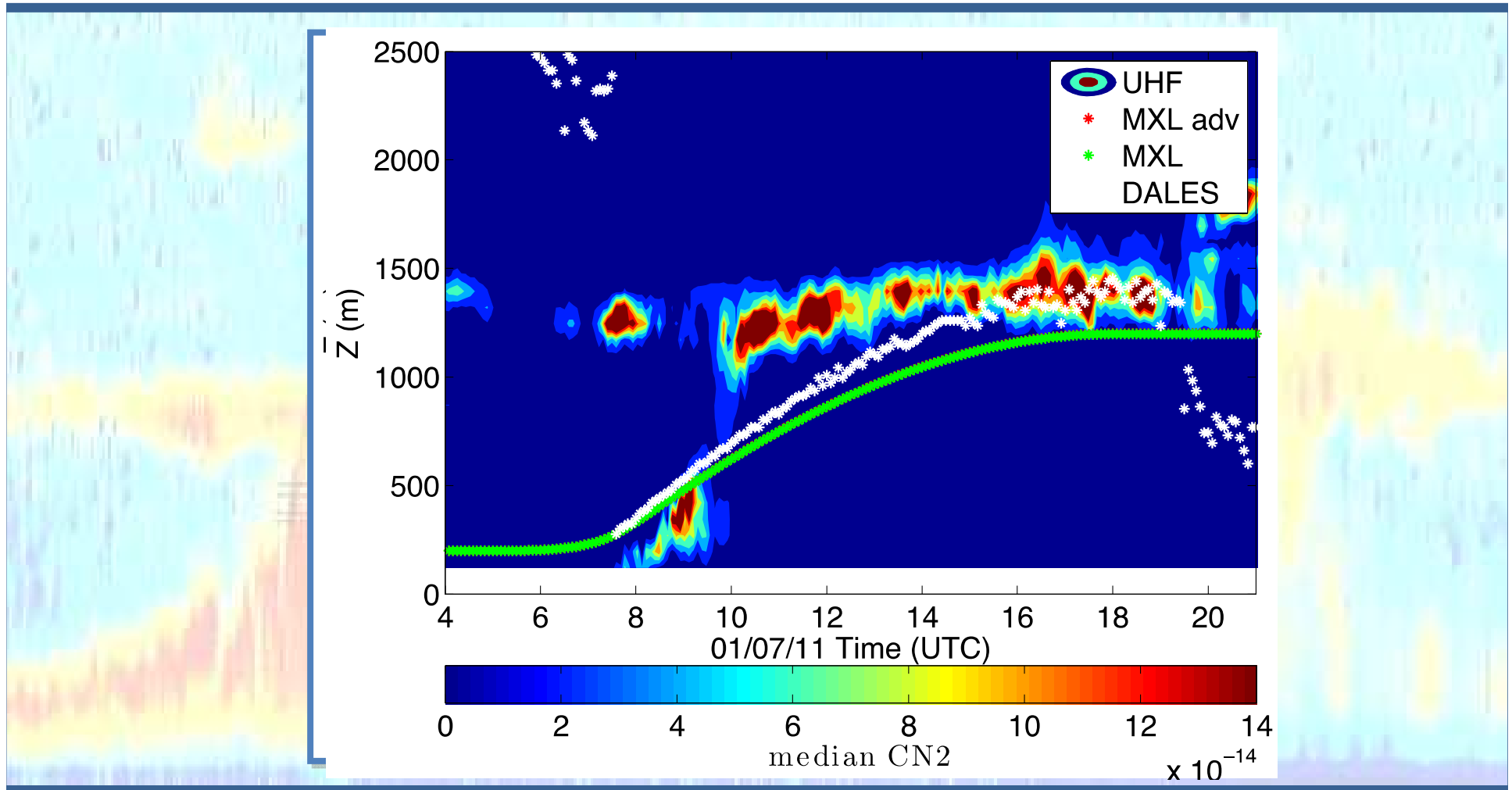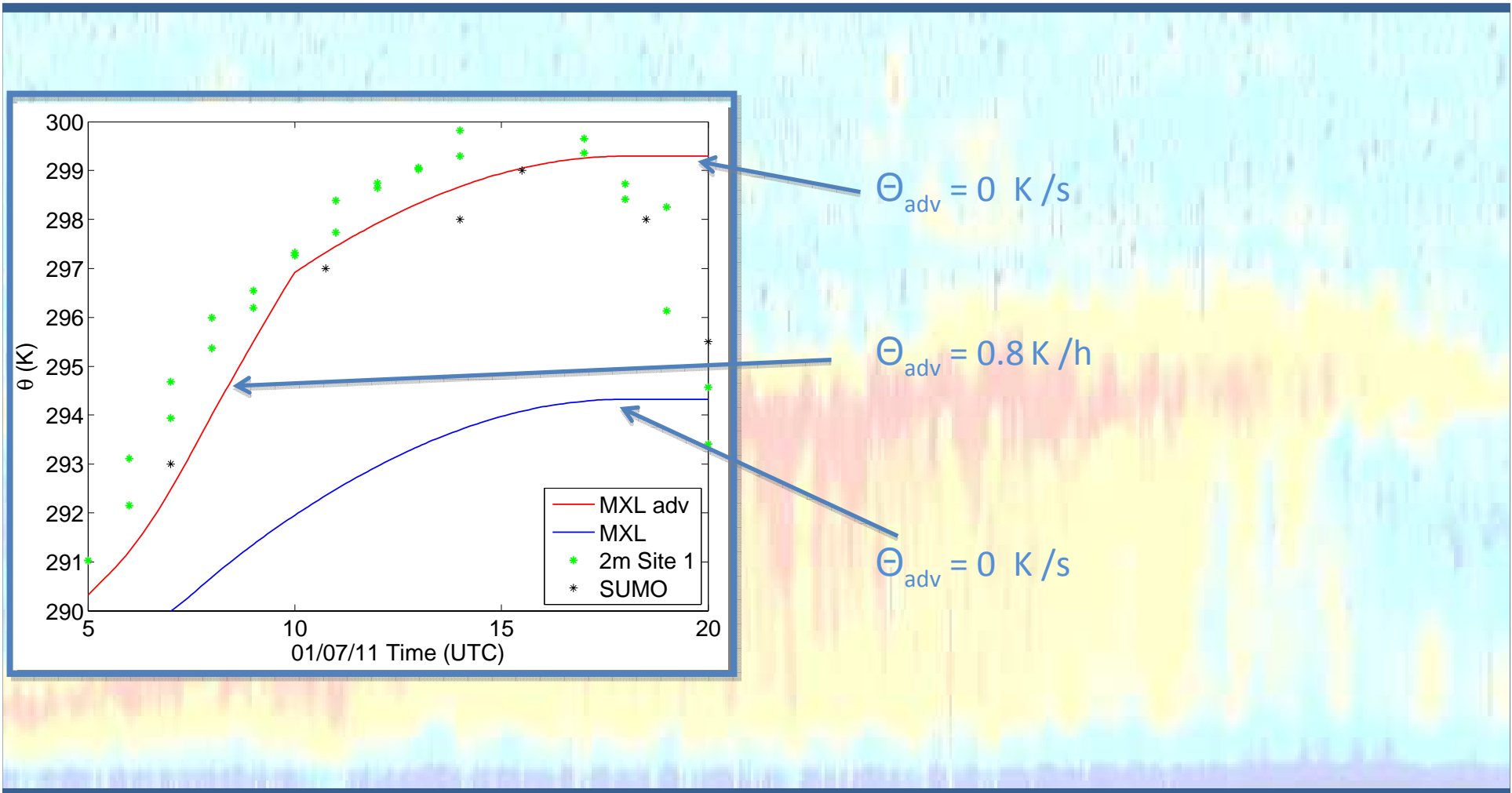# Surface Fluxes

$w\theta_{max}$ = 0.08 Km/s
Wq_{max} = 0.06(g/kg)m/s

Surface flux selected from 60 m tower (30 m)

MLH

Temperature

$\Theta_{adv} = 0$ K /s
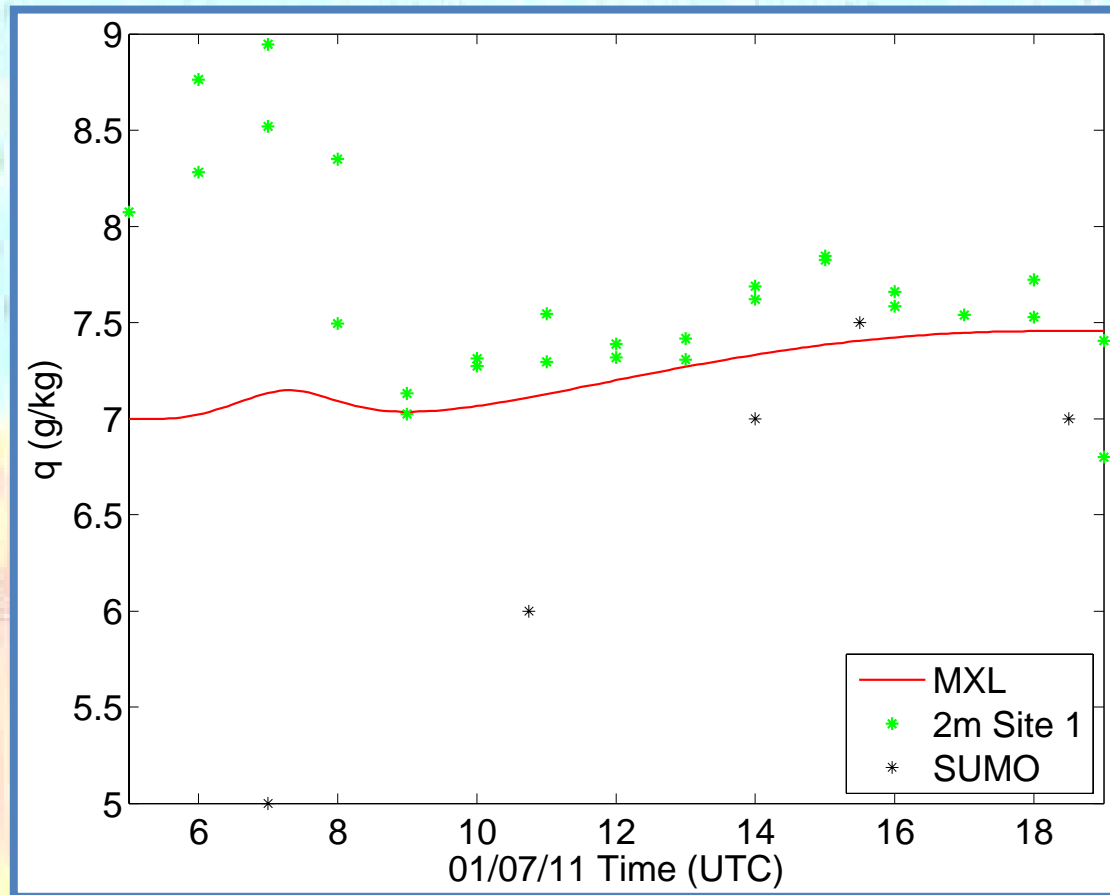
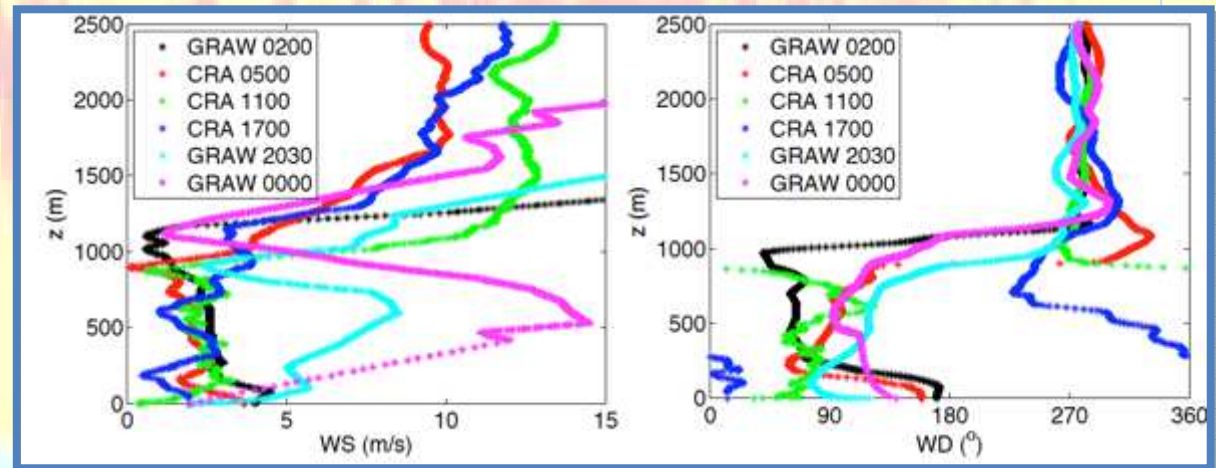$\Theta_{adv} = 0.8$ K /h

$\Theta_{adv} = 0$ K /s

Humidity

2ⁿᵈ July 2012

- **Summary of general conditions:** very nice day, **sunny** and **warm**, clear a very thin cloudy layer developing from the South in the evening **weak E wind** during the day.

2nd July 2012

- **MXL and LES Initial Conditions:**

$zi_0 = 200.0$ m

Subsidence $= 0.5 \times 10^{-5}$ s^{-1}

$w\theta_{smax} = 0.11$ K m/s

$\gamma_\theta = 0.004$ K/m

$\theta_0 = 295$ K

$\Delta\theta = 5$ K

$wq_{smax} = 0.076$ (g/kg) m/s

$\gamma_q = -0.00015$ (g/kg)/m

$q_0 = 7$ g/kg

$\Delta q = -1$ g/kg

$q_{adv} = 0.1$ (g/kg)/h

$\theta_{adv} = 0$ K/h

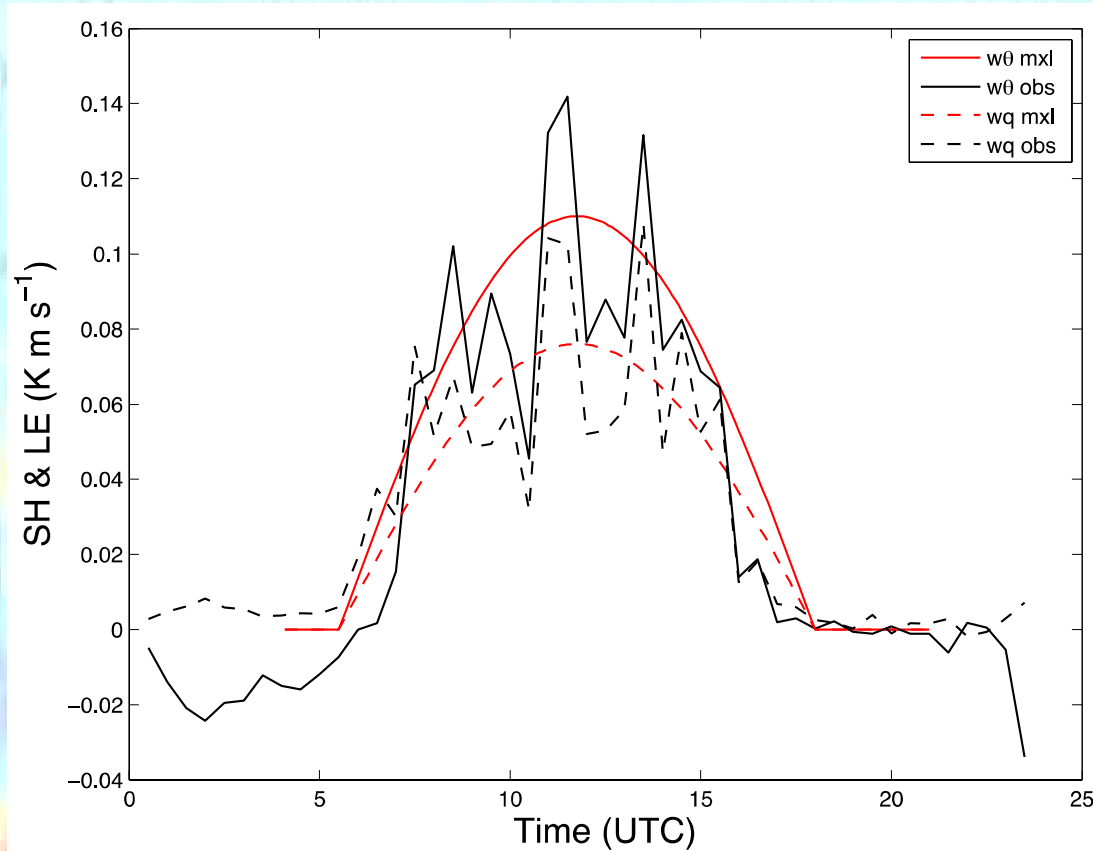UPC

2nd July 2012

- ## LES domain information:

  256 points 3 axis

  12800 m x and y axis

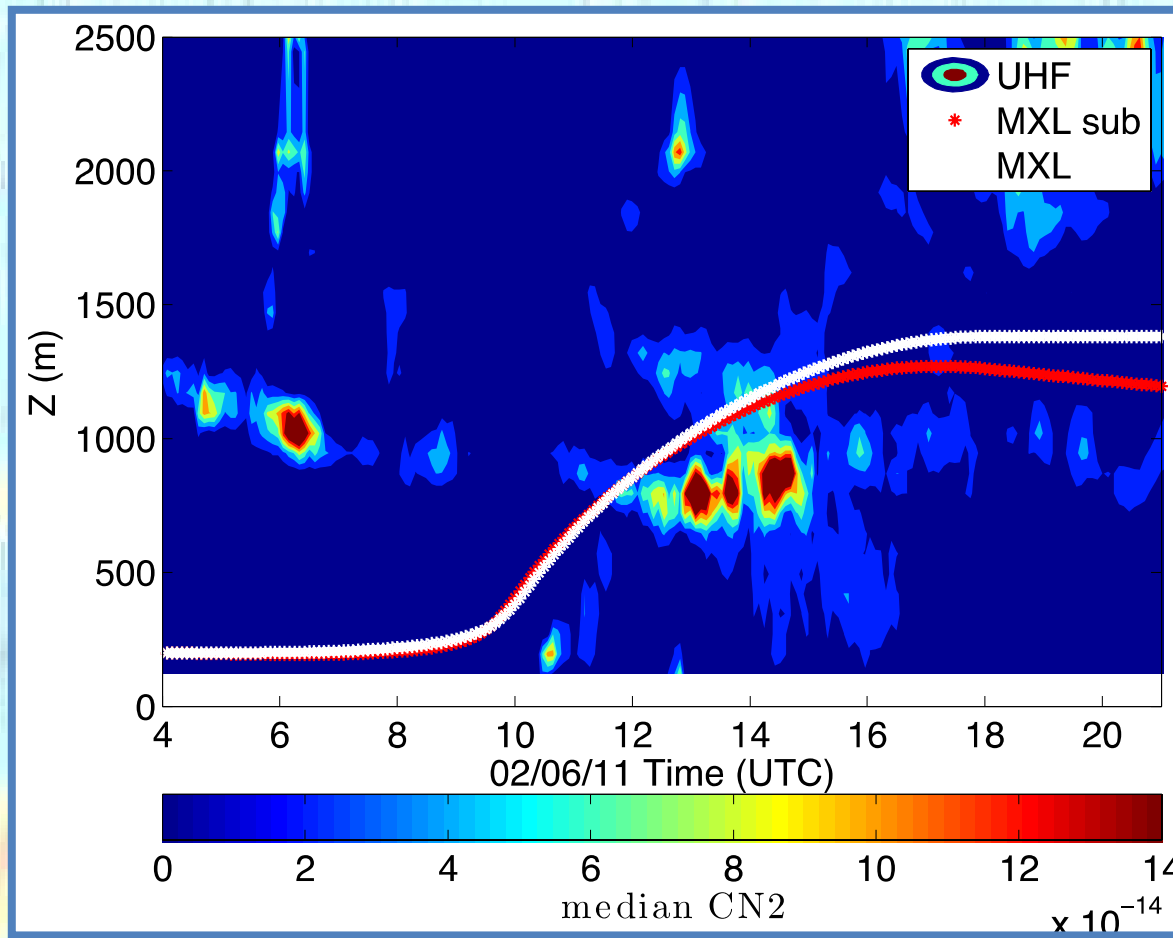 3000 m z axis

  No Advection/Subsidence

UPC

Surface Fluxes

$W\theta_{max} = 0.11$ Km/s
$Wq_{max} = 0.076$(g/kg)m/s

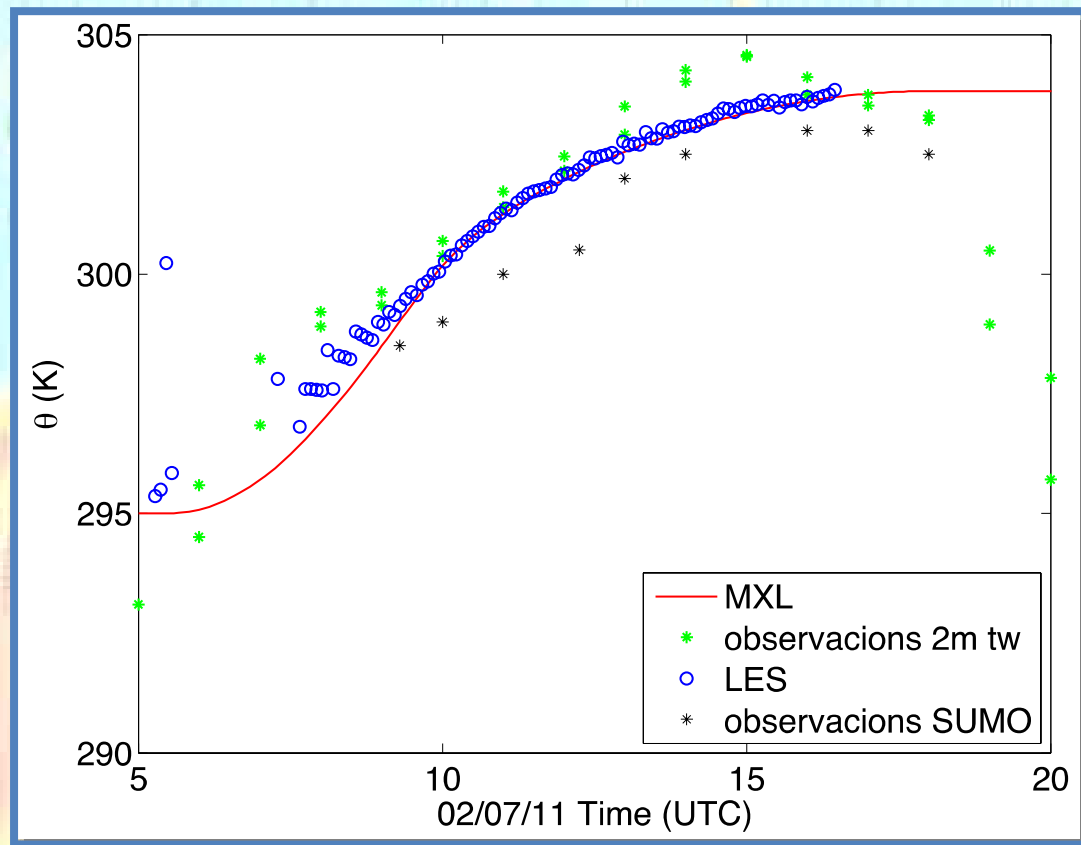Surface flux selected from 60 m tower (30m)

UPC

MLH

Temperature
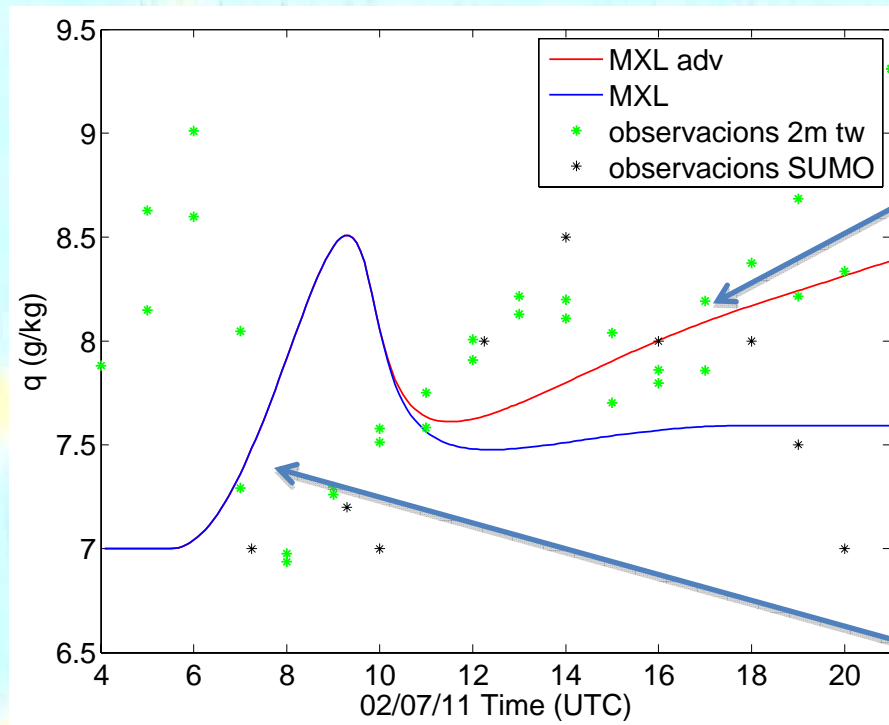
Humidity

Conclusions

- During these two days …
  - Surface Flux are not enough to explain the growth of the boundary layer neither the temperature or humidity evolution.
  - Advection/subsidence are needed.