Use of radiances in the operational global assimilation system at Météo-France

Florence Rabier
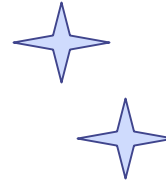
Élisabeth Gérard

Thibaut Montmerle

Delphine Lacroix
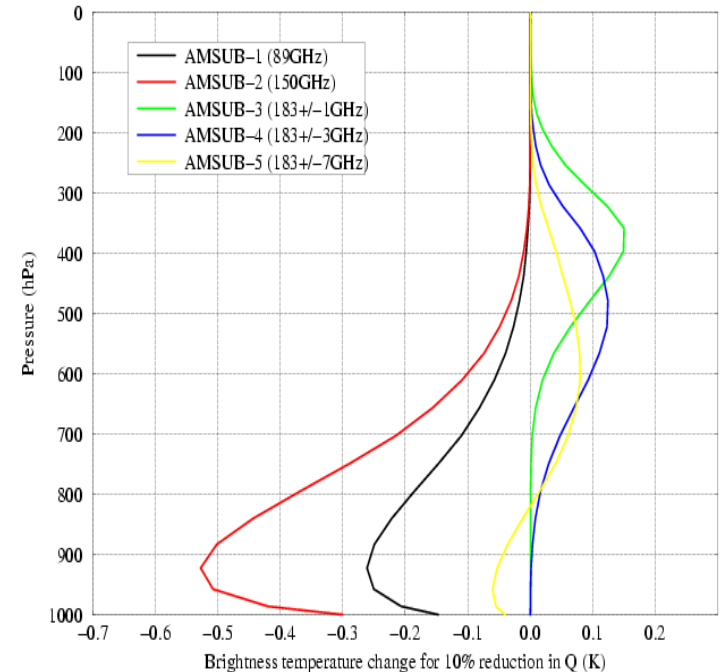
METEO FRANCE

Operational events

- End 2002
  - AMSUA raw radiances
- End 2003
  - HIRS
- End 2004
  - **AMSUB**
  - **EARS**
- March 2005
  - AMSUA AQUA

Assimilation of AMSUB data

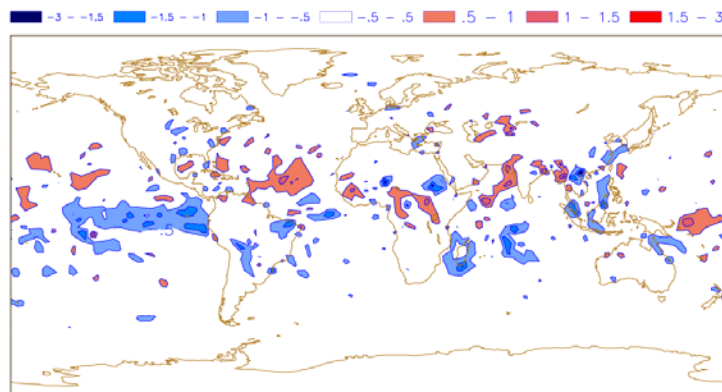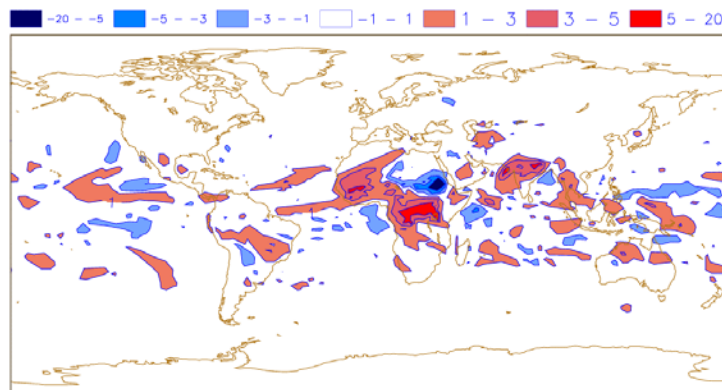| Conditions for use ✓	1	2	3	4	5
9 < scan position < 82			✓	✓	✓
Sea			✓	✓	✓
Land orog<1500m/1000m for channels 3/4			✓	✓	
Ts > 278 K and $\mid$ob-fg$\mid_{ch\,2}$ < 5 K			✓	✓	✓

In a similar way as for AMSUA & HIRS data:

➢ Scan and air-mass bias correction

➢ 250 km horizontal thinning

Mean TCWV increments and analysis difference

TCWV Increments 1-13 May'04 - 20IZ - Mean: -0.041 kg/m2

TCWV Analysis difference 1-13 May'04 - 20IZ-20KF - Mean: 0.234 kg/m2

An dif %	Global	Sea	Land
Globe	1.0	0.4	**2.5**
N. Hem	0.8	-0.0	2.0
Tropics	0.8	0.2	3.0
S. Hem	1.7	1.4	2.1

… To be compared to impact of HIRS data (with / without HIRS)

AMSUB

An dif %	Global	Sea	Land
Globe	1.0	0.4	**2.5**
N. Hem	0.8	-0.0	2.0
Tropics	0.8	0.2	3.0
S. Hem	1.7	1.4	2.1

Control= 20FM   Experiment= 20BT   all points

HIRS

%	Global	Sea	Land
Globe	-3.9	**-5.1**	-0.3
N. Hem	1.1	1.9	-0.1
Tropics	-7.1	-8.7	-0.7
S. Hem	-3.3	-3.7	0.7
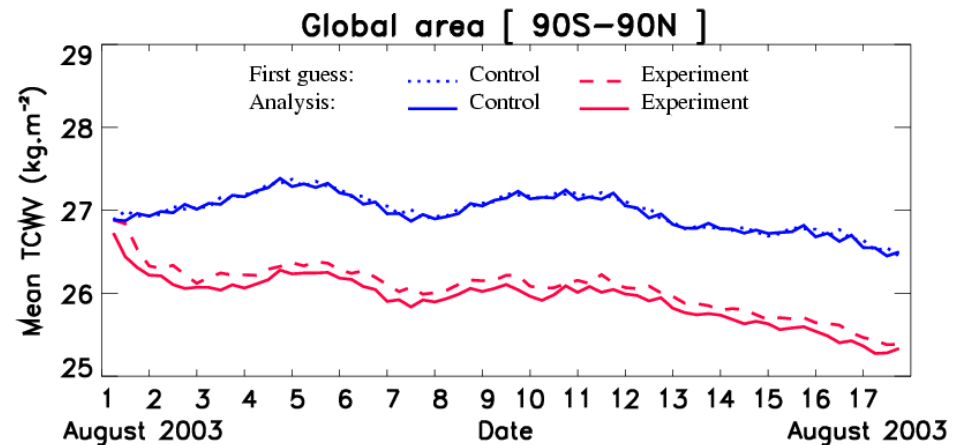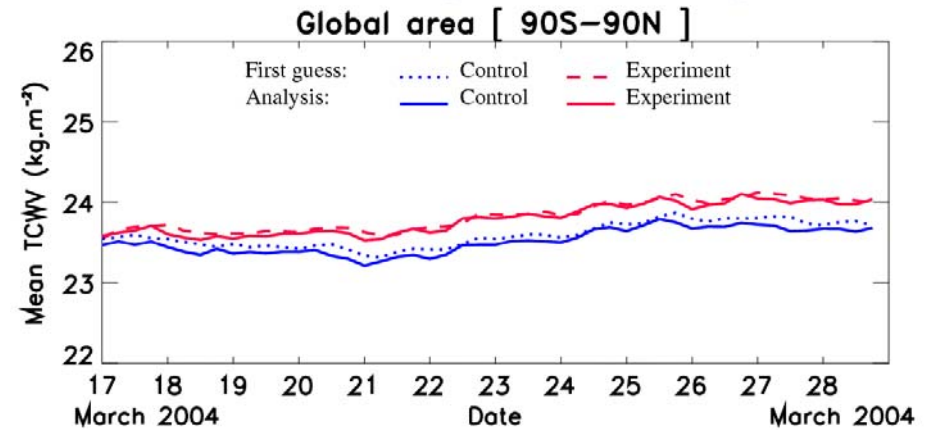
Zonal mean analysis difference

q (g/kg) [0.05] Analysis difference 20IZ-20KF (1-13 May'04)

w (Pa/s)[0.002] Analysis difference 20IZ-20KF (1-13 May'04)

T (K)[0.05] Analysis difference 20IZ-20KF (1-13 May'04)
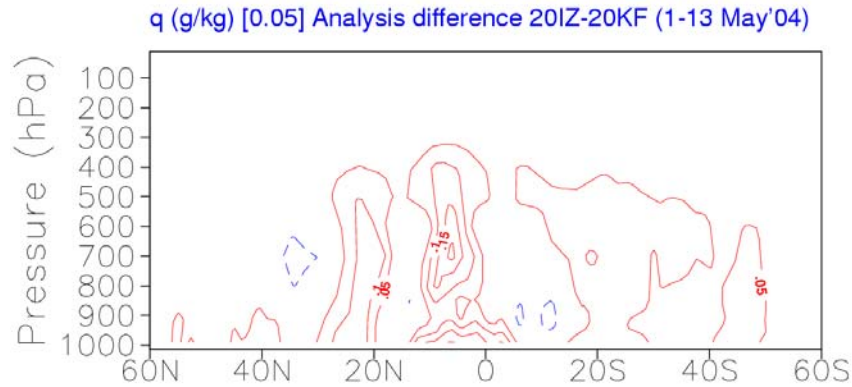
Stronger
Hadley cell
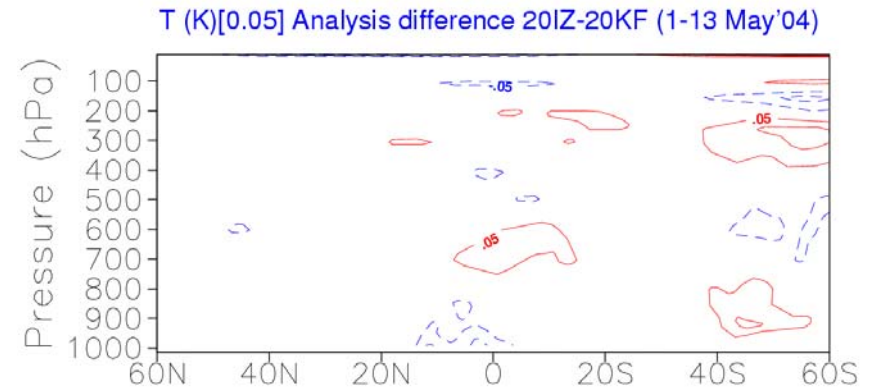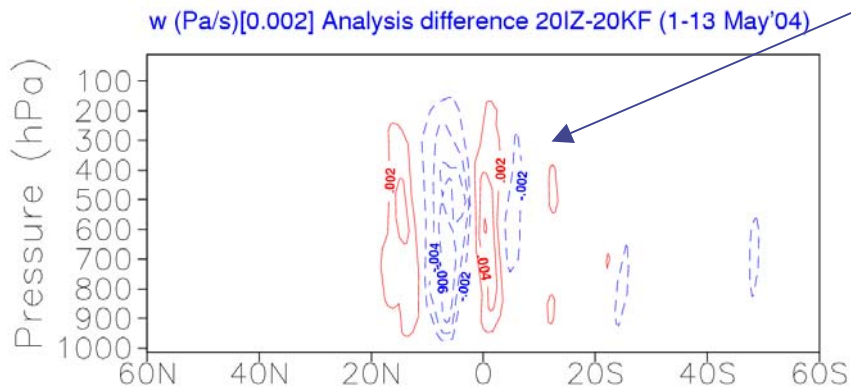
Spring scores
wrt radiosondes
(17 Mar – 3 Apr 2004)

RMS, std dev. and bias errors (without minus with AMSUB data) for geopotential [m] as a function of forecast and vertical ranges
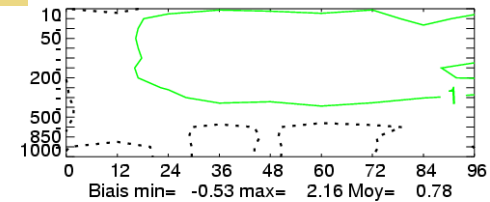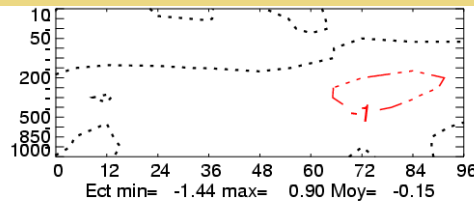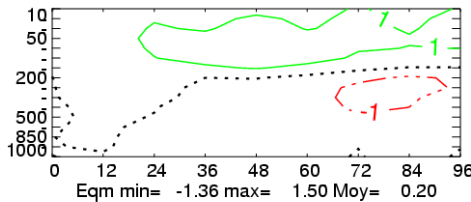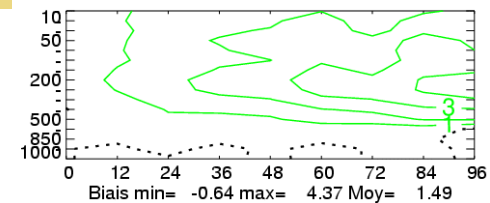
Red: degradation from AMSUB

Green: improvement from AMSUB

RMS

Std dev.

Bias

Northern Hemisphere

Eqm min= -1.36 max= 1.50 Moy= 0.20

Ect min= -1.44 max= 0.90 Moy= -0.15

Biais min= -0.53 max= 2.16 Moy= 0.78

Southern Hemisphere

Eqm min= -0.19 max= 3.27 Moy= 1.05

Ect min= -0.87 max= 1.63 Moy= 0.26

Biais min= -0.64 max= 4.37 Moy= 1.49

Tropics

Eqm min= -0.22 max= 4.26 Moy= 1.33

Ect min= -0.67 max= 0.74 Moy= 0.06

Biais min= -0.14 max= 4.84 Moy= 1.75
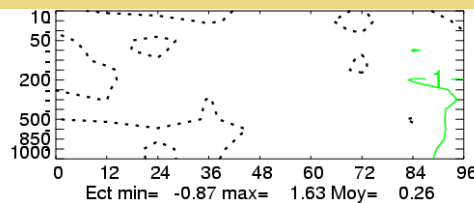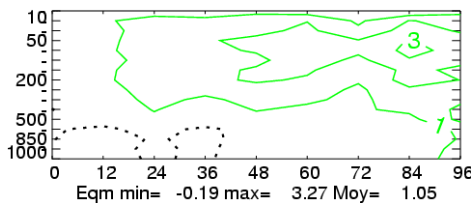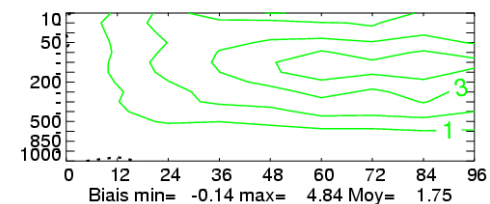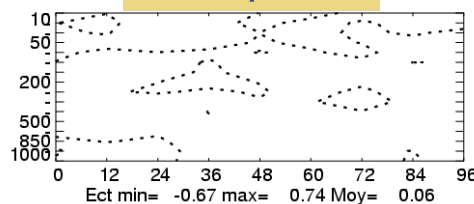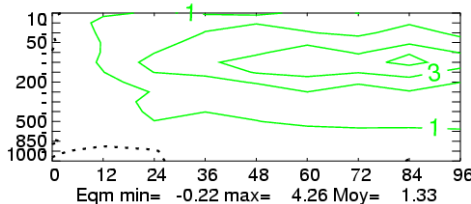
Assimilation of AMSUB data - Conclusion

◆ Increase of humidity over land

◆ Better balance between first guess and analysis

◆ Positive impact on forecast scores

EARS data

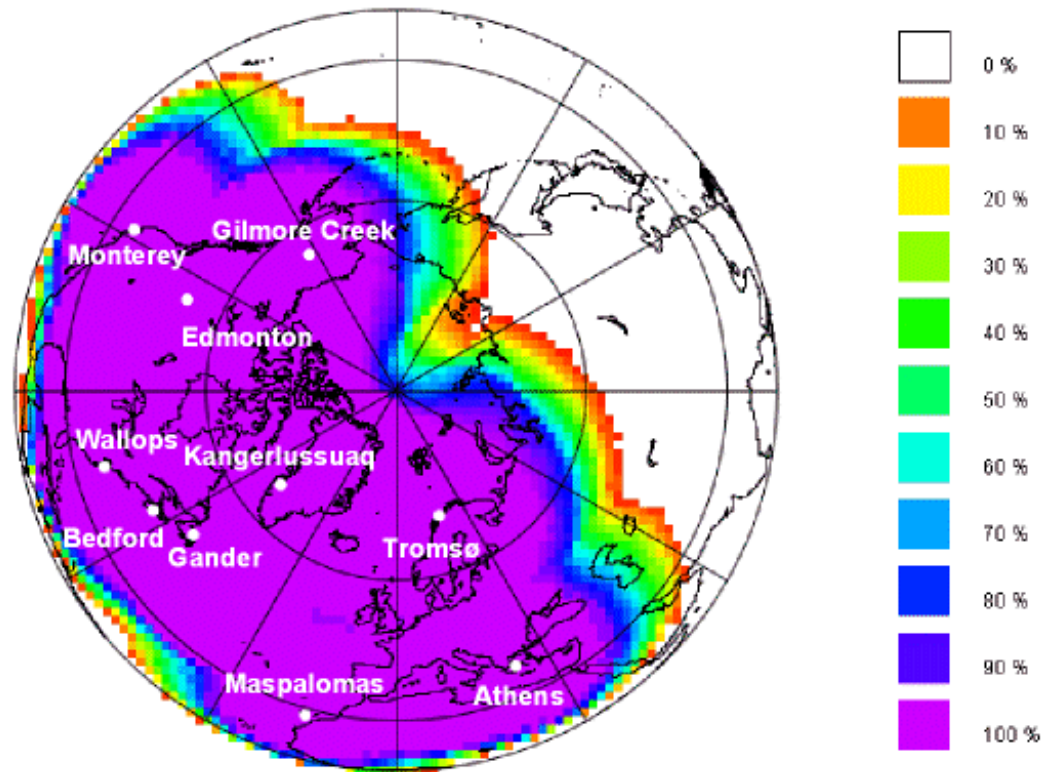(**E**umetsat **A**TOVS **R**etransmission
   Service)

Goal: ATOVS data available for
   short cut-off times and in
   regional applications

Data:

• Levels 1a and 1c radiances

   AMSU-A, AMSU-B et HIRS

Received at CMS with EUMETCAST,

Orbits reconstructed with no
redundant data from level 1a

*Percentage of AMSU-A data received
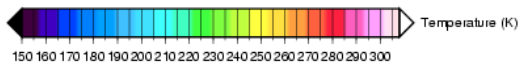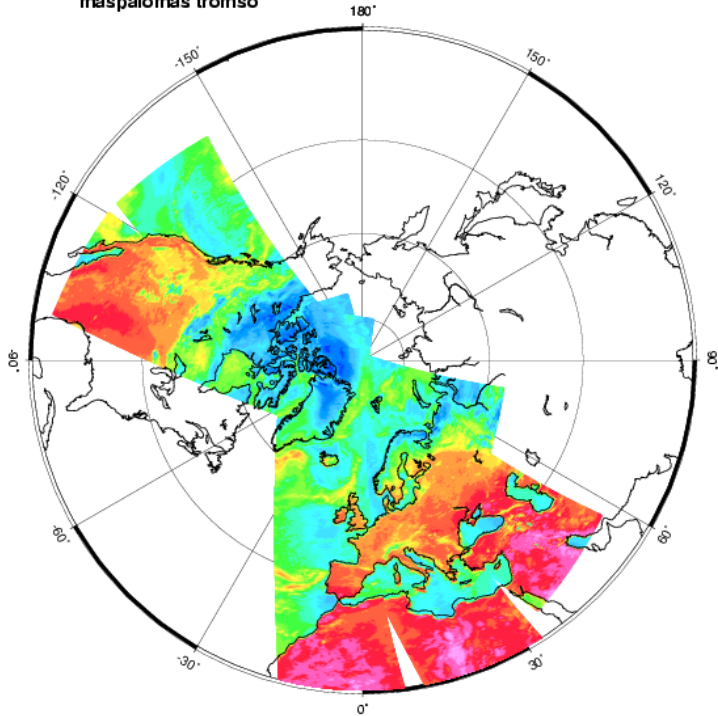in 30 min*

« EARS-Lannion » data

Produced since February 2004

Level 1c radiances calibrated by CMS from level 1a radiances (EARS and locally received at Lannion).
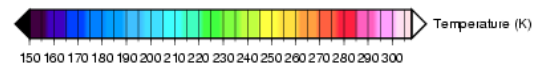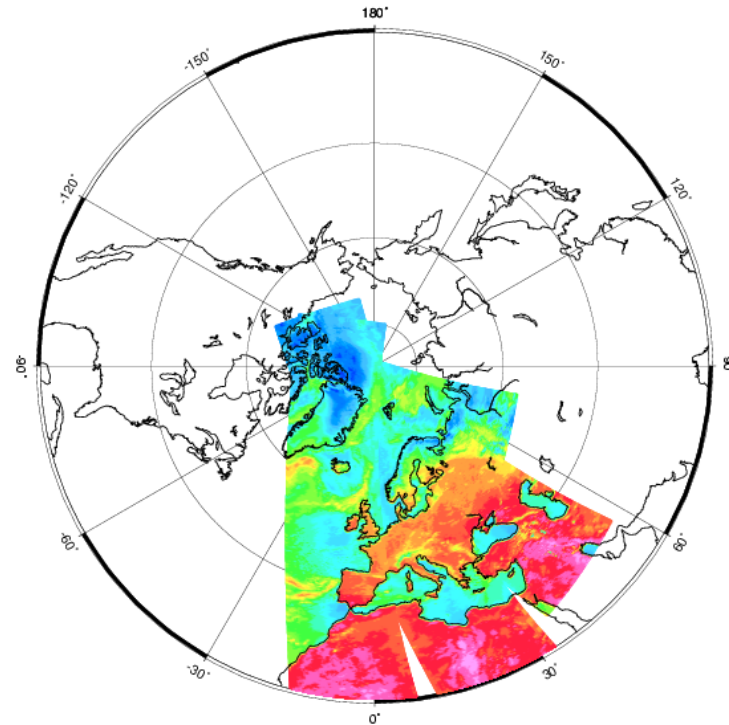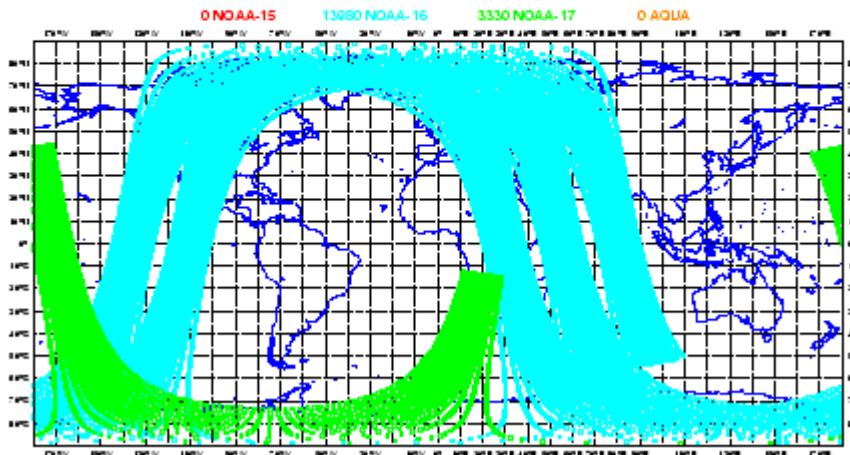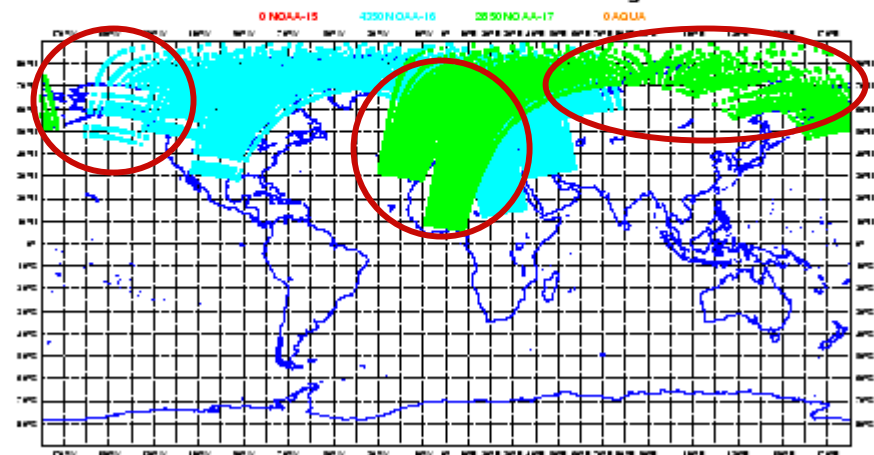
Number of additional data assimilated

AMSU-B for 2005/05/10 12Z, Cut-off time:1h50

Global data

EARS data

Number of additional data assimilated

2004/05/01 0Z
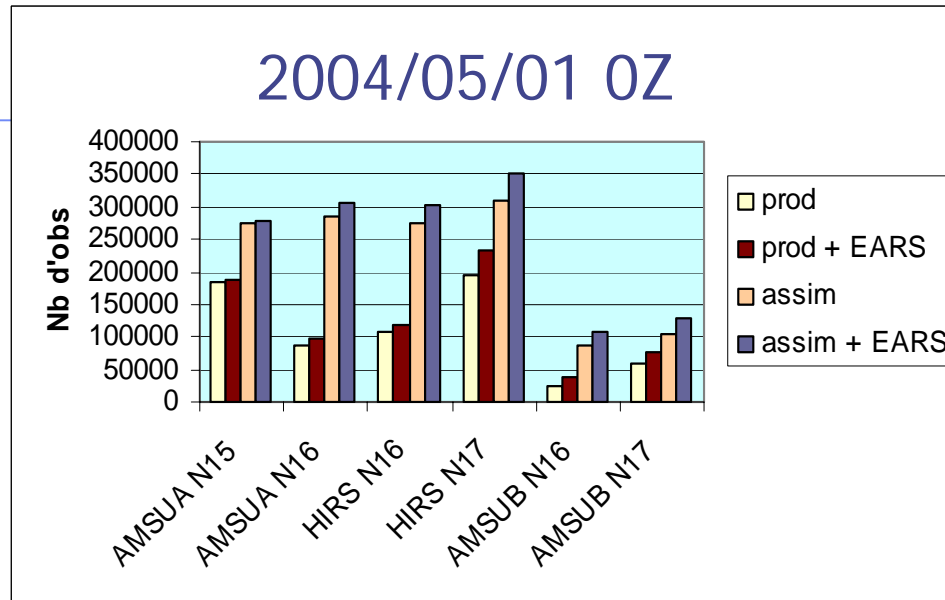
Cut-off times:

1h50

8h10

2004/05/01 12Z
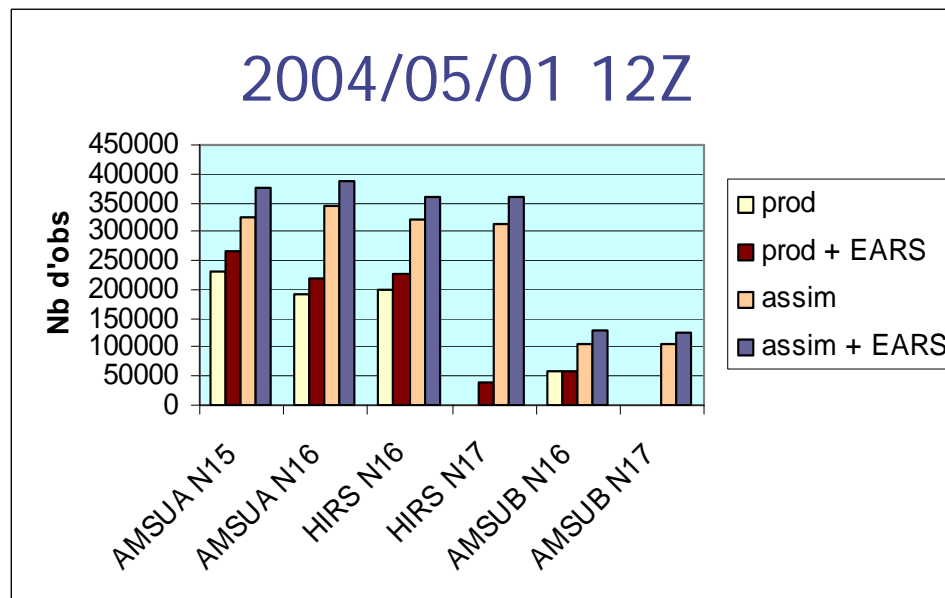
EARS data assimilation experiments

- **Processing**

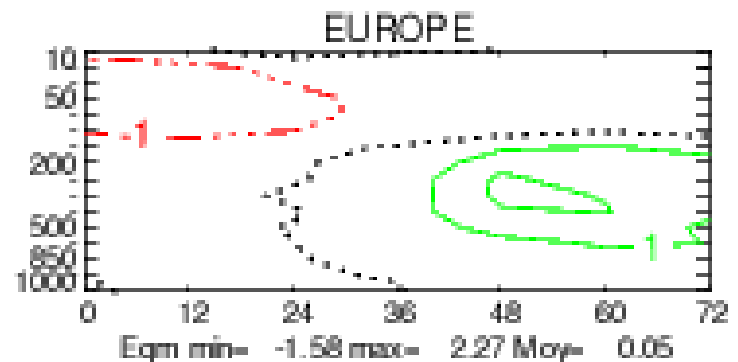   identical to global radiances, same bias correction

- **Forecast impact**

    slightly positive over Europe

Geopotential scores

wrt Radiosondes

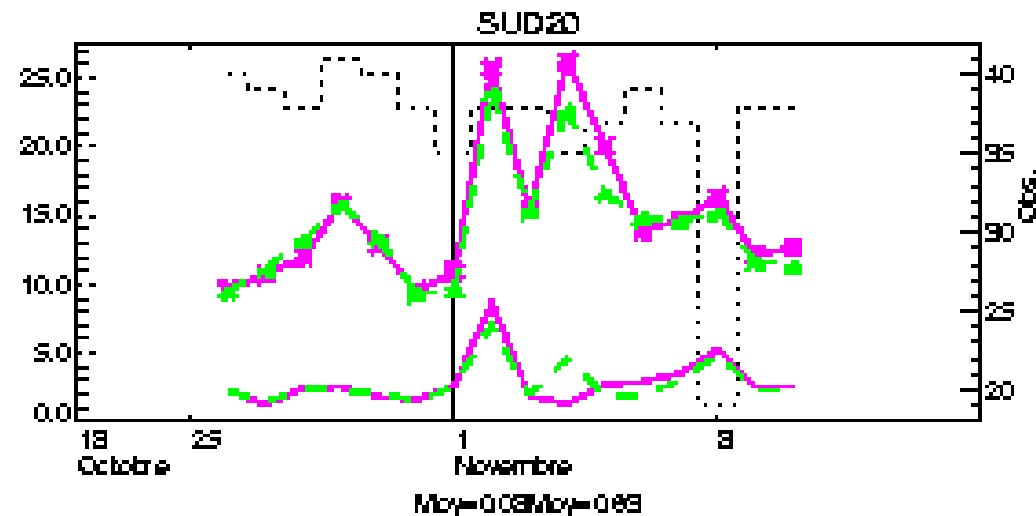(2 weeks)

AIRS data assimilation experiments

Data used

64 channels, data over sea, clear pixels

Preliminary results

very slightly positive

250hPa wind scores
wrt Radiosondes
(2 weeks)

Outlook

- AIRS

- Work on surface emissivity for AMSU and AIRS

  (posters by Hua and Karbou)

- Meteosat CSR

- MODIS winds

- SSMI(/S)

- Retuning of satellite radiance errors