

Data compression

Regional data user perspective

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What we do in regional models with hyperspectral infrared data

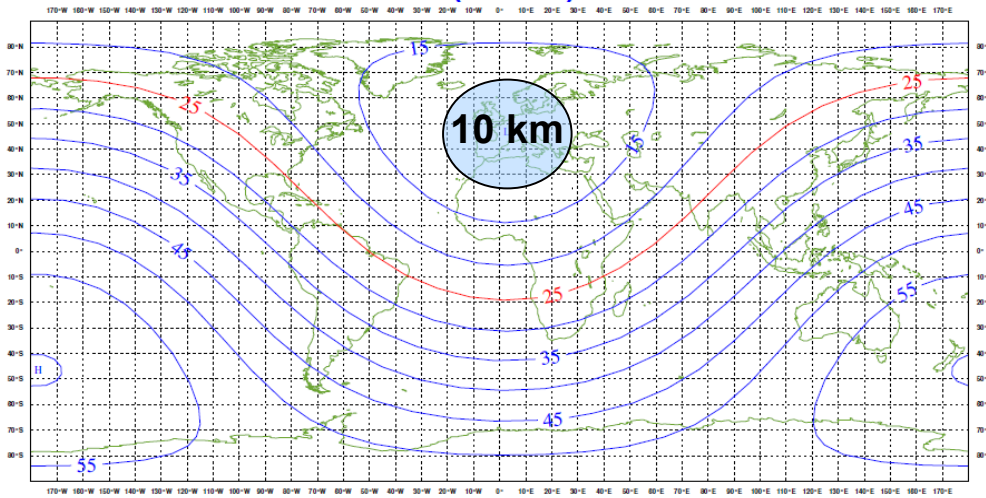
- BUFR with all channels (EumetCast) or BUFR with a channel subset (GTS)
- From global broadcast or from EARS or local
- Assimilation of channels from the spectra
- No reconstructed radiances, no PC assimilation
- Use assimilation techniques in a similar way as for global models (for cloud detection / characterisation, bias correction, etc.)

→ Example of IASI in Météo-France model AROME

Description of operational NWP models at Météo-France

Global model ARPEGE

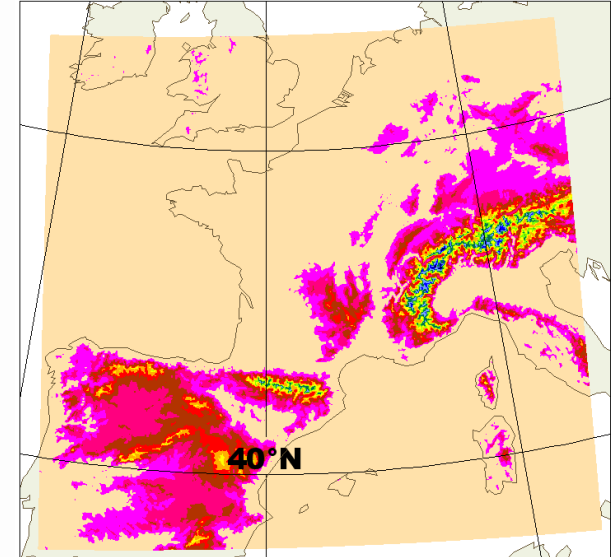
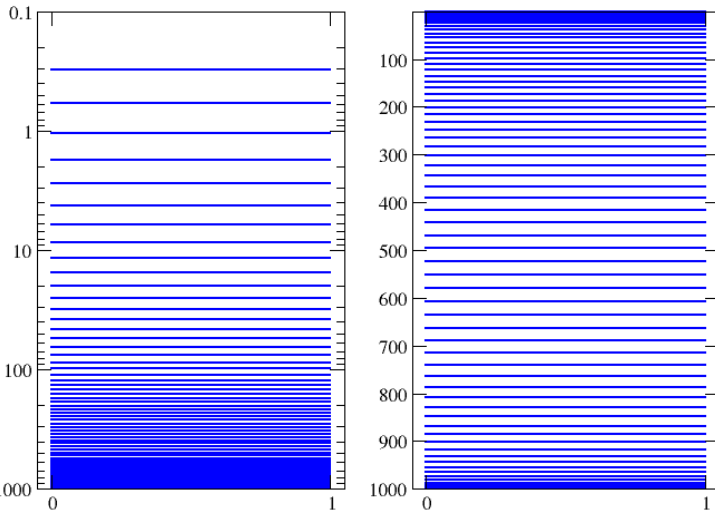
Horizontal resolution: between 10 and 60 km



70 vertical levels

logarithmic pressures

linear pressures



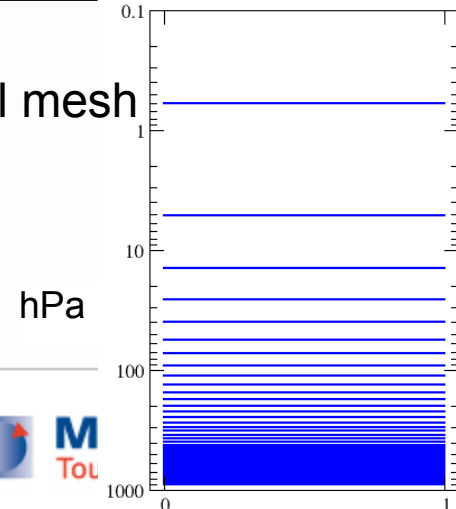
0°

Limited area model

AROME

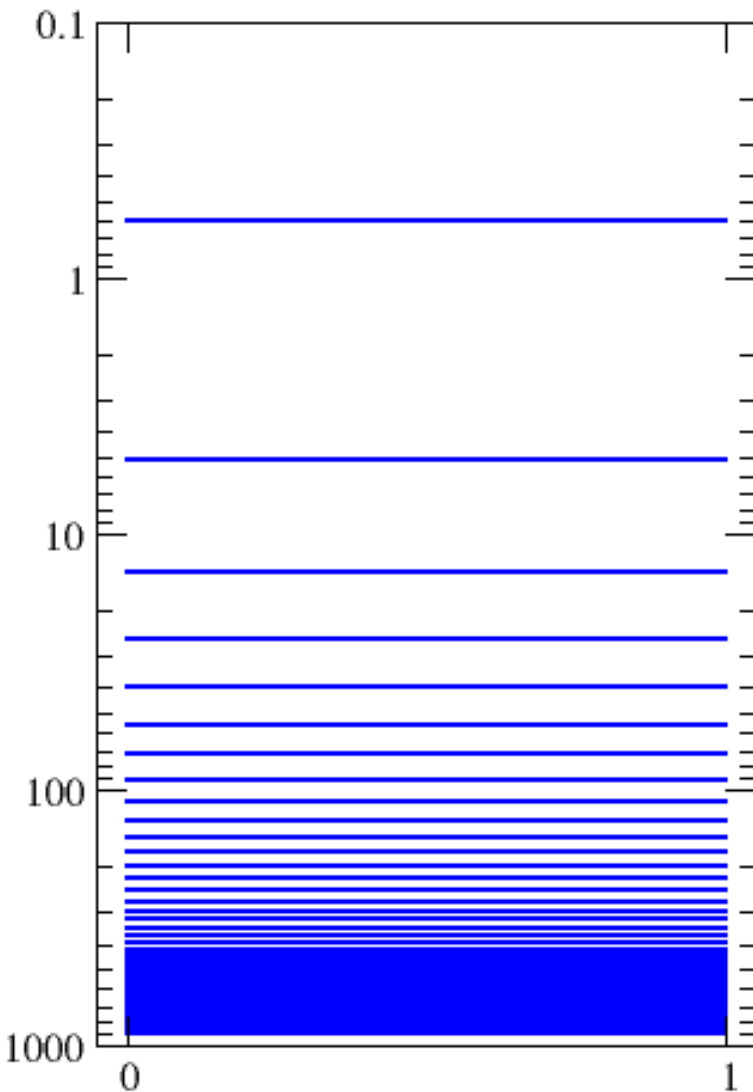
2.5 km horizontal mesh
60 vertical levels

logarithmic pressures

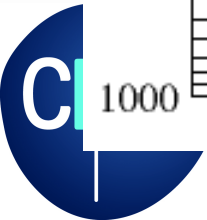
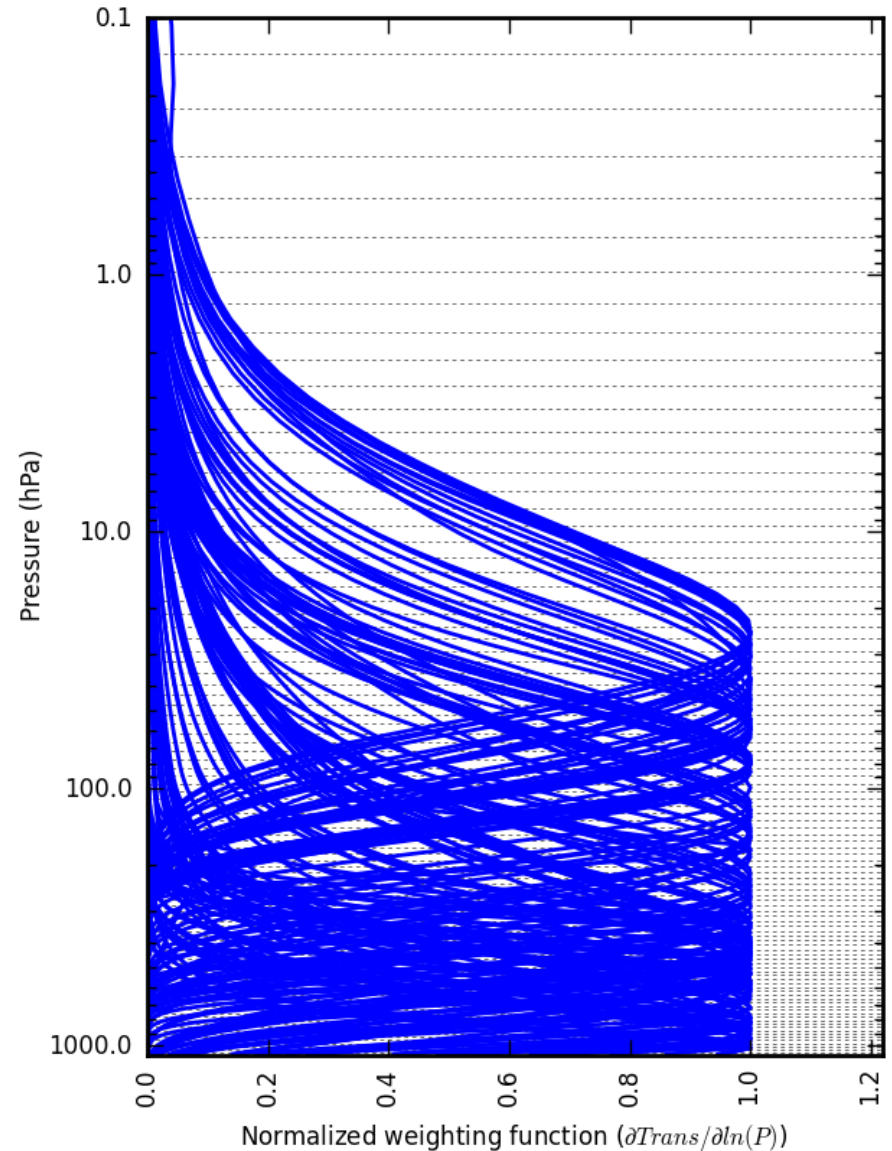


Channel selection in operational AROME model

Model levels



122 channels assimilated over sea



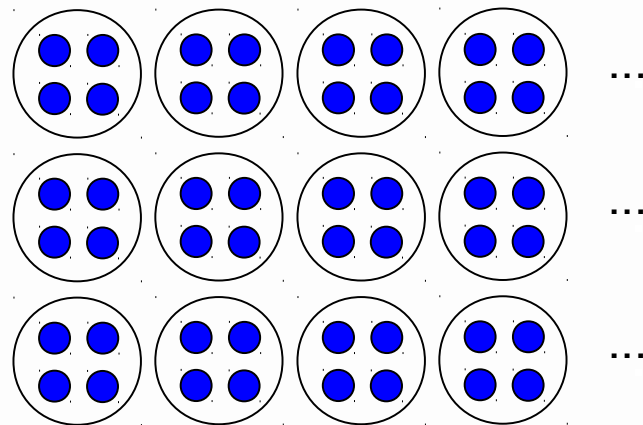
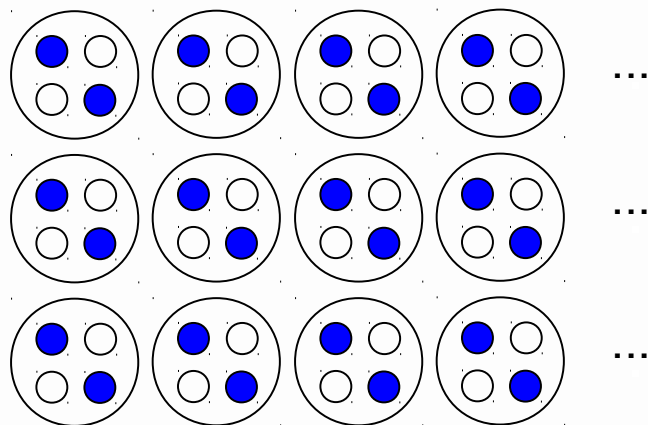
Field of view pre-selection and geographical thinning

Operational AROME (2.5km)

Future AROME (1.3km)

Input to screening
Detectors #1 & #3, all FoR

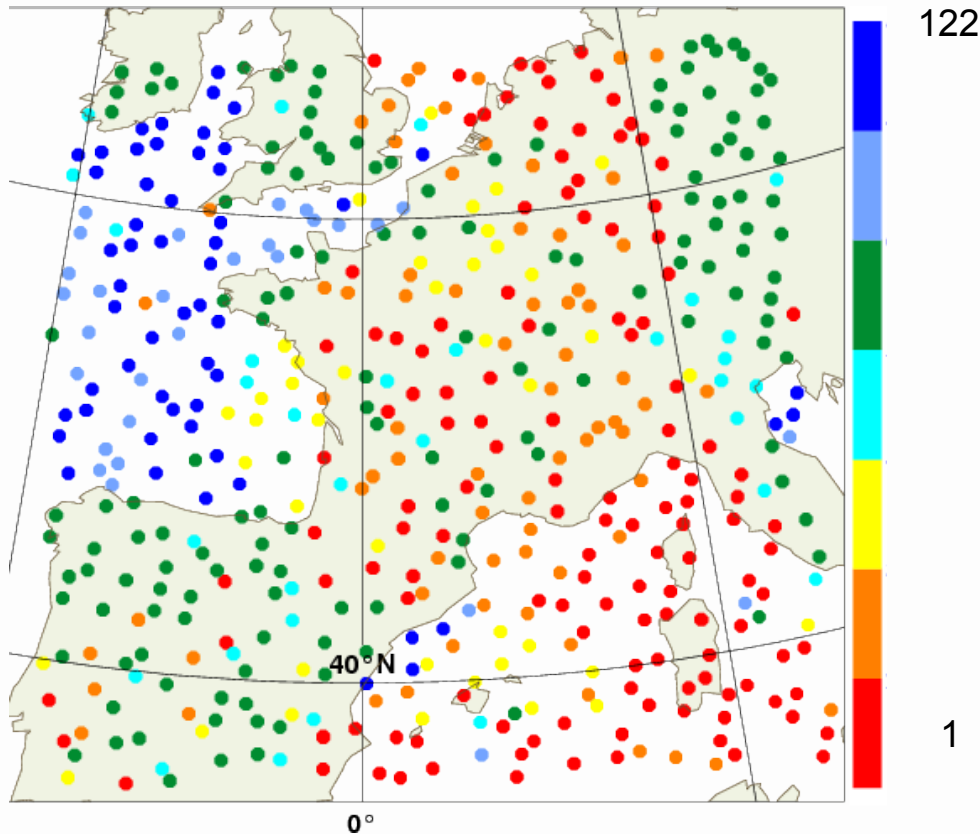
Input to screening
All detectors, all FoR



Thinning before assimilation
1 pixel in 80-km box

Thinning before assimilation
1 pixel in 60-km box ?
Denser ?

Regional models at Météo-France

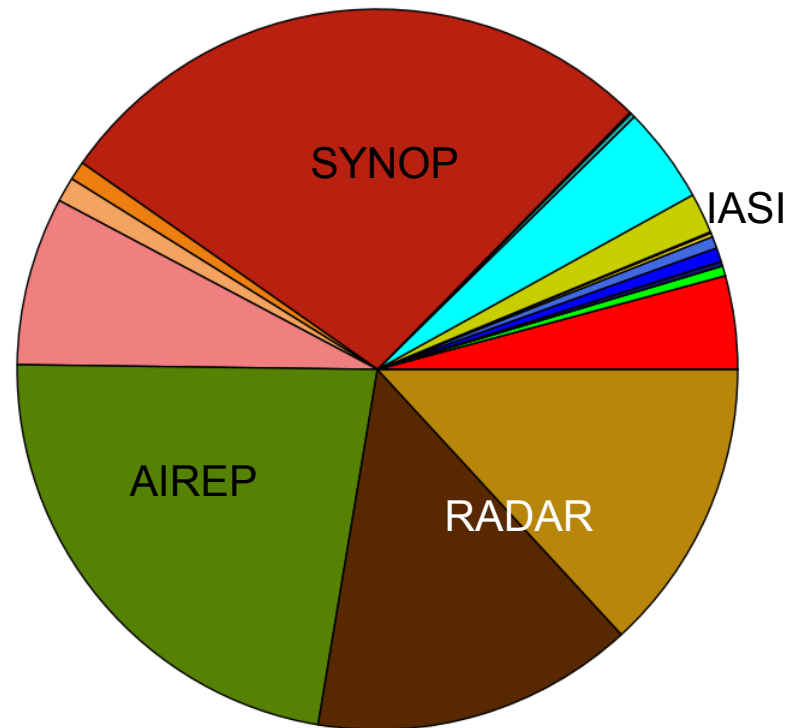
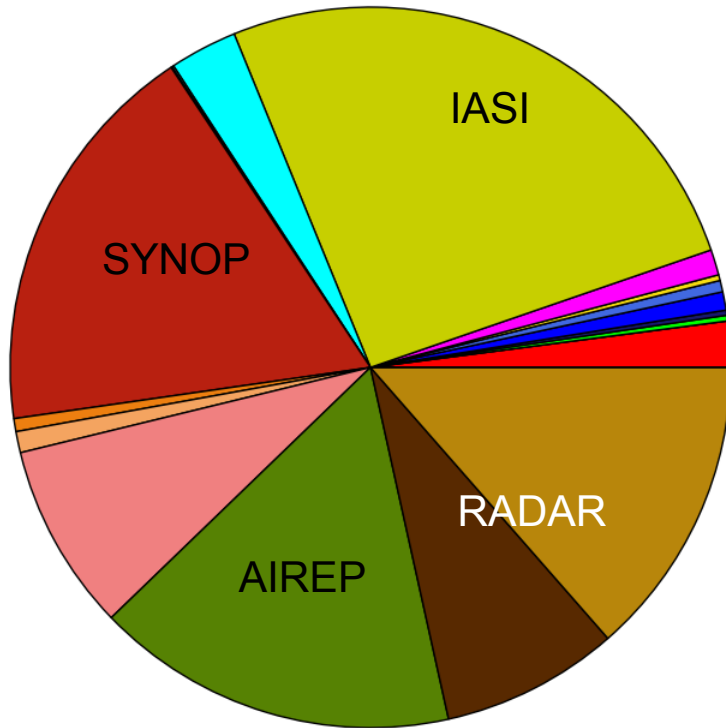


Typical coverage in **AROME France**
Assimilation time around 09 UTC
(number of active channels)

Information content of observations in AROME (2012)

Number of observations

Degrees of Freedom for Signal

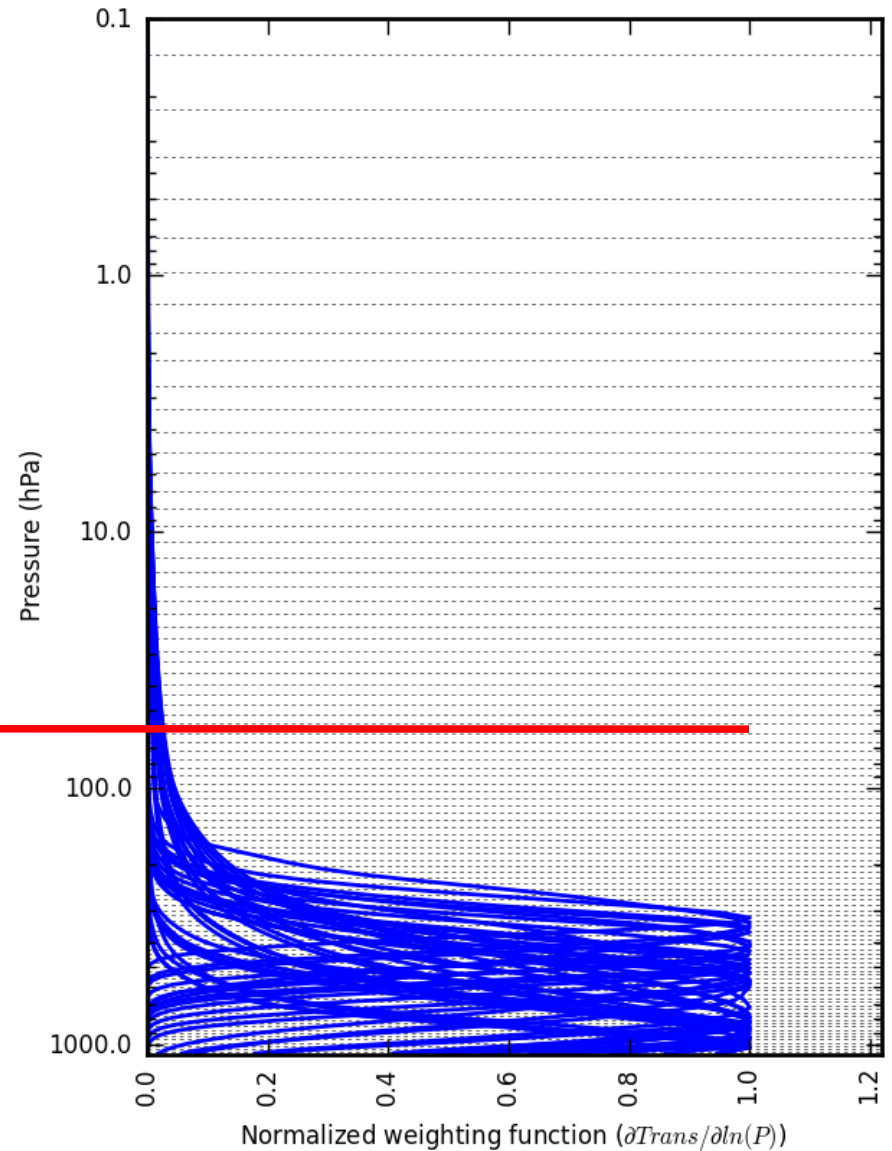
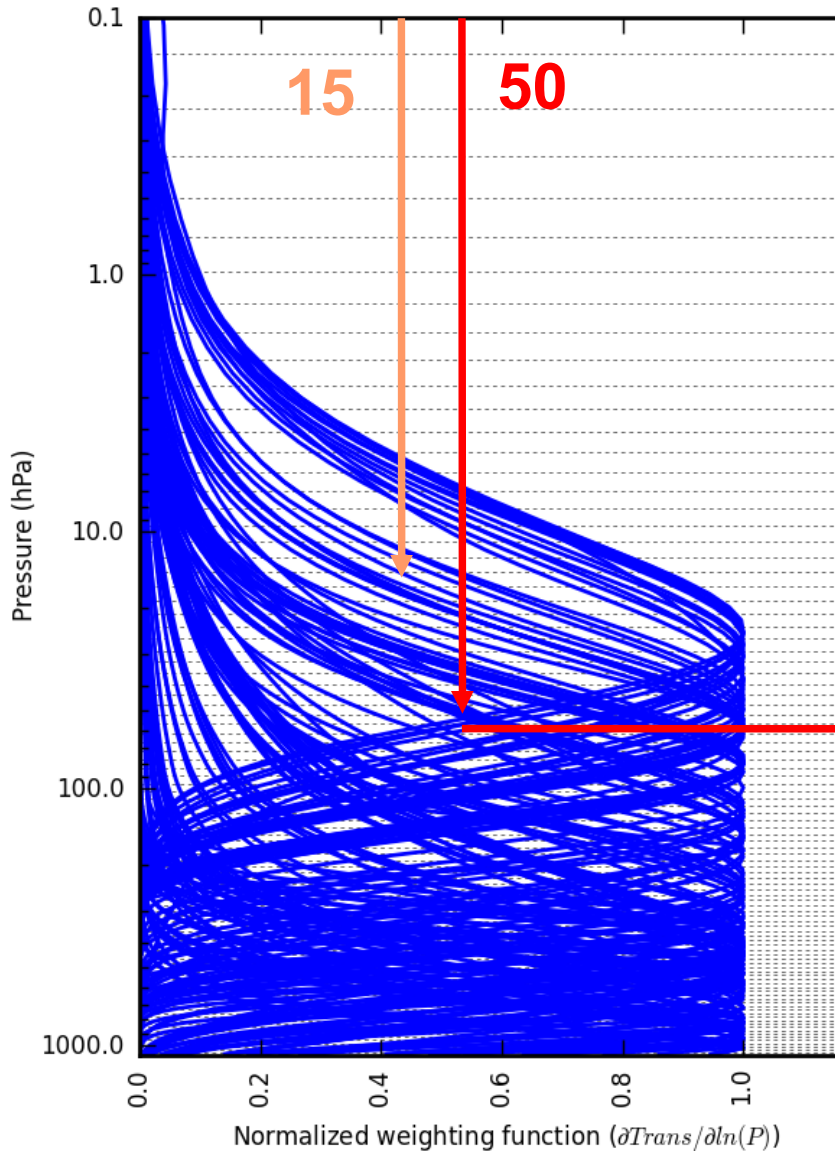


Vertical resolution of regional models

- Increase in the number of vertical model levels
- Mostly in the boundary layer and around the tropopause
- No real trend to have a higher model top
- In a near future, regional model will have a model top between 50 hPa and 15 hPa
- --> large parts of the spectrum are useless

Impact of a lower model top on the channel selection

From 122 channels to 36 channels assimilated over sea?



Channel sampling

- Sensor on board **polar-orbiting satellites**

For small regional models (i.e. convective scale), data cover the domain only twice a day

Few analysis times are to assimilate one particular sensor

Channel sampling sufficient as a compression ?

- Sensor on board **geostationary satellites** (future IRS on board MTG, e.g.)

Data every 30 minutes at high horizontal density

Channel sampling may not suffice ?

Compression for dissemination

- Any lossless compression for dissemination is welcome !
- In case of PC calculation
 - Training dataset: should it be local or global ?
If local, should we go down to each user domain or a large domain (over Europe?)
 - Processing time : should not be a problem for timeliness
What if we go to Rapid Update Cycles (1 hour, less?) ?
 - PC over land surfaces
 - Discard parts of the spectrum which correspond to high peaking channels (above model tops) ?

Compression for dissemination

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- In case of PC calculation
 - Training dataset: should it be local or global ?
If local, should we go down to each user domain or a large domain (over Europe?)
 - PC over land surfaces

If global PC set is well defined, it could be used for local needs too

- If we focus on the tropopause + troposphere + Tsurf, channel sampling may be sufficient
- Retrieval of surface emissivity:
PCs could help to retrieve emissivity spectra
- To be evaluated
 - Assimilation of Reconstructed Radiances
 - Assimilation of PC scores
 - Potentiel benefits of PCs for cloud microphysics retrievals

Potential need of more information for assimilation

- Horizontal mesh is ~km and may increase

Pixels of polar-orbitting IR sounders are much larger

- Information from companion imagers may be needed for assimilation of heterogeneous scene
 - Cloud information or heterogeneity analysis (as for IASI)
 - More detailed information at kilometric scale from imager ?
- Should this information be compressed on its side and disseminated separately ?

An aerial photograph of a town, likely in the Alps, is shown from a high angle. The town is surrounded by green hills and is partially obscured by thick, white clouds. Overlaid on the bottom half of the image is a white weather map showing isobars (lines of equal atmospheric pressure) and wind vectors (arrows). The isobars are labeled with values such as 1010, 1015, 1020, 1025, 1030, 1035, and 1040. The wind vectors indicate a flow from the southwest towards the northeast. The background of the entire image is a deep blue gradient.

Merci de votre attention



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