I/ The field campaign:

From 14 June to 8 July 2011

On the Instrumented site of Lannemezan, (Centre de Recherche Atmosphérique, Laboratoire d’Aérologie) in the South-West of France

The afternoon-evening transition: presentation of the BLLAST field campaign and a first evaluation of NWP models

F. Couvreux, M. Lothon, F. Lohou, E. Bazile, Y. Seity, B. Sintini, F. Guichard, D. Legain and the BLLAST team

BLLAST OBJECTIVES:
- to understand the evolution of the intensity and scales of the turbulence, and, to determine the role of different processes (PBL entrainment, mesoscale circulations…)
- to identify the role of surface heterogeneity in this transition
- to evaluate the ability of NWP in reproducing this afternoon-evening transition

Issues:
- Only few numerical studies and very few observations
- Close to/Beyond the edge of scaling laws and boundary layer definitions
- Importance of Transitional aspects
- Competition of various weak forcings (advection, subsidence, radiation…)

I/ First evaluation of Numerical Weather Prediction Models:

Models:
- AROME: 2.5km resolution, no deep convection scheme but still shallow convection scheme (Seity et al., 2011)
- ARPEGE: 10 km resolution
- ECMWF: ~15km resolution

Observations:
- Radiosondes: Radiosoundings were launched at site 1 (MODEM or GRAW) or site 2 (VAISALA) at different times during the day
- Radiative fluxes, turbulent fluxes and near surface atmospheric variables: observed at the 60m tower at site 1 and the corn and moor sites at site 2

General behaviours:
- ECMWF has a dry bias in term of relative humidity near the surface. It also tends to produce slightly too large boundary-layer height during the day.
- ARPEGE has a strong subsidence not observed.
- AROME tends to correctly represent the transition in the low levels

A focus on 1st and 2nd of July: clear sky days:

During these two days, clear skies were observed and simulated.

The afternoon flow is mainly from North-West.

ARPEGE tends to be too cold at night but the afternoon transition present a more realistic evolution than AROME that has a too slow decrease of temperature at this time.

CONCLUSION:

A large dataset has been gathered to document the afternoon-evening transition with different instrumental techniques with a total of 12 IOPs covering different synoptic conditions.

Some systematic biases in the NWP models exist with a general better behaviour for the high resolution model.

References:

BLLAST web site: http://bllast.sedoo.fr


The BLLAST Team:

Most of the pictures are from Patrick Dumas @ Look at Science / BLLAST

Location of the different sites and zone of exploration of Unmanned Aerial Systems (UAS) and aircraft.

Land-use around site 1 and site 2

Vertical structure of the PBL:
- radiosoundings standard and frequent (2 balloons in order to get back the sonde, retrieval rate =80%, 65 soundings with 20 probes)
- UHF, doppler and aerosol lidars, telemeters, sodar, radiometers
- Meteorological tower -> 65m
- UAS profiles

Turbulence measurements:
- Aircrafts
- UAS
- tethered balloon with a turbulent probe

Surface Layer Heterogeneities:
-2 Tethered balloons with sondes at similar heights over two large vegetated patches (meadow and corn)
- Meteorological and Flux stations over these two patches and a forest patch
- Soil temperature and moisture measurements

Radiation divergence:
- Radiative tower -> 10 m
- Skin flow mast

New instrumental devices tested during this campaign are indicated in red

A total of 12 IOPs:
Covering different synoptic conditions: heat-wave, North-Westery flow, Easterly flow, North-Eastery flow and North flow
Clear sky or cumulus (post-frontal situations)

The exploration needs and associated instruments:

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Summary table of IOPs with details of aircraft, UAV and radiosoundings operations

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