Preparation of observational data for verification of HIRLAM data against Sodankylä mast and soundings

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Available data

- ○ Mast data:
  - From 48m meteorological mast
  - From long wave radiation measurements
  - From flux measurements (Flux data)
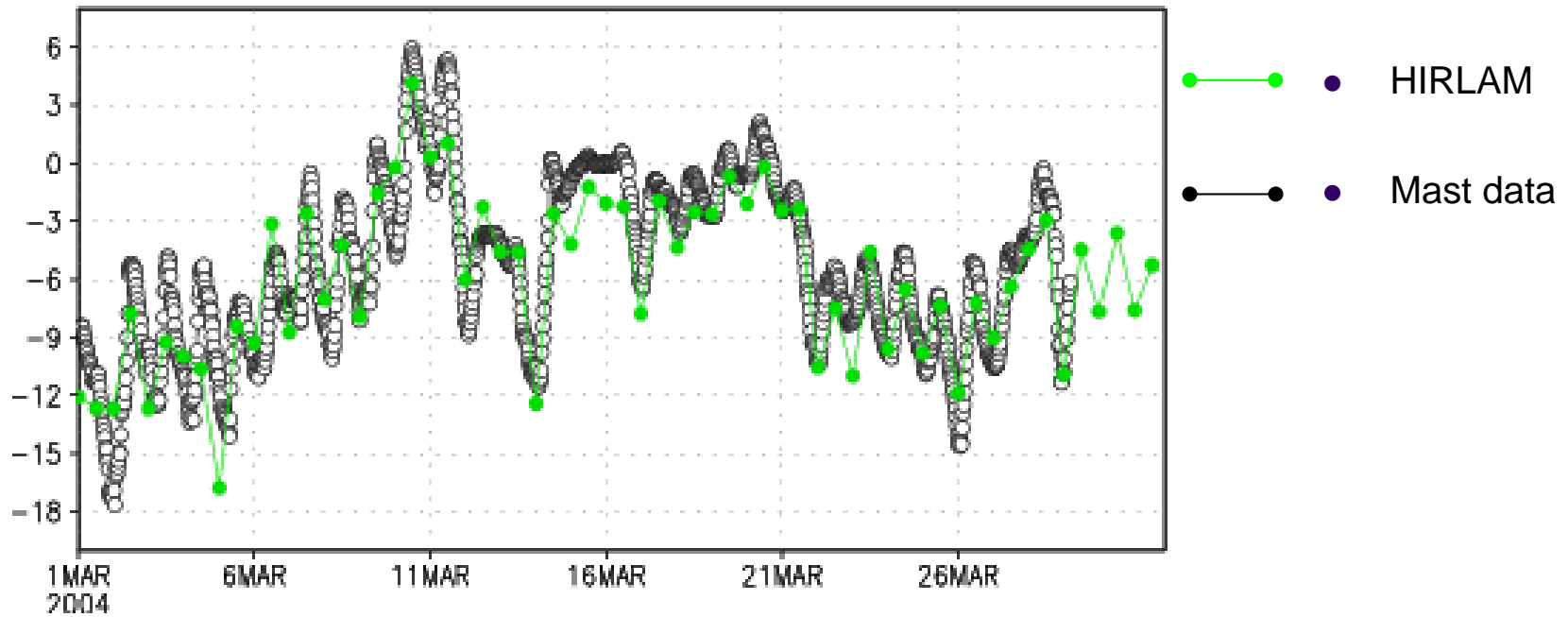- ○ Soundings data

Mast data

Height

Temperature	(3-48m)
Relative humidity	(3-48m)
Wind speed	(3-48m)
Downwelling SW radiation	(47m)
Reflected SW radiation	(47m)
Upwelling LW radiation	(47m)
Downwelling SW radiation	(not available)
Sensible heat flux	(25m)
Latent heat flux	(25m)
Evaporation	(25m)
Momentum flux	(25m)

48m
47m
38m
32m
25m
18m
8m
3m

Raw data

Temperature

Legend: HIRLAM, Mast data

Soundings

- Temperature
- Dew point temperature
- Relative humidity
- Wind speed
- Wind direction
- Synoptic information

Problems

- Appropriate vertical scale, the data are to be verified at, is needed

- Appropriate method of interpolation for a variable

- ○ - HIRLAM vertical coordinate is used

$$P_{k+1/2} = A_{k+1/2} + B_{k+1/2}P_S$$

- ○ - Ps could be taken as from observations as from the model data

- ○ - Parameters at a main model level *k* represent the mean value in the model layer limited by two surrounded additional model levels *k*±1/2

$$T_k = \frac{1}{N}\sum_{i=1}^{N}T_i$$

For model layers, having no sounding points, temperature and dew point temperature are linearly interpolated with respect to logarithmic pressure

$$T_{k\pm1/2} = T_{low} - (\ln P_{low} - \ln P_{k\pm1/2}) \frac{T_{low} - T_{up}}{\ln P_{low} - \ln P_{up}}$$

$$T_k = \frac{T_{k+1/2} + T_{k-1/2}}{2}$$
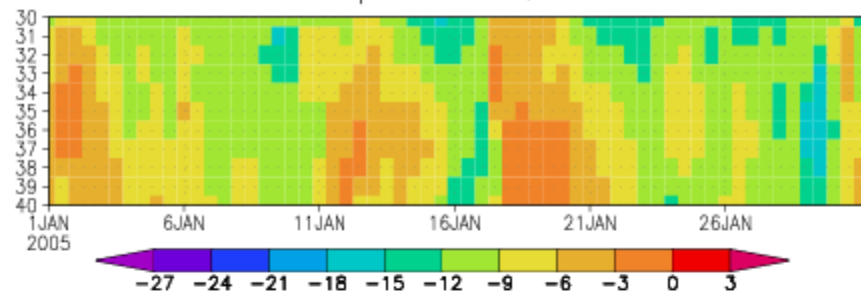
Ps observed, Analysis, December 2004

Ps modeled, Analysis, December 2004

Temperature, soundings
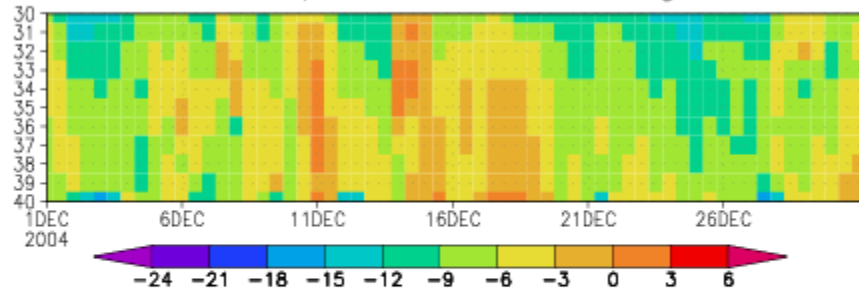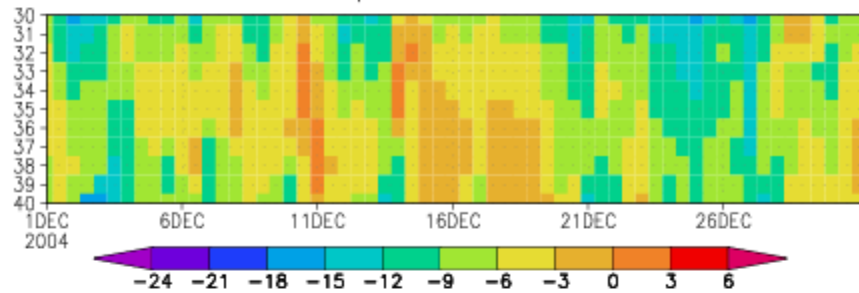
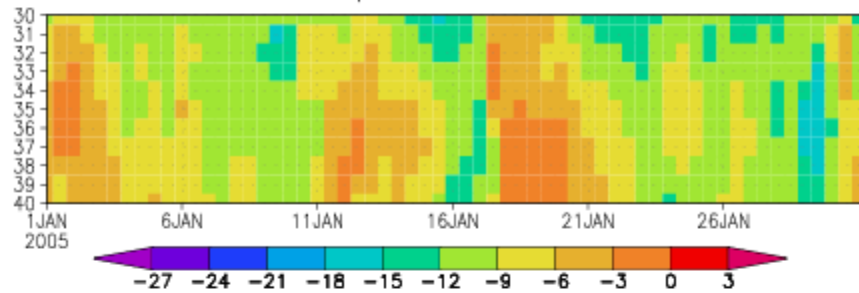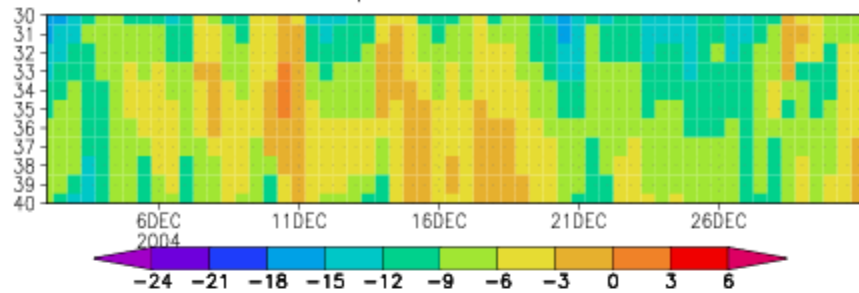Temperature, fc00

Temperature, Tmodel−Tsound
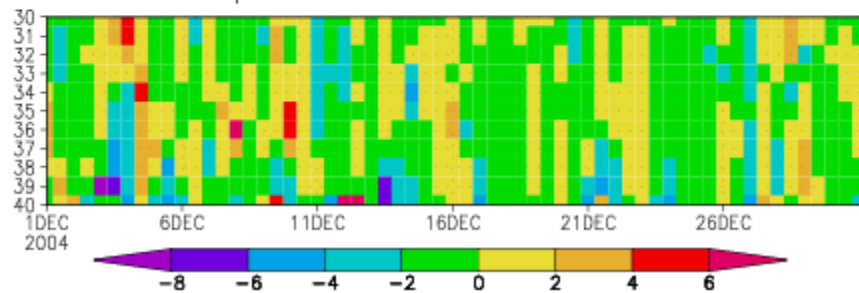
Ps observed, Analysis, January 2005

Temperature, soundings
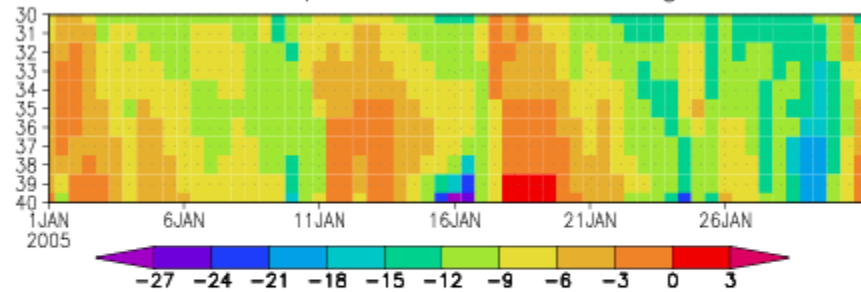
Temperature, fc00

Temperature, Tmodel−Tsound

Ps modeled, Analysis, January 2005
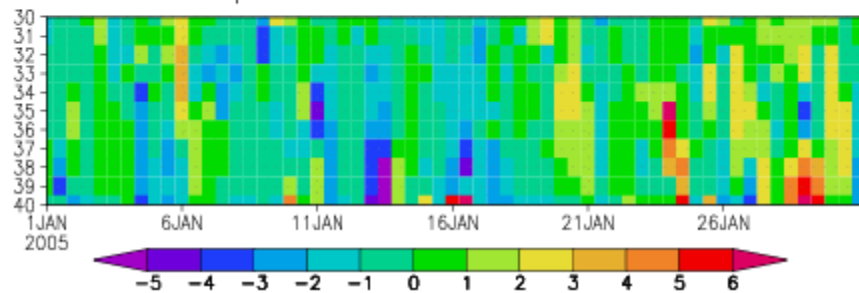
Ps observed, 24h forecast, December 2004

Ps modeled, 24h forecast, December 2004
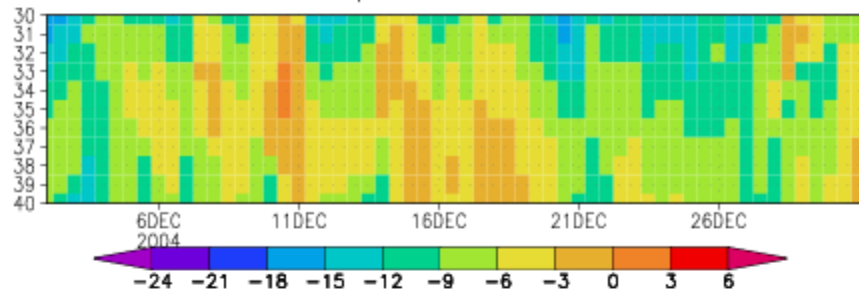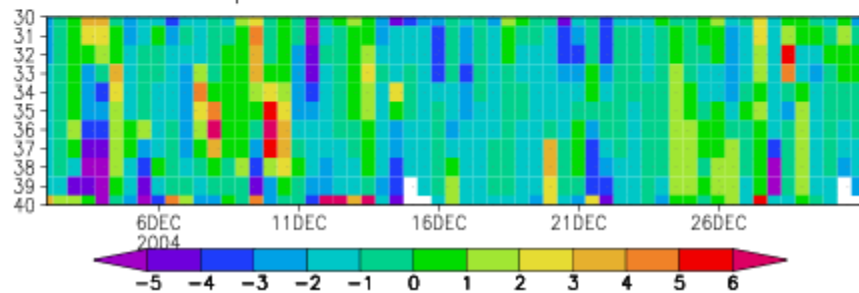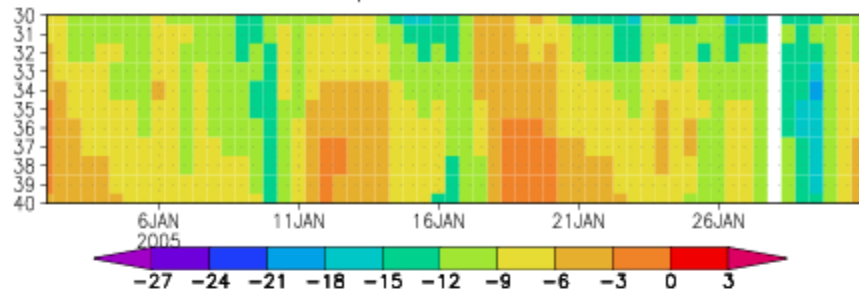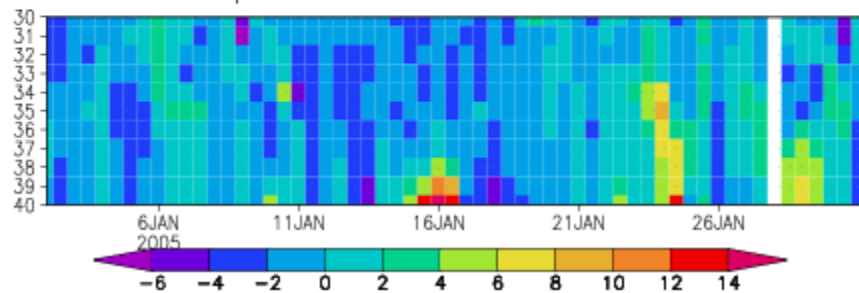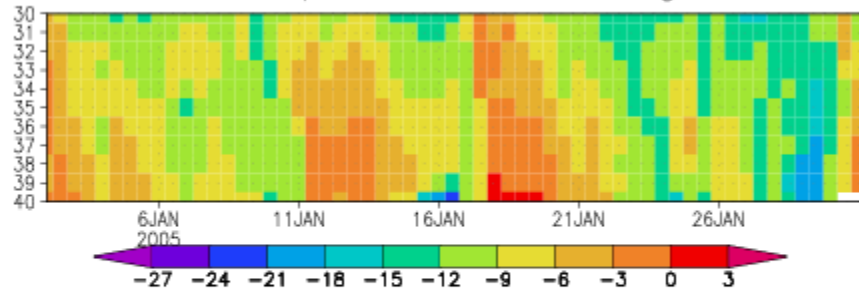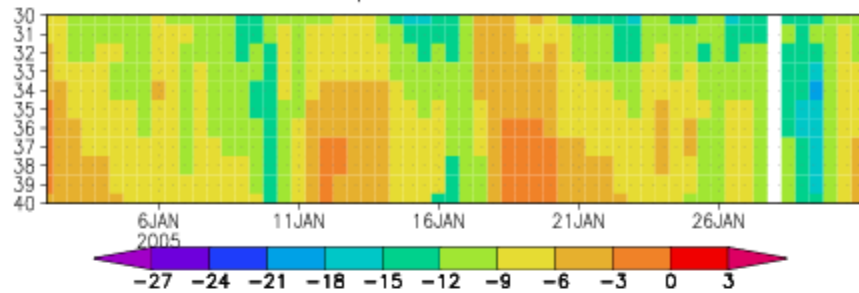
Ps observed, 24h forecast, January 2005

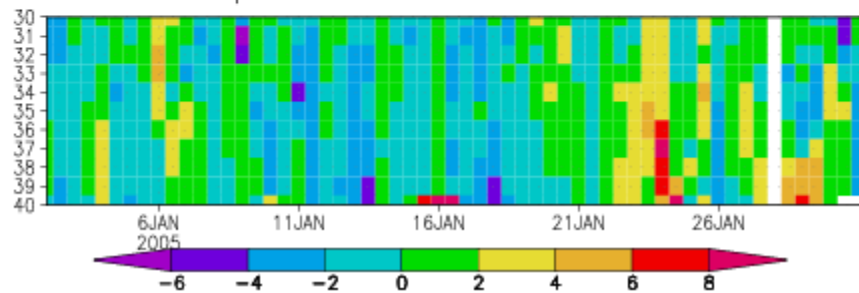# Ps modeled, 24h forecast, January 2005

Temperature, soundings
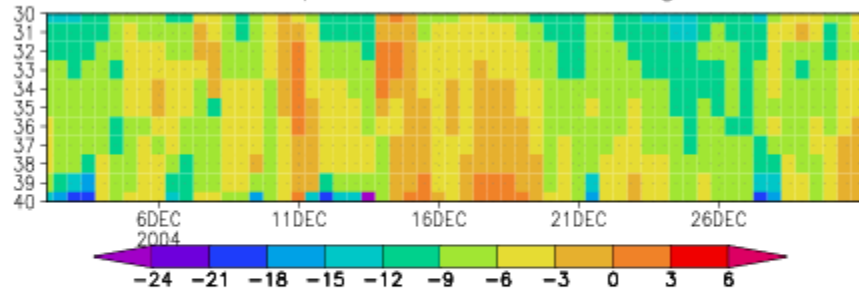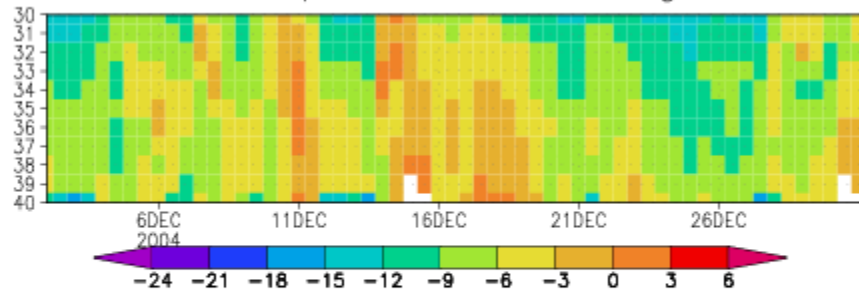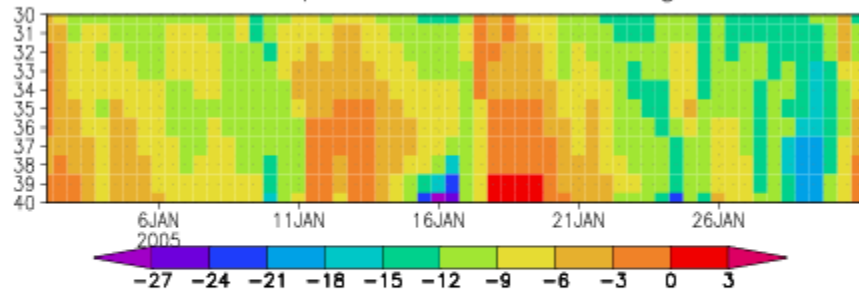
Temperature, fc24

Temperature, Tmodel−Tsound

Conclusions

○ Both vertical coordinates (based on modeled and observed surface pressure) have drawbacks in implementing. The universal vertical coordinate (like of standard pressure levels) should be implemented, where both the model and the observational data would be interpolated.

○ Some other methods of interpolation are to be tested and compared with each other.