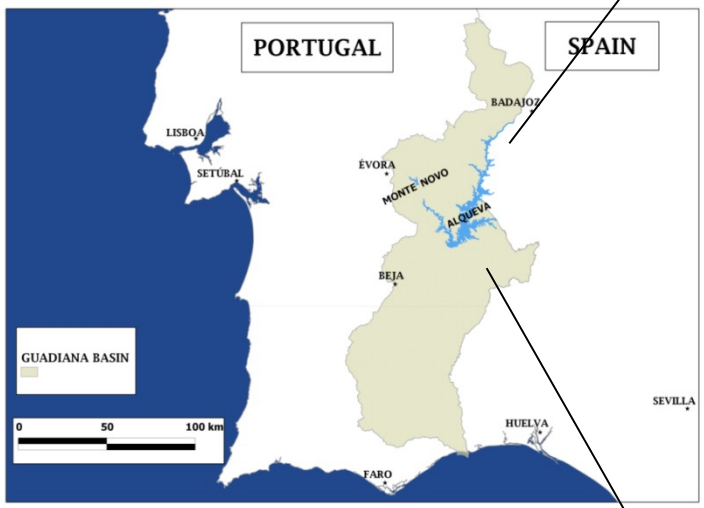
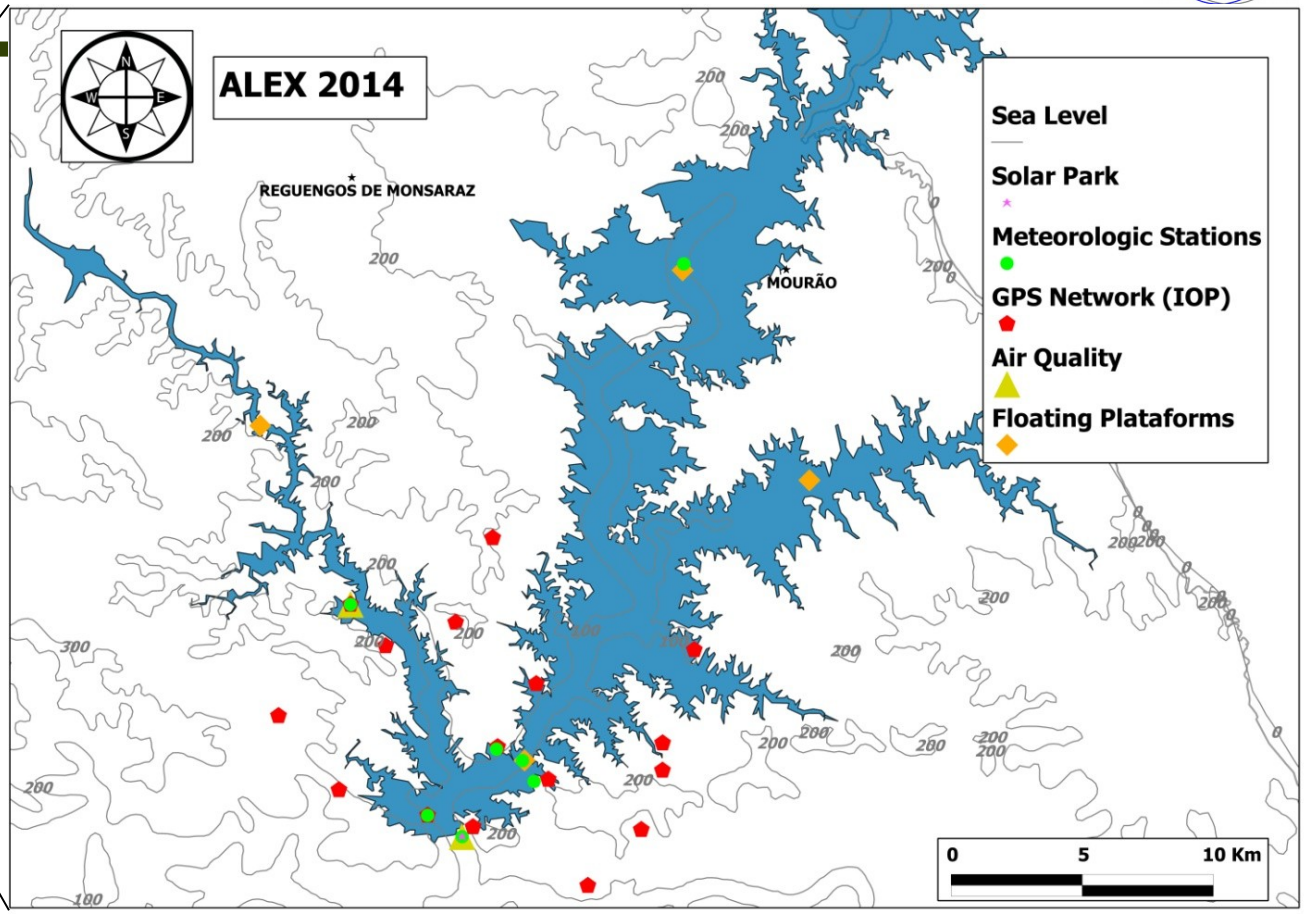
La circulation atmosphérique dans le sud du Portugal et l'effet du réservoir d'Alqueva. Cas d'étude ALEX 2014

Rui Salgado, Carlos Policarpo
et Miguel Potes
Instituto de Ciências da Terra (ICT)
Universidade de Évora, Portugal

5 November 2015 Toulouse

ALEX2014 field campaign





www.alex2014.cge.pt

The **ALqueva hydro-meteorological EXperiment**, ALEX 2014

- An integrated field campaign with measurements of chemical, physical and biological parameters around the Alqueva reservoir;
- With the purpose of studding the lake-atmosphere interactions
- From June to September and comprised a three days Intensive Observation Period (IOP) from 22 to 24 July.

ALEX2014
ALqueva hydro-meteorological EXperiment

UNIVERSIDADE DE ÉVORA

EDIA

ICT

Include:

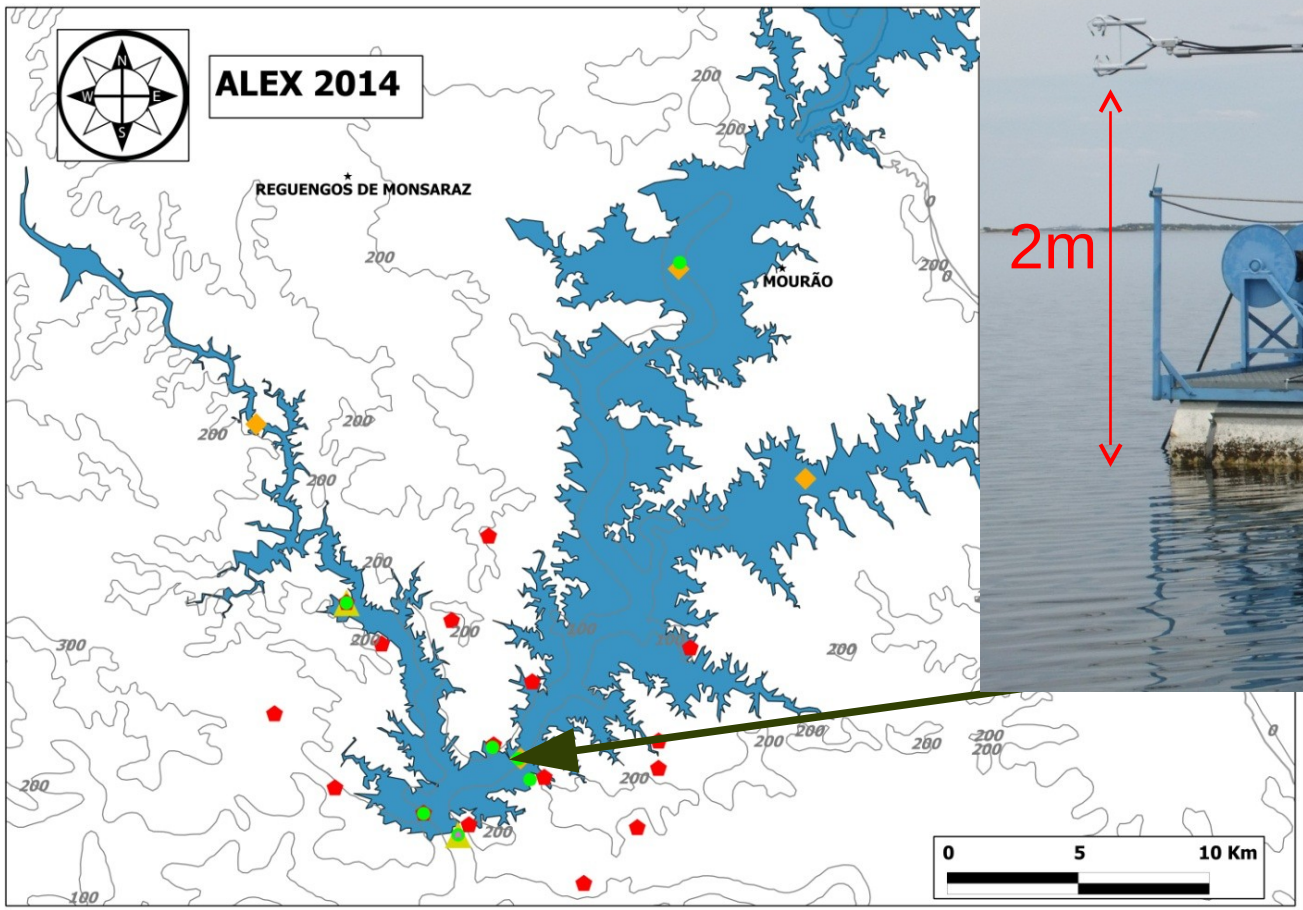
- Meteorological and flux measurements
- Solar resource
- Water quality – Chemical and phytoplankton composition
- Inwater solar attenuation
- Air quality - Atmospheric, aerosols and gases measurements
- Water vapour mapping through GPS network (IOP)
- Radiossondes with Meteorology and Atmospheric Electricity components (IOP)
- Night darkness

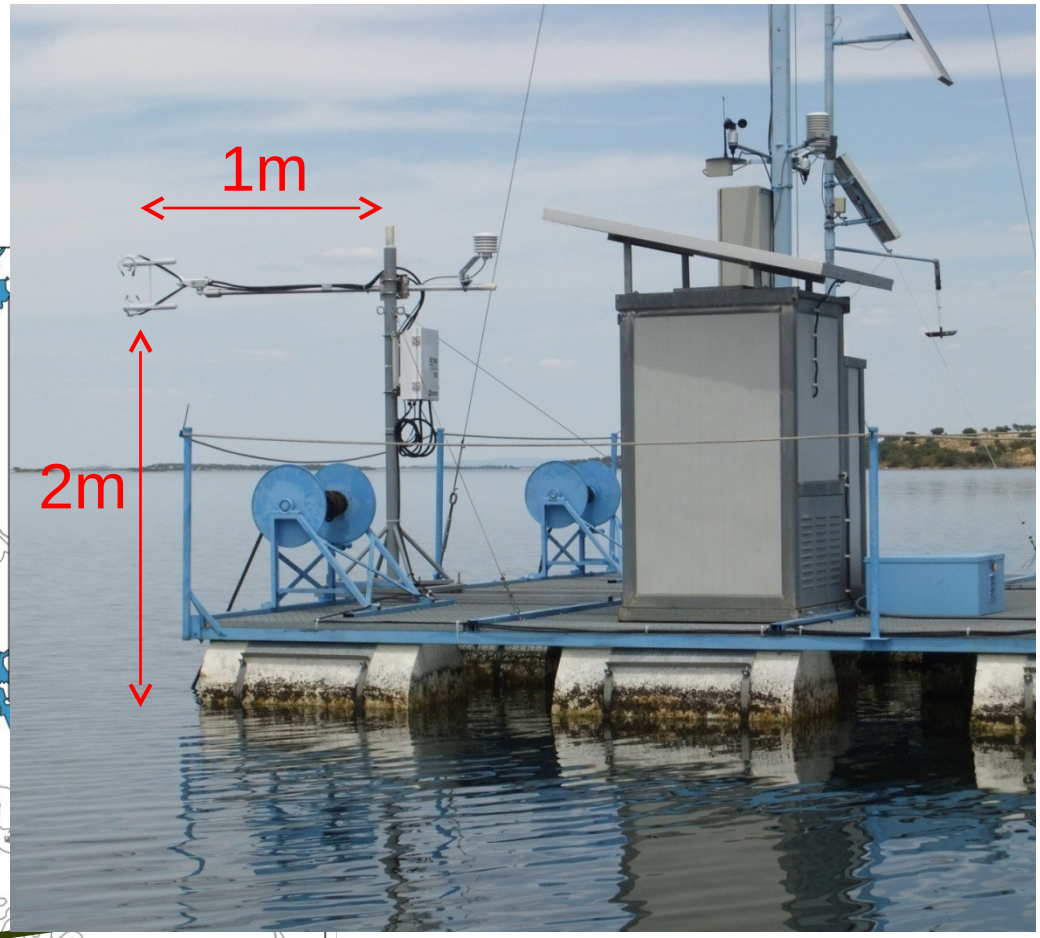
Alqueva Region:

- Köppen classification: Csa
- Annual precipitation: 570 mm
- Number of days above 30°C: 77.1

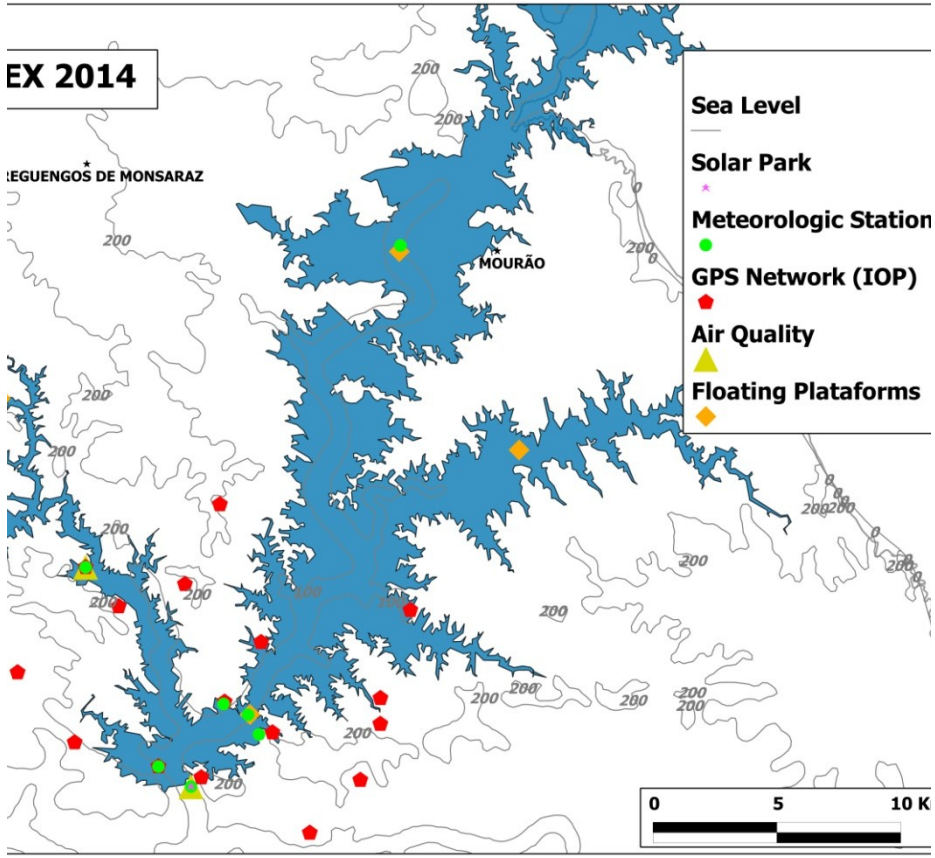
Eddy covariance measurements

- Energy fluxes (radiative and sensible and latent heat), CO2 and H2O over the reservoir





Weather stations



- near surface meteorological stations: temperature, humidity, wind, precipitation and pressure.
- 7 automatic weather stations were in place
  - upwind and downwind

Intensive Observation Period

IOP: 22, 23 and 24 of July 2014, during which:

- 18 meteorological balloons with meteorological radiosondes were launched.
- every 3 hours

- 2 daily radiosondes were launched in Lisbon (00 and 12 UTC (by IPMA)

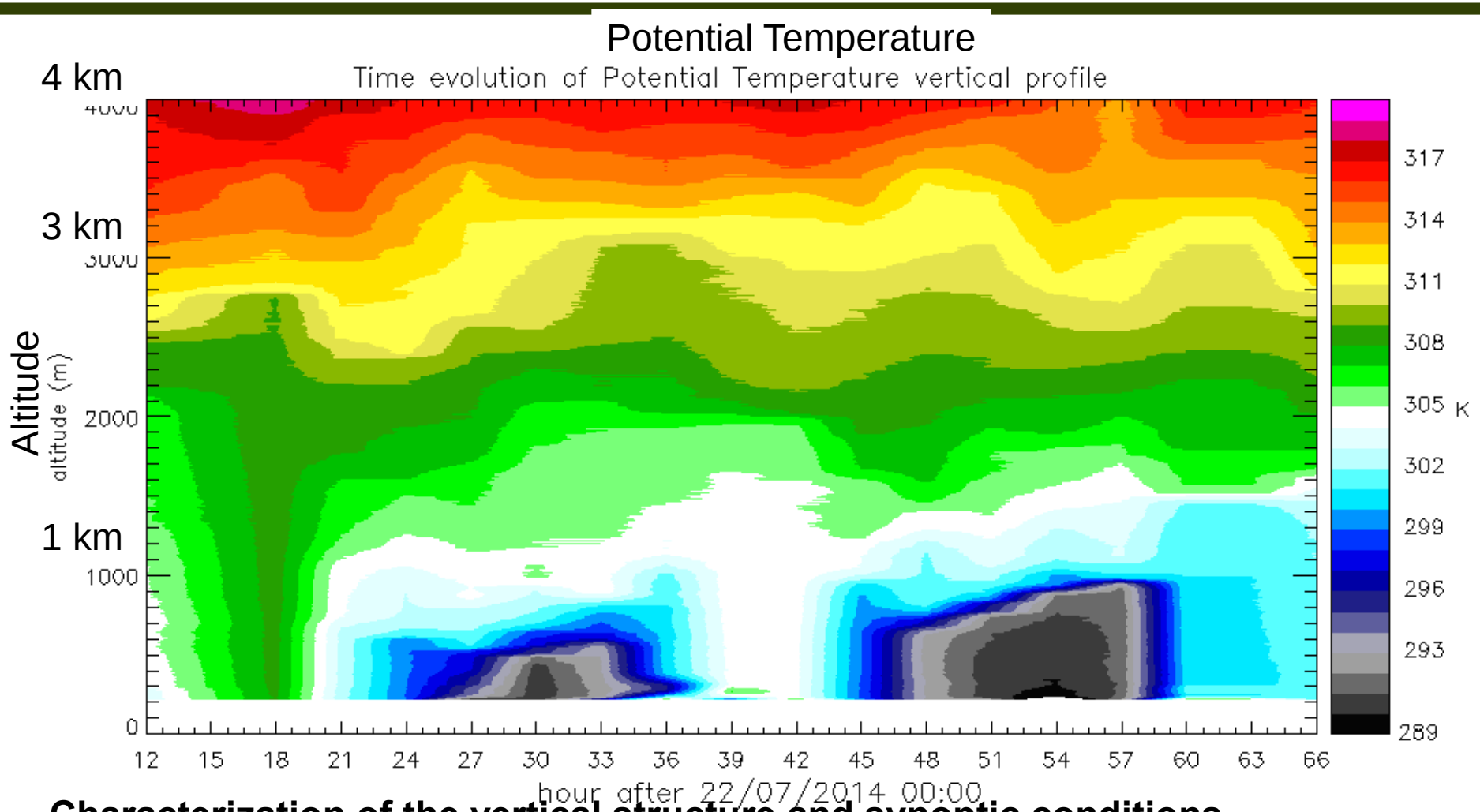
ALEX 2014 Database

Index of ftp://nas.cge.uevora.pt/alex2014_dados/

Up to higher level directory

Name	Size	Last Modified
Coluna de Água		02/06/2015 03:32:00 PM
Composição da Atmosfera		02/12/2015 04:01:00 PM
Dados Espectrais (FieldSpec)		02/06/2015 02:52:00 PM
Dados Hidrológicos		02/06/2015 02:55:00 PM
Dados IRGASON		02/12/2015 03:56:00 PM
Dados Meteorológicos		02/06/2015 03:10:00 PM
Dados de Satélite		02/07/2015 03:35:00 PM
Electricidade Atmosférica		02/07/2015 03:33:00 PM
Luminosidade		02/06/2015 02:41:00 PM
Radiação Solar		02/07/2015 03:35:00 PM
Radiossondagens		02/06/2015 02:53:00 PM
Radão		02/07/2015 03:34:00 PM
Sismologia		02/06/2015 02:47:00 PM

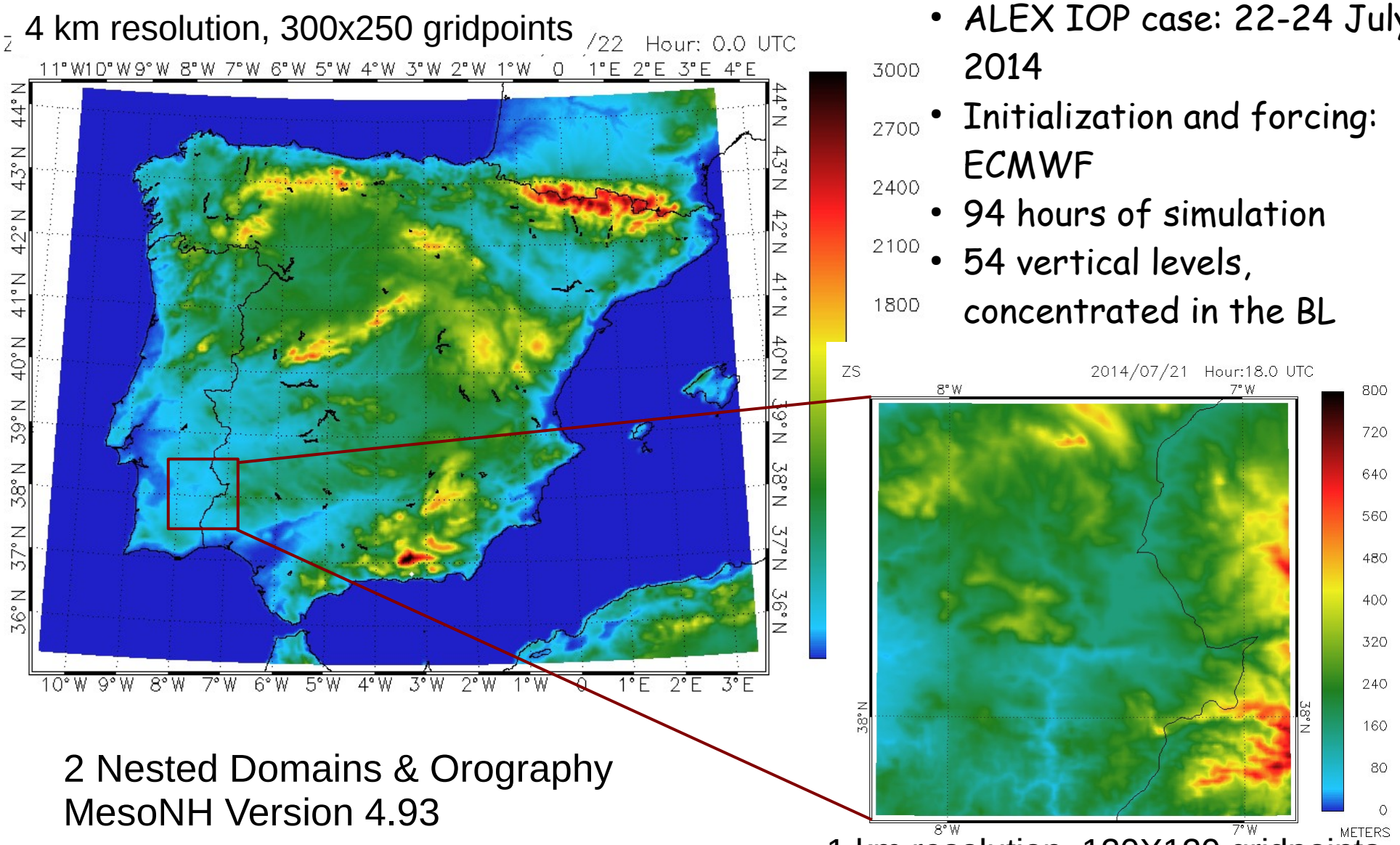
IOP Observed vertical structure



Characterization of the vertical structure and synoptic conditions

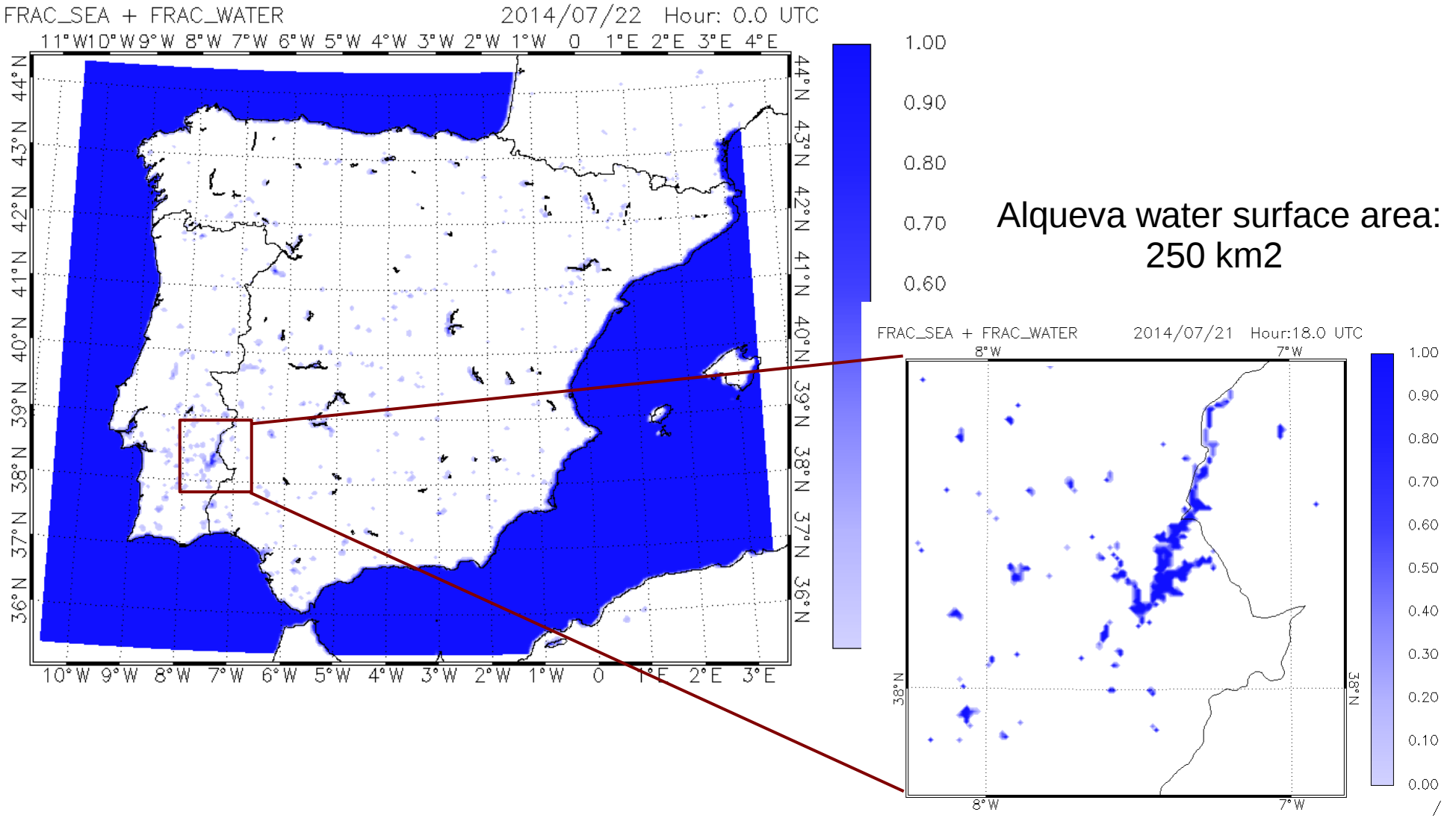
- Anticyclonic conditions
- Boundary layer well developed (more than 2500m deep in 1st day)
- Instable surface layer in the region (over land) with high values of sensible heat flux
- Near surface temperatures greater than 35ºC (1st day)

Setup of Meso-NH Simulations



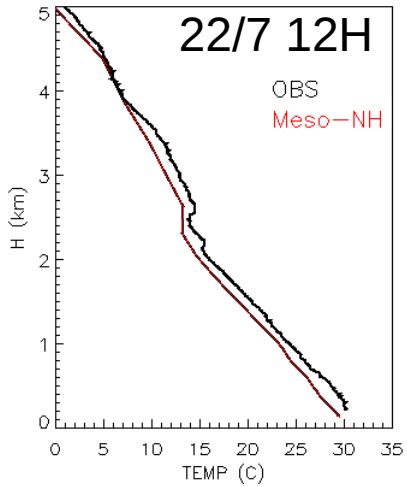
- ALEX IOP case: 22-24 July 2014
- Initialization and forcing: ECMWF
- 94 hours of simulation
- 54 vertical levels, concentrated in the BL

Numerical surface water fraction

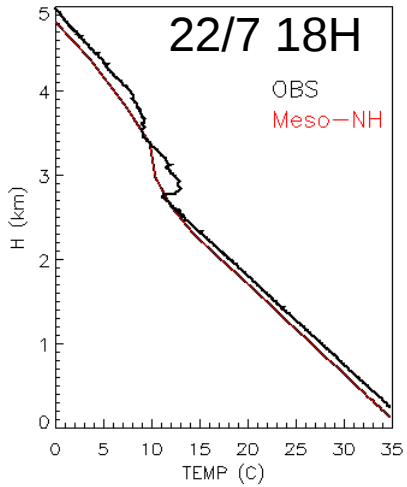


Validation against radiosondes - TEMP

Vertical Profil, ix: 64 iy: 48 2014-7-22 12 U



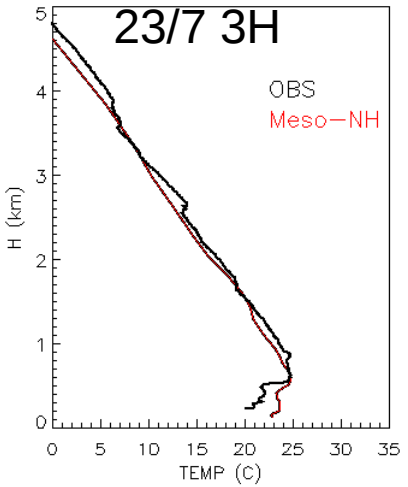
Vertical Profil, ix: 64 iy: 48 2014-7-22 18 UT



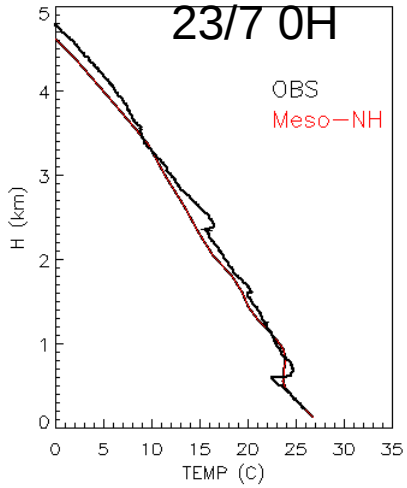
Temperature Profile 1st 5 km

- Good representation of the temperature during the day time, specially in the afternoon
- up to 00 H
- mixed boundary layer is well simulated

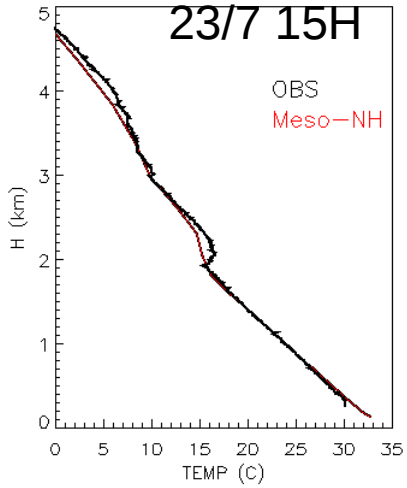
Vertical Profil, ix: 64 iy: 48 2014-7-23 3 UT



Vertical Profil, ix: 64 iy: 48 2014-7-23 0 U

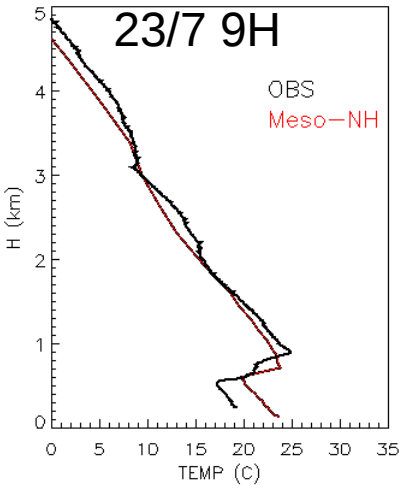


Vertical Profil, ix: 64 iy: 48 2014-7-23 15 UT

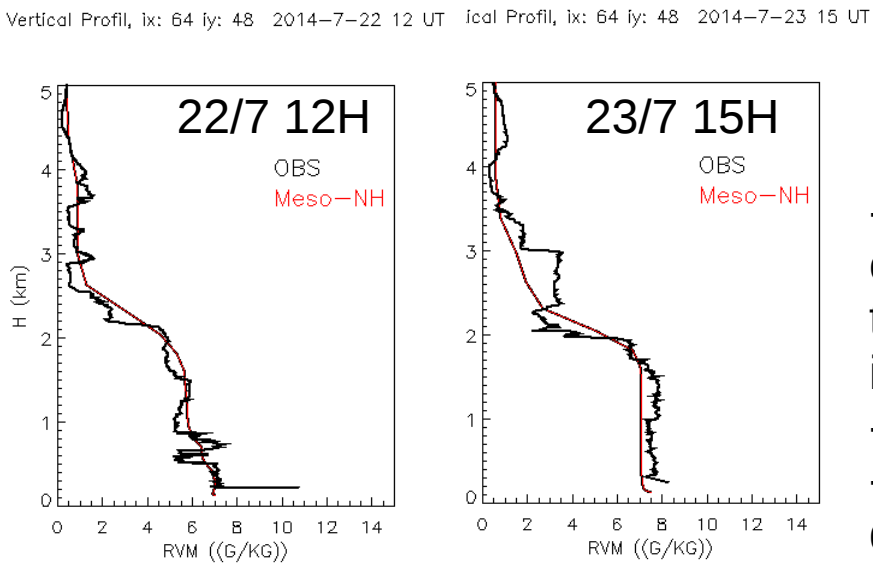


- Not so good representation of the temperature profile at night and morning (00 – to 09), specially in the first night.
- Meso-NH too hot near surface

Vertical Profil, ix: 64 iy: 48 2014-7-23 9 UT

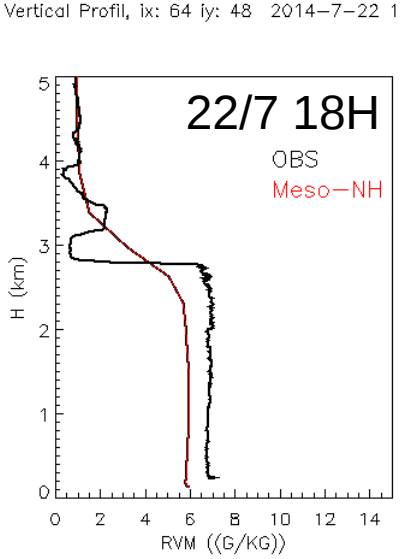


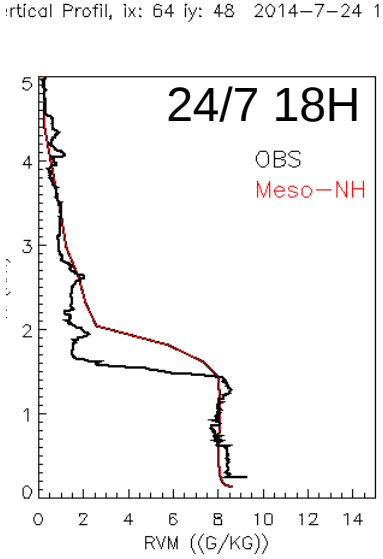
Validation against radiosondes - RV



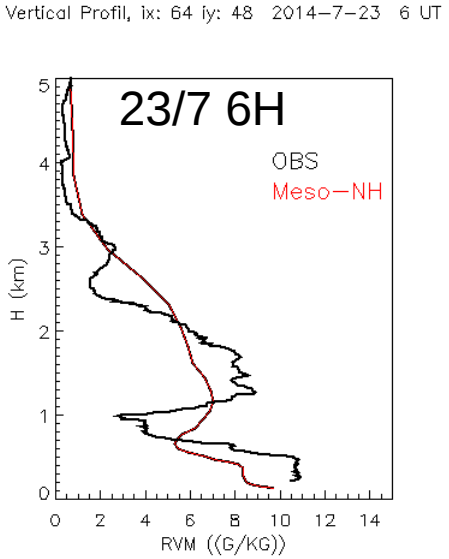
Moisture Profile 1st 5 km

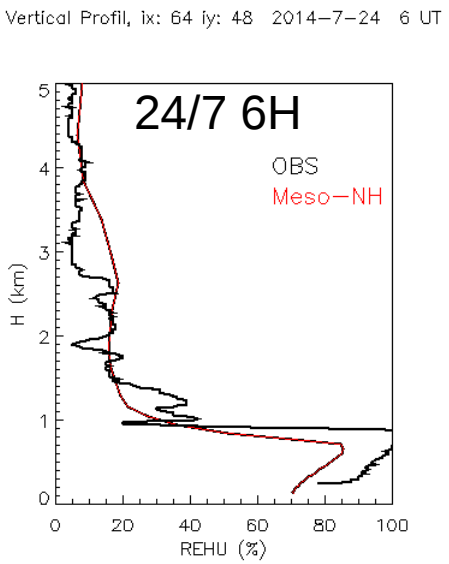
- Good representation of the moisture during the day time, specially in the afternoon,
- Meso-NH is drier
- and do not show a decrease as abrupt as in the obs.
- mixed boundary layer is well simulated





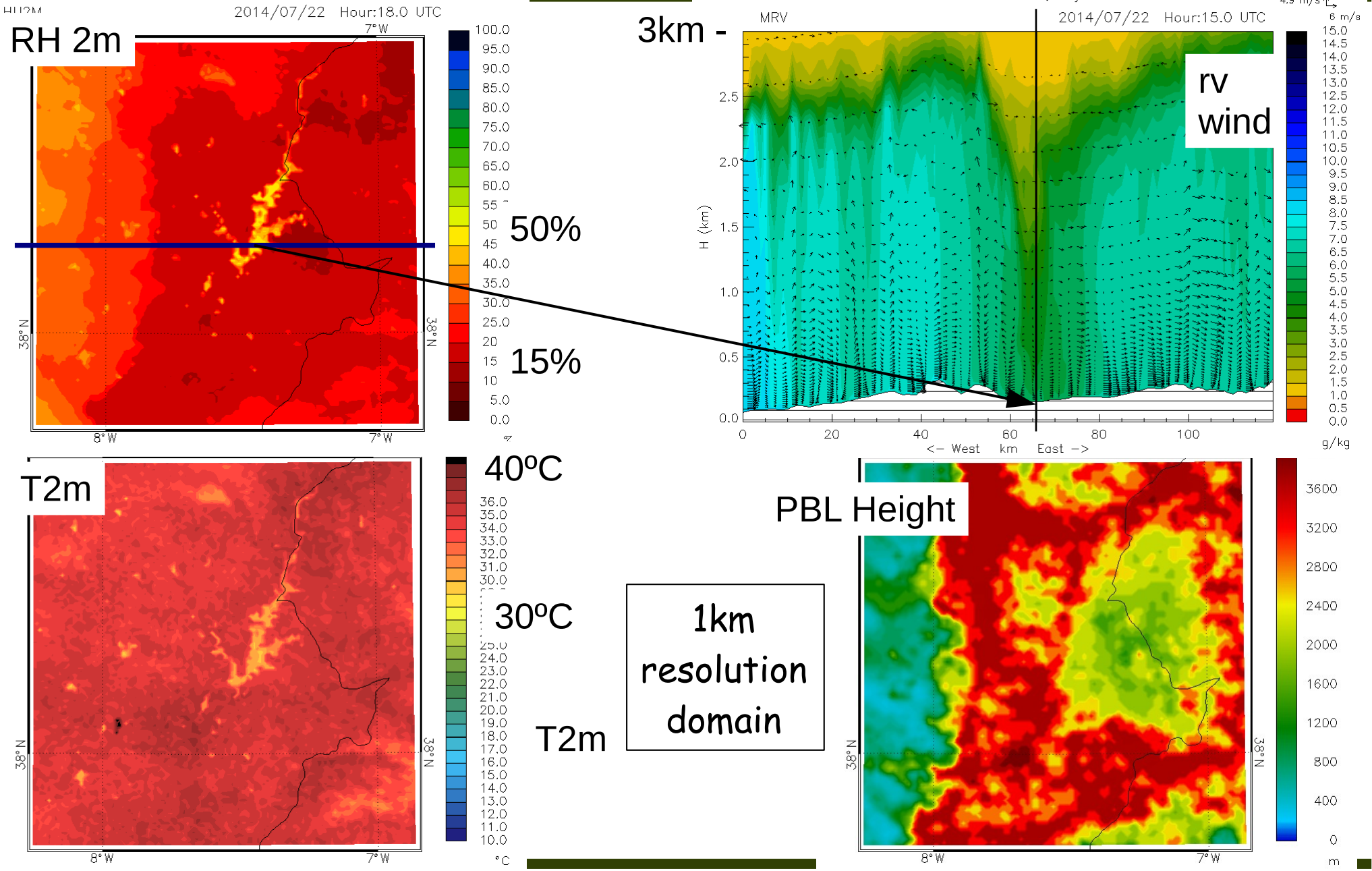
- Meso-NH indeed too dry near surface during the night



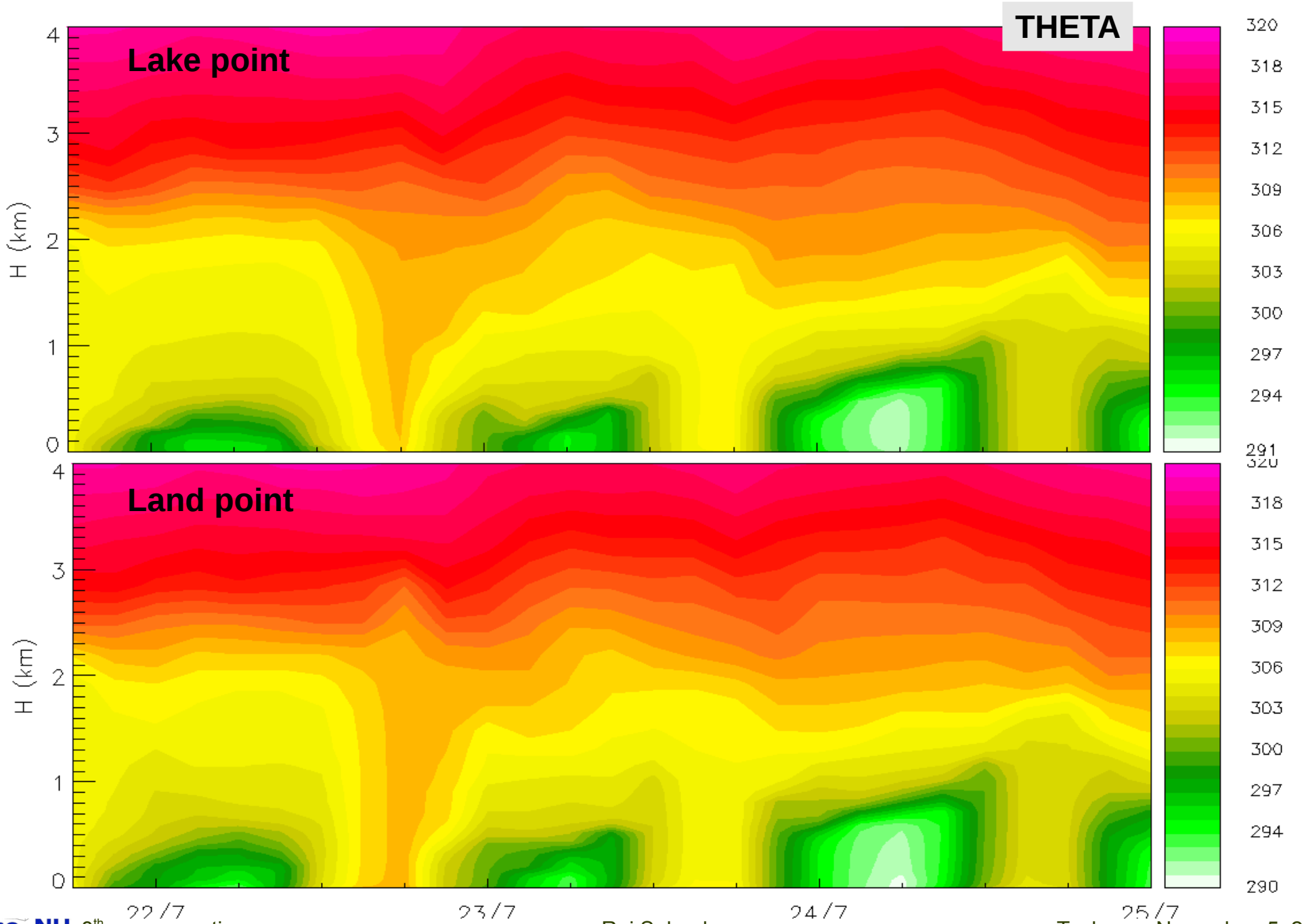


Simulation results: Examples

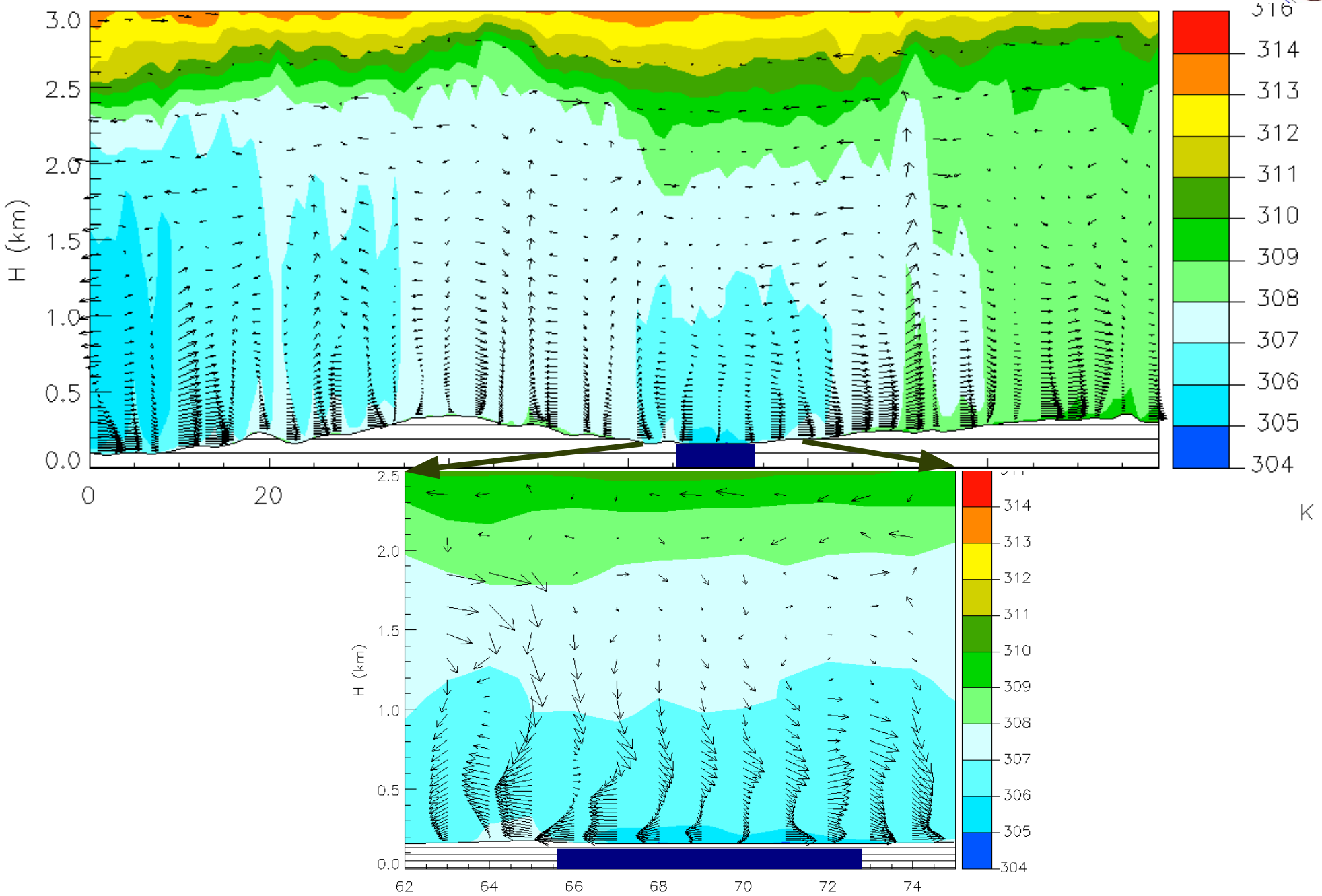
22/07/2014
18 TU



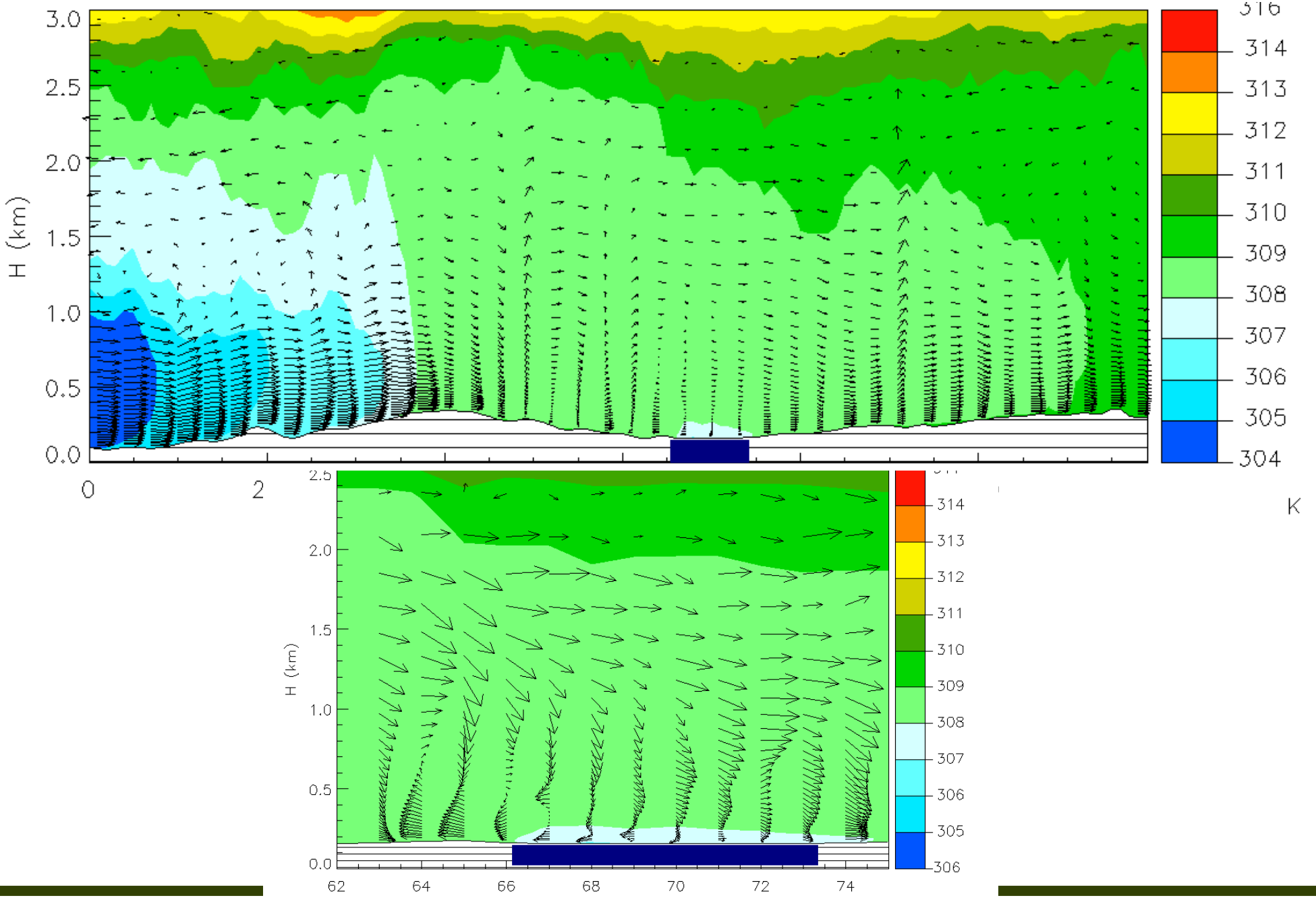
Time-height cross sections (Hovmoller)



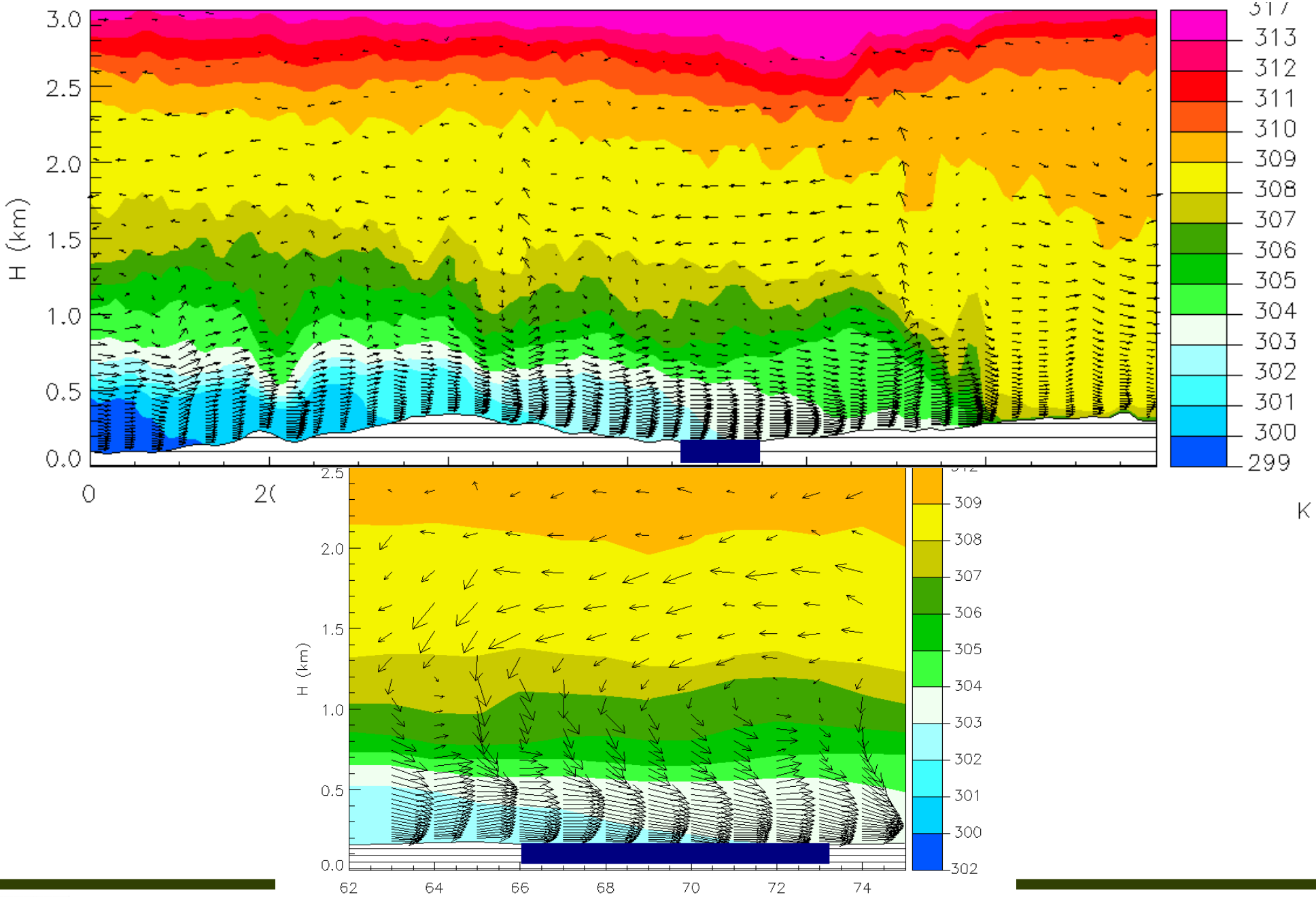
Lake breeze 15 TU



Lake breeze 18 TU

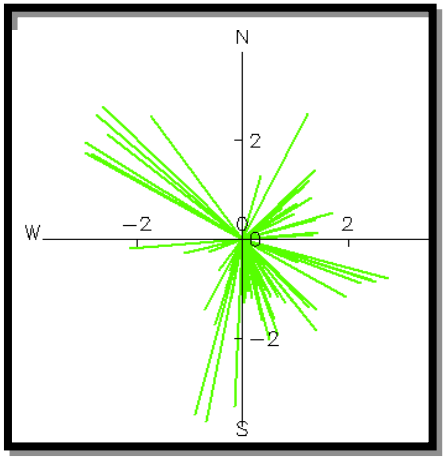


Sea Breeze 21 TU

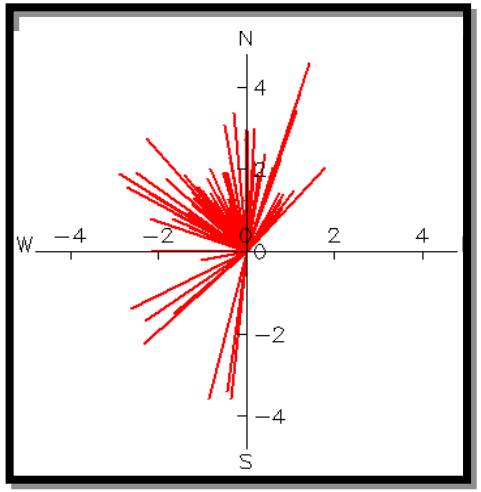


Observed lake breeze (FW days)

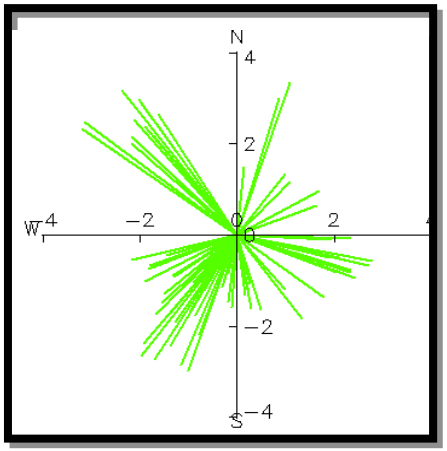
BAR:10-12 UTC

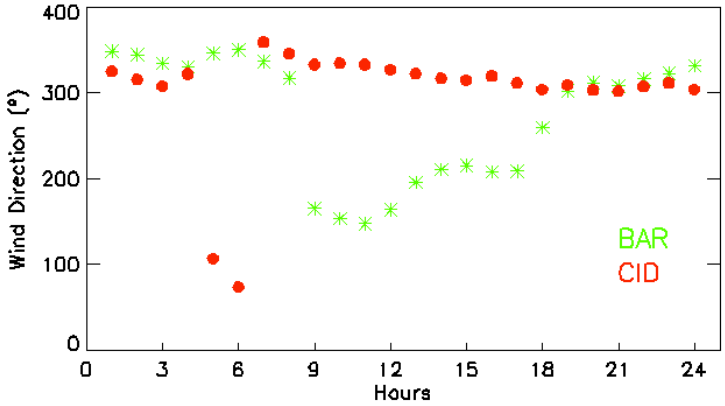


CID: 10-12 UTC

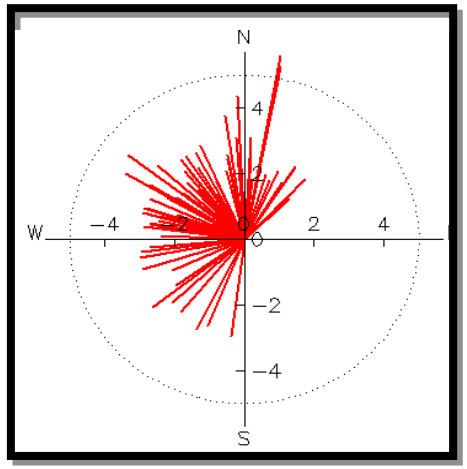


BAR:13-15 UTC





CID: 13-15 UTC



Conclusions

- ALEX 2014: A unique data-set of meteorological, hydrological and biological (water quality). 4 months (summer 2014)
  - http://www.alex2014.cge.uevora.pt
  - In particular the IOP 22-25 July 2014, well documented
  - Useful for studies on lake-atmosphere interaction under Mediterranean climate.
- Meso-NH at 1 km resolution represents the evolution of the boundary layer structure and its evolution.
  - Underestimation of the humidity in the boundary layer
- Lake affects the boundary layer at a regional scale
- Sea breeze is clearly visible in observations and in simulations