25th ALADIN Workshop & HIRLAM All Staff Meeting 2015
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ALADIN activities in Romania

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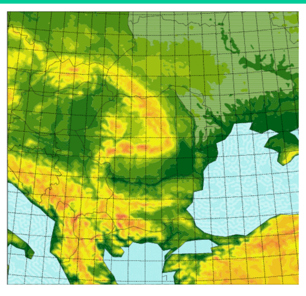
ALARO Operational Suite

ALARO - ROMANIA



Δx=6.5 km
240 x 240 points
60 vertical levels
Linear grid
Lambert projection

Characteristics

- semi-implicit semi-Lagrangian 2TL; Δt=240 s
- physical parameterizations : **ALARO-0 baseline**
  including last developments from 2012 concerning thermodynamics adjustment (dependency of critical relative humidity on the model resolution for Xu - Randall adjustment), microphysics (sedimentation of cloud water and ice) moist deep convection (modulation of the entrainment rate by the vertical integral of relative humidity, adaptive detrainment, mixed type of closure)

LBC from ARPEGE, 3h frequency ; **DFI** Initialization;
4 runs /day 00, 06, 12, 18 UTC - no DA ; Forecast range: 78/54/66/54 hours

Post-processing and visualization

FPOS : in line - geographical grid (0.1 x0.125)
off line – model grid
Specialized forecasts for different customers
Graphics based on Magics for web site
new **Quasi-operational graphics based on NCL-NCAR**

Statistical Adaptation Verification

Downstream applications

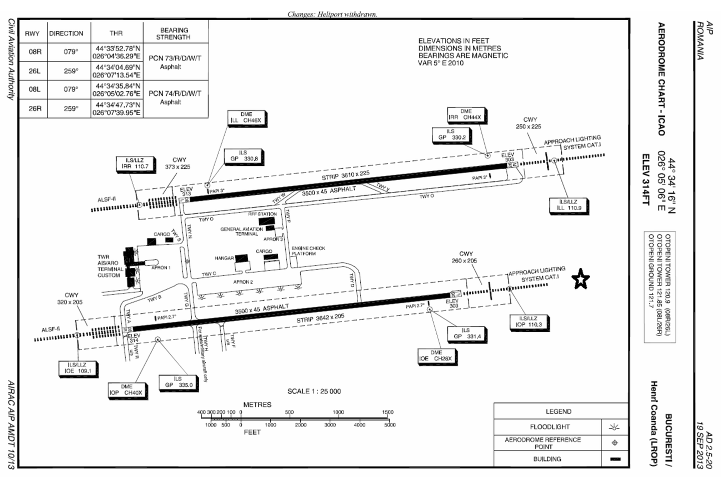
Atmospheric input for:
- Hydrological model: from ALARO-ROMANIA
- Wave model: from ALADIN
- Marin circulation model: from ALARO-SELAM

Otopeni airport wind shear profile

❑ **wind shear is the most troublesome fact during aircraft taking-off and landing**

generating sources: convection, frontal surfaces, sea or mountain breezes, strong surface wind coupled with local topography, mountain waves or low level temperature inversions.

❑ **Low level wind shear for Bucharest Otopeni airport study**

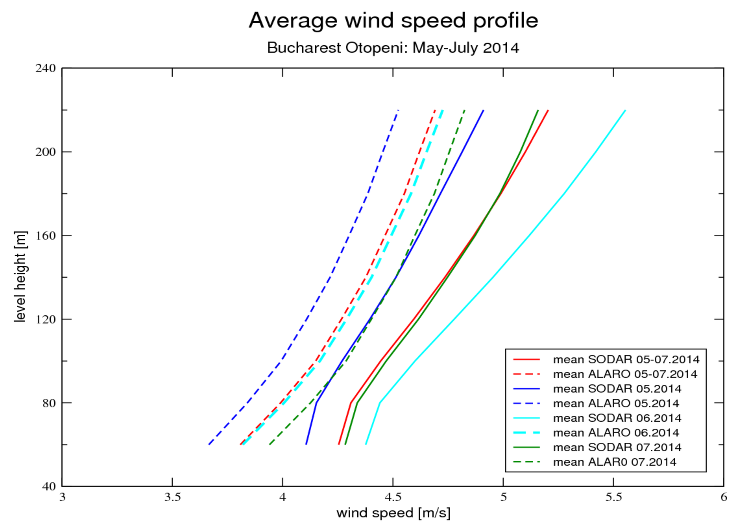


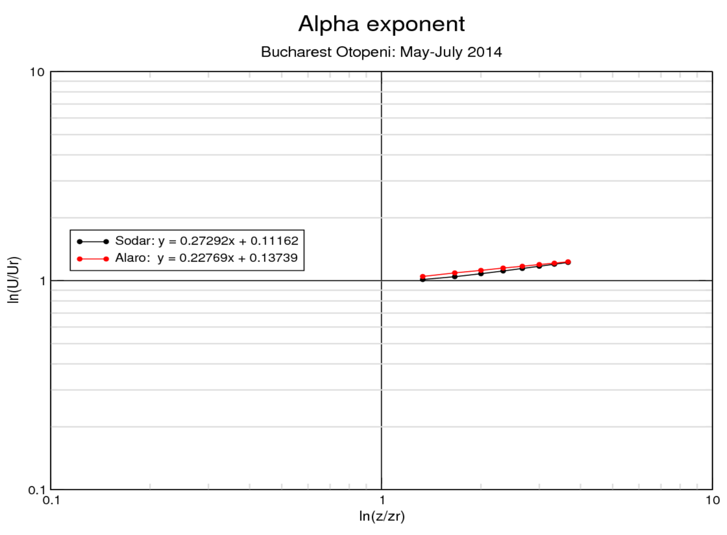
★ mobile Doppler SODAR registrations (PCS.2000- Metek)

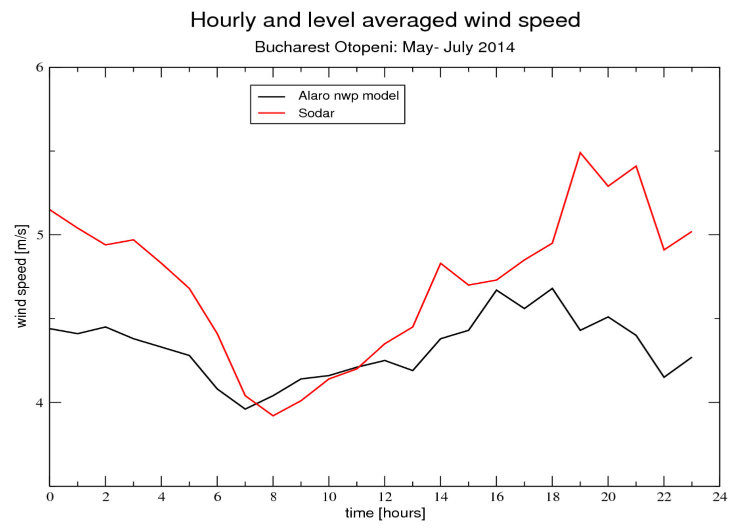
- **non conventional data, particularly**:
  - SODAR registrations-(**SO**nic **D**etection **A**nd **R**anging system)
- **wind shear profile evaluation : <u>statistical approach</u>**
  - ✓ **3 month period (May-July 2014) statistics**
  - ✓ **a simple method to estimate wind shear profile**
    - ***using SODAR***
      (Elizabeth Walls, and Niels LaWhite, SODAR and Extrapolated Tower WindShear Profile Comparison in Various Topographic Conditions, EWEC2009 Marseille, 2009)

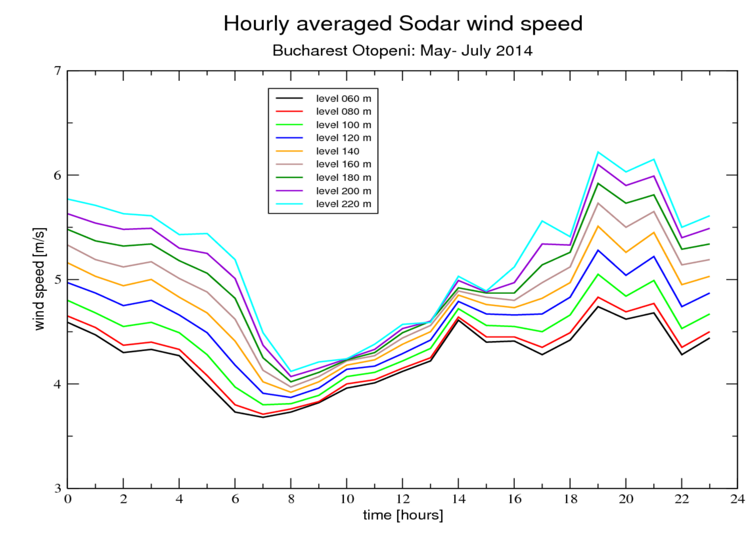
$$\frac{U_z}{U_{ref}} = \left(\frac{z}{z_{ref}}\right)^{\alpha}$$

α power law share exponent describes the shape of the wind shear profile:
- low α ➪ little shear (wind speed does not drastically change)
- high α ➪ large increases in wind speed









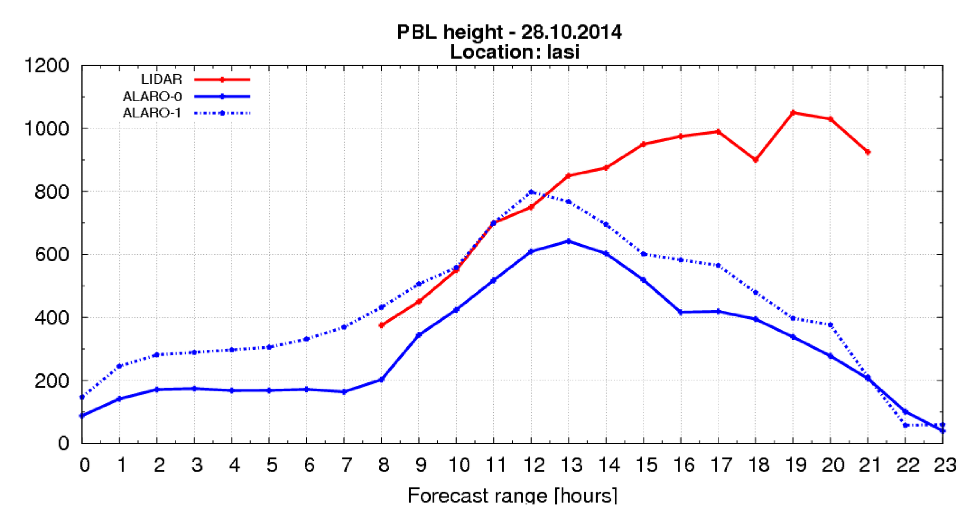
- ***comparison with NWP ALADIN (Alaro version) wind shear profile***

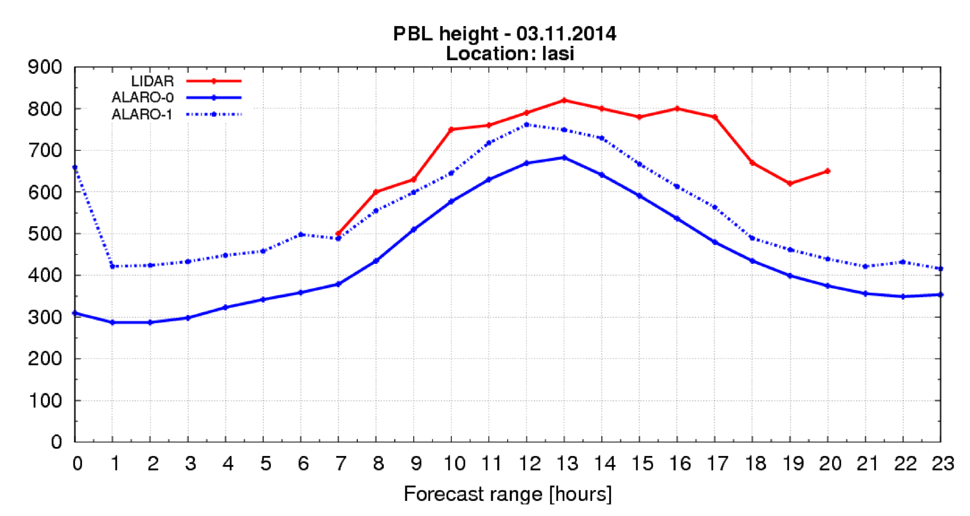
$\alpha_{SODAR} = 0.27292$ > $\alpha_{ALARO} = 0.22769$

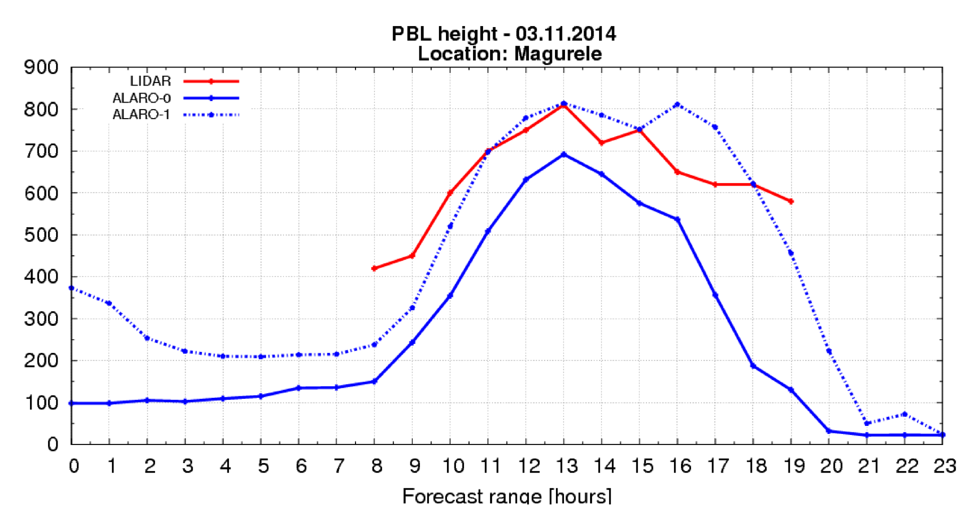
- the model has a more logarithmic profile;
- underestimates the wind shear (systematic error; the lowest error for July 2014 – convective activity)
- comparable diurnal cycle

First tests using ALARO-1 version ➪ PBL forecast using two LIDAR systems

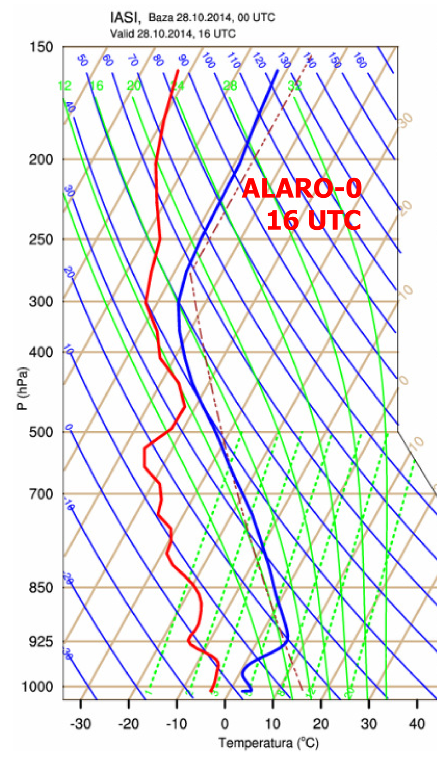
LIDAR data provided by Adrian Timofte and Silviu-Octavian Gurlui
Alexandru Ioan Cuza, University of Iasi, Faculty of Physics, through POSDRU/159/1.5/S/137750

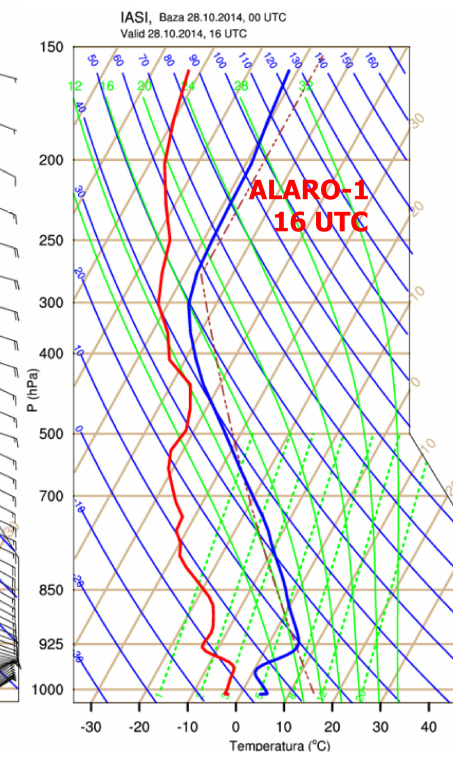


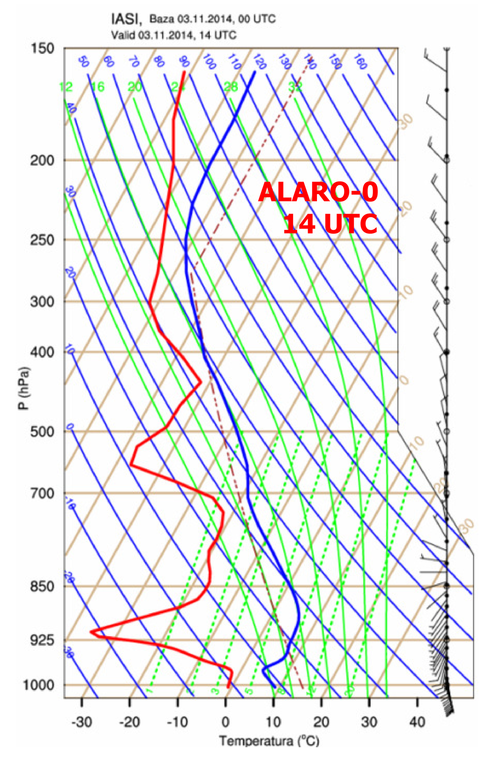


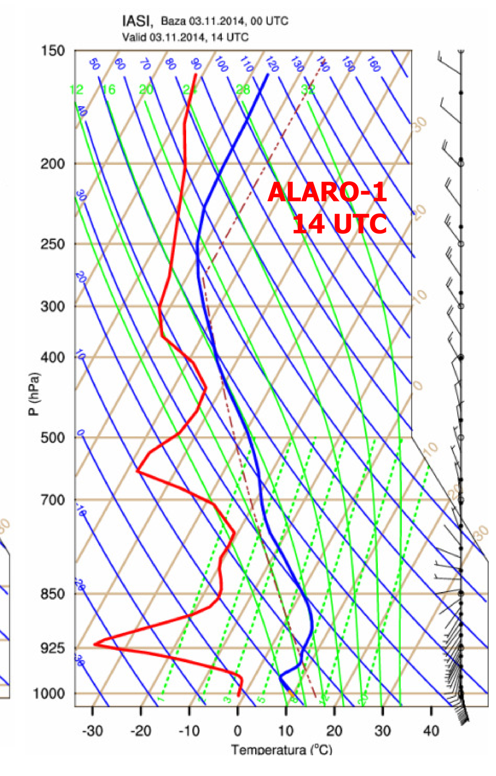


➢ **ALARO-1 model simulates better the PBL height**









ALARO-1:
- new radiation scheme ACRANEB2
- turbulence scheme **TOUCANS** :
  - total turbulent energy TTE
  - new type of stability functions
  - parameterization of moist third order moments
  - turbulent diffusion of cloud condensates
- improvements in microphysics :
  - the enhancement of vertical geometry of cloudiness and falling precipitation
  - the improvement of rain drop size distribution

ALARO-0: pseudo TKE

- temperature profile
- dewpoint profile
- standard atmosphere
- saturation adiabats
- saturation mixing ratio lines
- dry adiabats