SCATT activities for NWP in Météo-France

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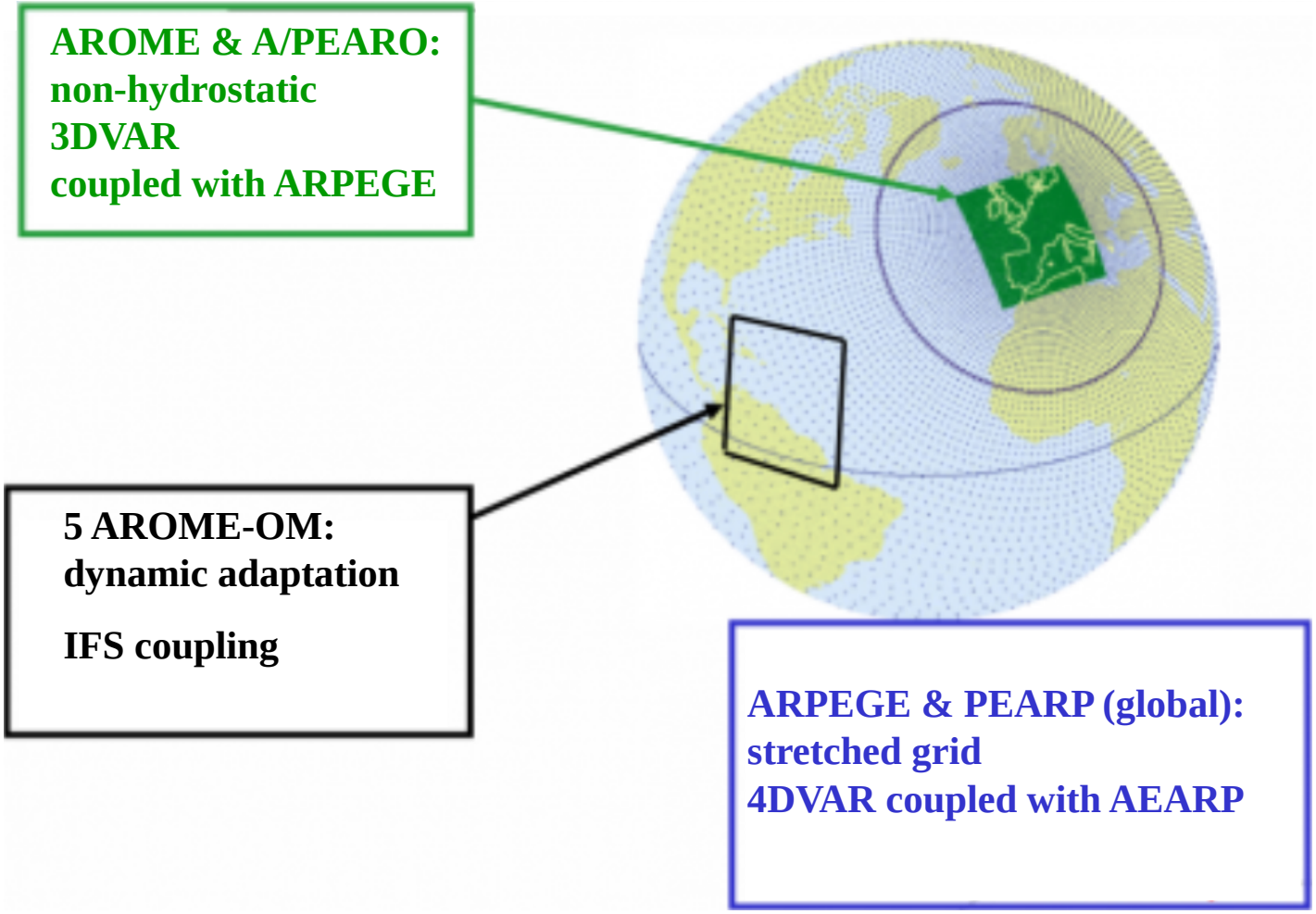
Outline

- Update of Météo-France operational NWP system
- Changes regarding the assimilation of scatterometer winds
- CFOSAT SCAT monitoring

Operational NWP system

AROME & A/PEARO:
non-hydrostatic
3DVAR
coupled with ARPEGE



5 AROME-OM:
dynamic adaptation

IFS coupling

ARPEGE & PEARP (global):
stretched grid
4DVAR coupled with AEARP

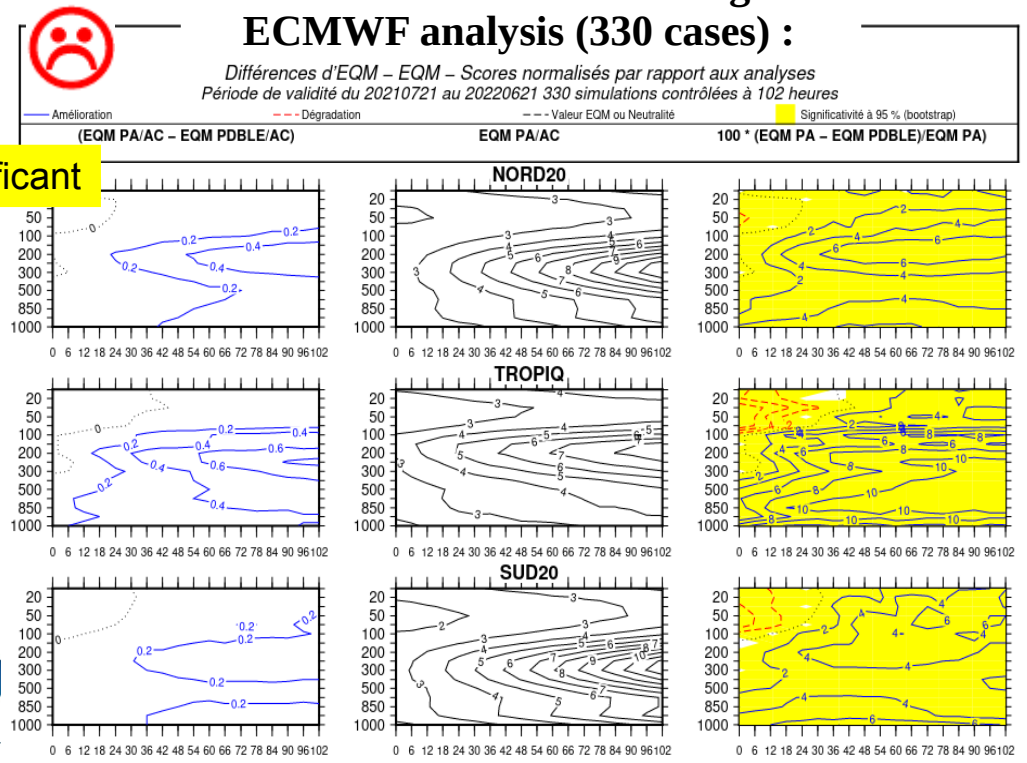
Last update on 29/06/2022

New operational NWP system since 29/06, major changes regarding the global model (ARPEGE) :

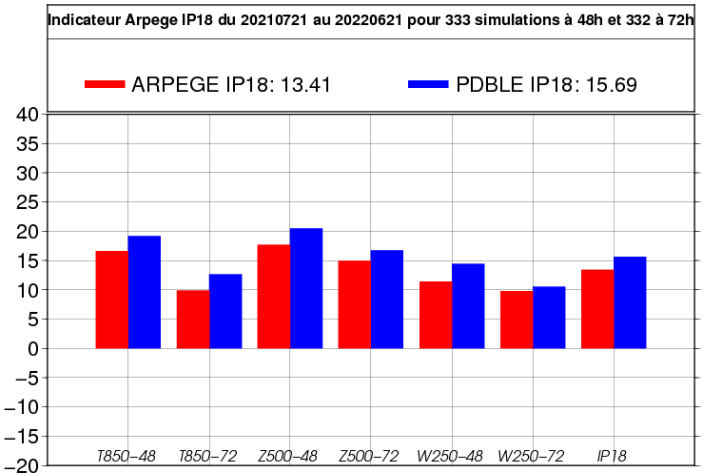
	previous (version CY43T2)	*now (version CY46T1)*
deep convection	Geleyn/Bougeault scheme with anti-gps v3 (Marquet et al 2019)	New scheme based on *Tiedtke* 1989, *Bechtold* et al. 2004, 2008, 2014 (IFS scheme)
air-sea fluxes	ECUME scheme (Belamari and Pirani, 2007)	*ECUME V6* (Belamari et al, 2016)
solar radiation	SW 6 bands from Fouquart and Bonnel (1980) modified by Morcrette et al. (2008)	SRTM from Mlawer et al. 1997 with Mclca solver (Pincus et al 2003)
sea-ice	analysis update (from OSTIA)	*1D scheme GELATO* (Salas y Melia 2002)

0 UTC wind forecast scores against ECMWF analysis (330 cases) :

significant



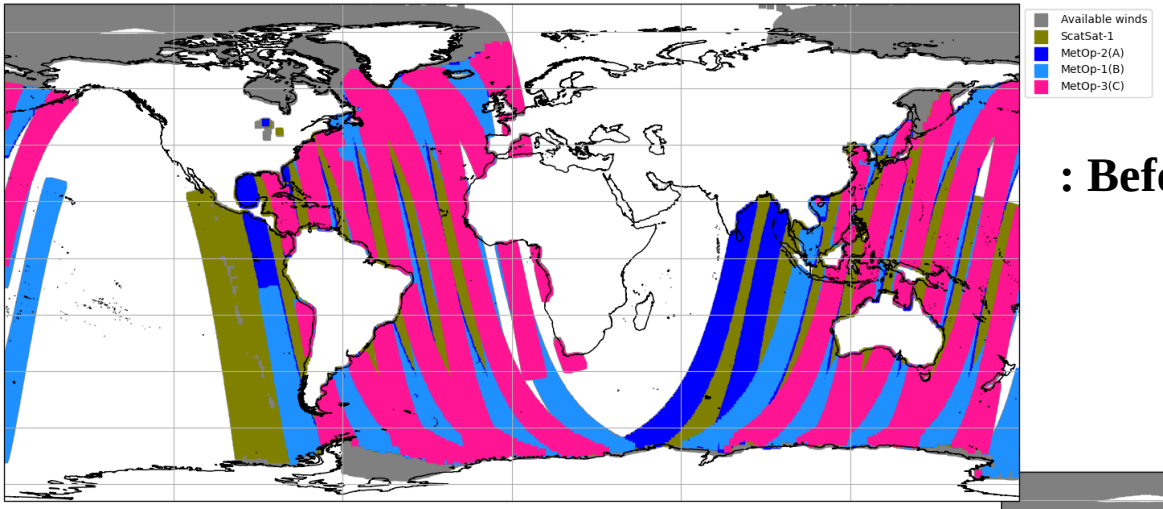
Synthetic score against radiosondes over Europe, based on T850, Z500, Wind250, +48 and +72 h, (+2.28) :



Scatterometer winds in the operational context

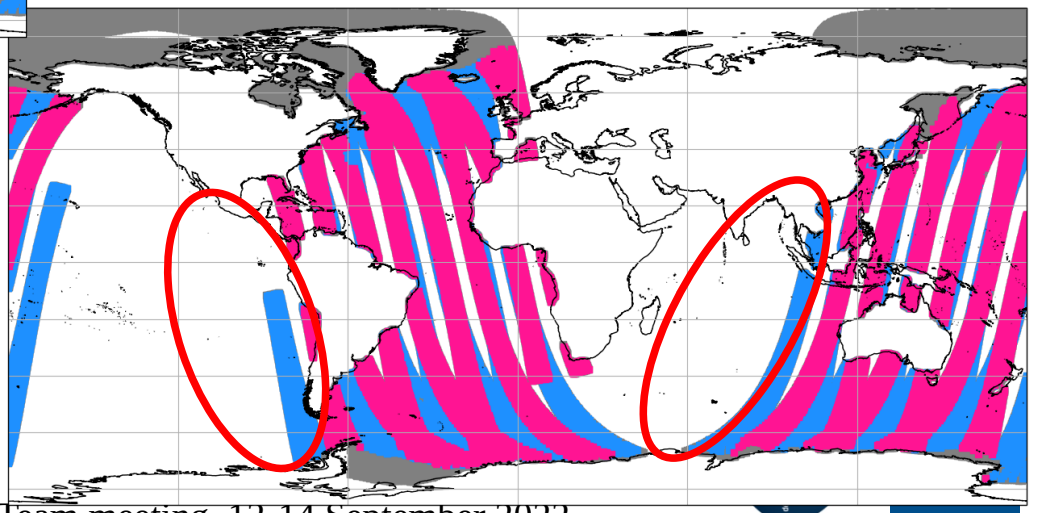
- ScatSat-1 stopped in February 2021, MetOp-2 (ASCAT-A) decommissioned in November 2021
- Remained assimilated operationally the 50 km winds from ASCAT (25 km grid) provided by EUMETSAT OSI SAF, both in ARPEGE (B & C) and AROME (B only)

Scatterometer winds availability on a 6 hours assimilation window for ARPEGE :



: Before February 2021

After November 2021 :

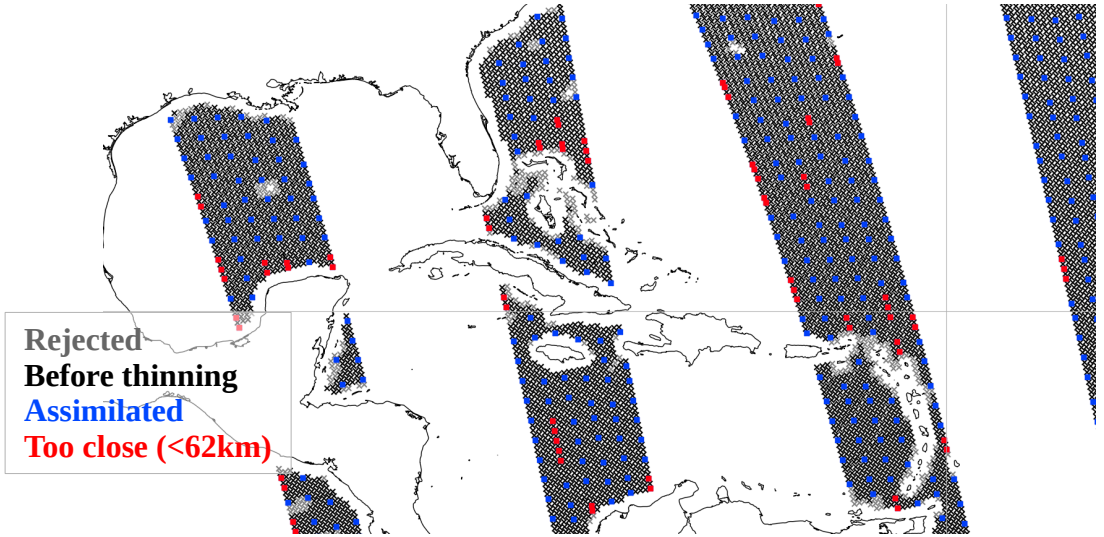


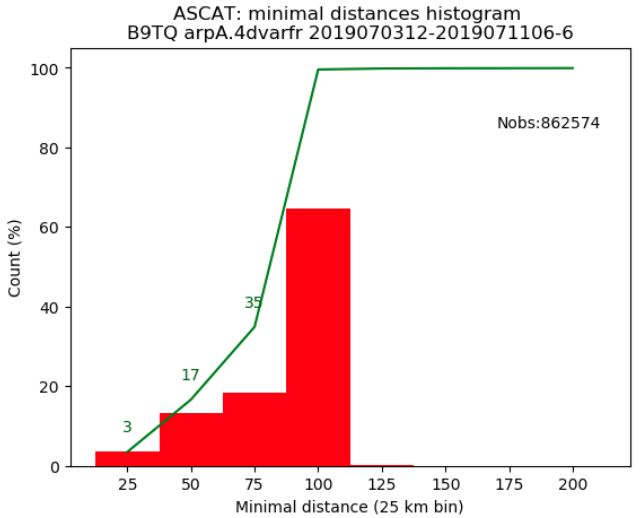
Changes regarding the scatterometer winds

- A new thinning scheme
- HY-2B and HY-2C adding in ARPEGE (OSI SAF L2B from NSOAS L1B)
- New tuning of observation errors for ASCAT winds
- HR ASCAT winds (12.5 km grid) used in AROME with ASCAT-C adding

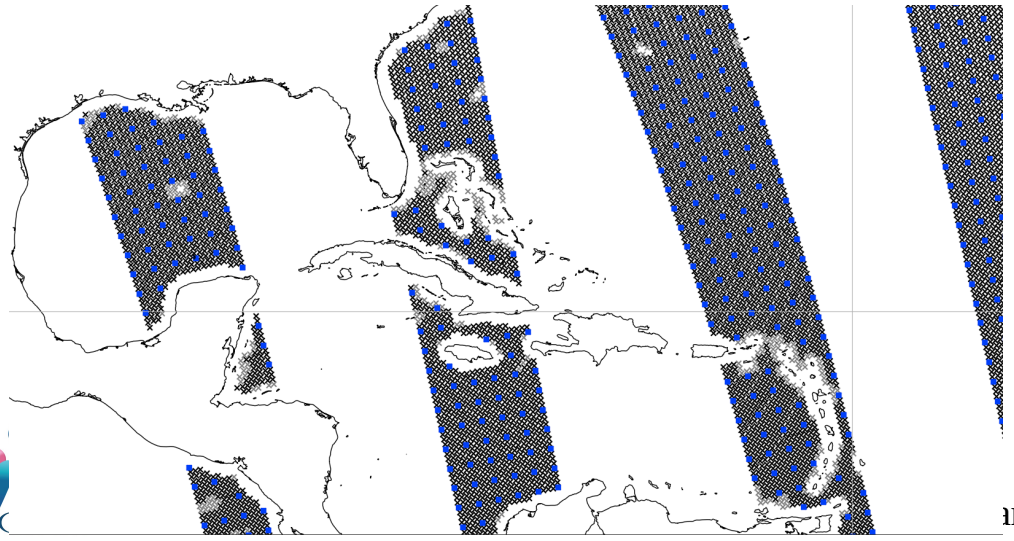
A new thinning scheme

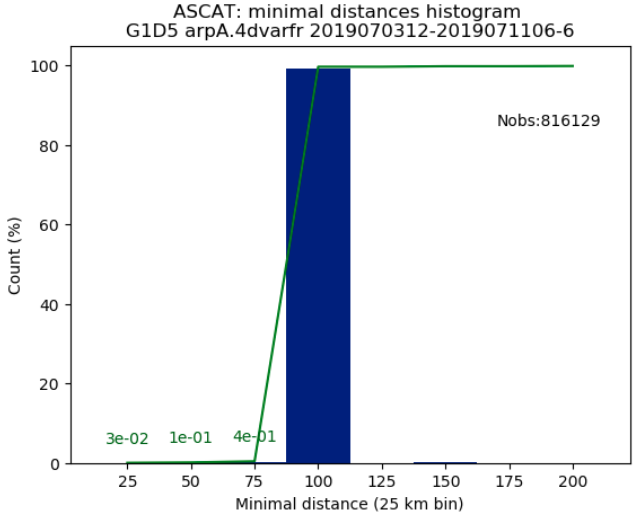
- Former thinning scheme based on spatial earth-grid :





- New thinning scheme based on observation grid :

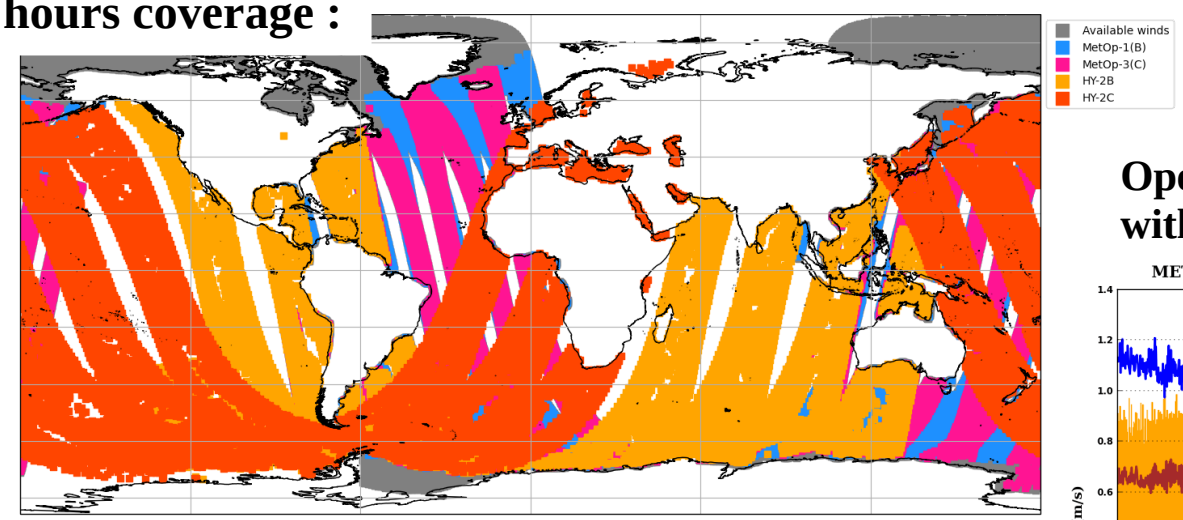




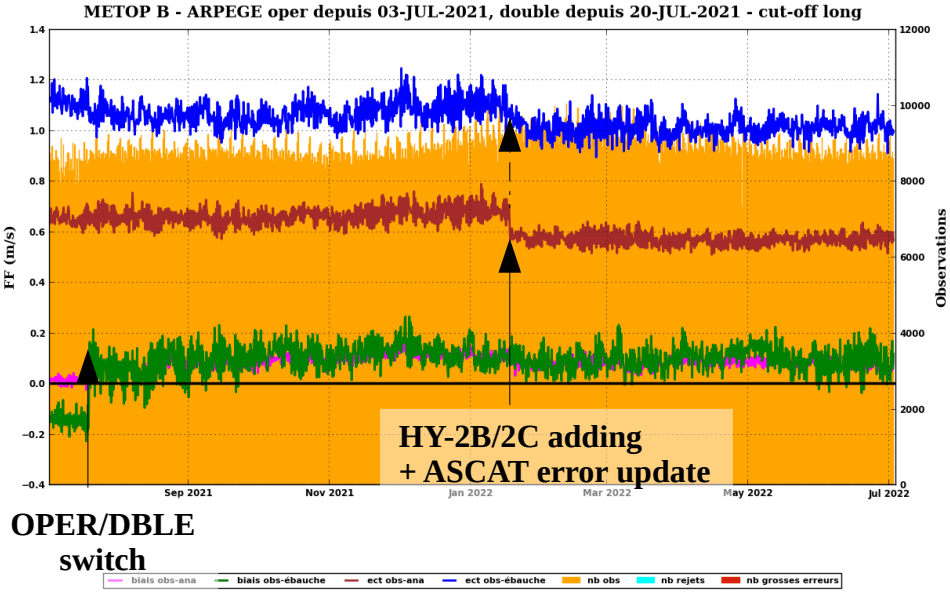
HY-2B and HY-2C adding and ASCAT error revision in ARPEGE

- **HY-2B** at 6:00 desc., **HY-2C** not sun-synchronous

6 hours coverage :



Operational monitoring of ASCAT-B wind speed with the new ARPEGE version :

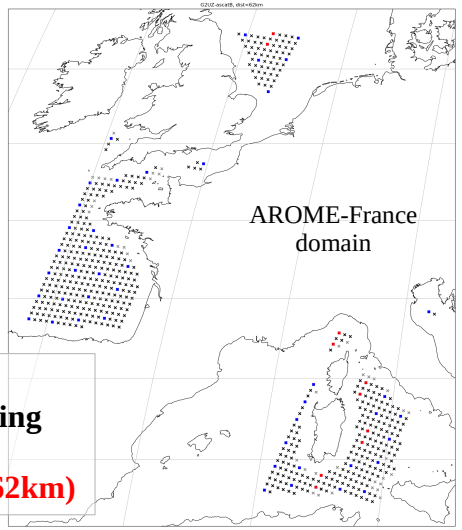


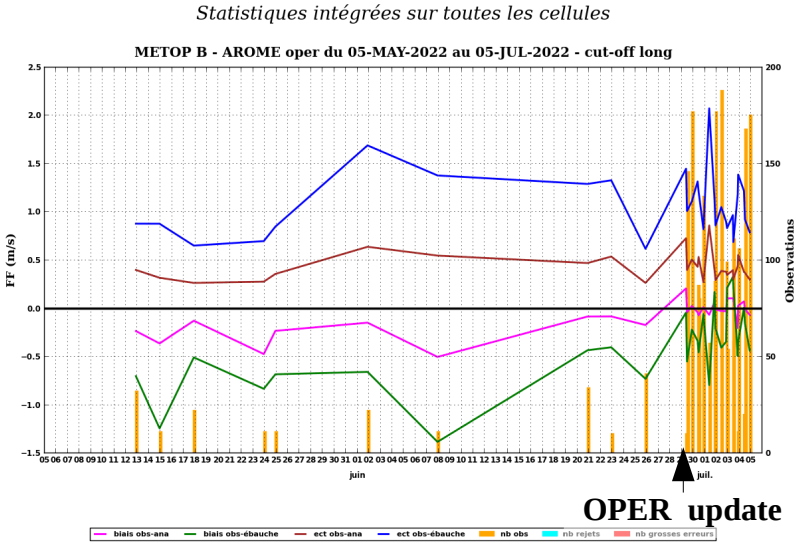
- Observation error revision (based on Desroziers diagnostic) :

Obs. error /Instr. (m/s)	ASCAT	HSCAT
New tuning (U/V)	1.00/1.05	0.95/0.90
Former	1.39/1.54	
(O-B)	1.30/1.40	1.20/1.20

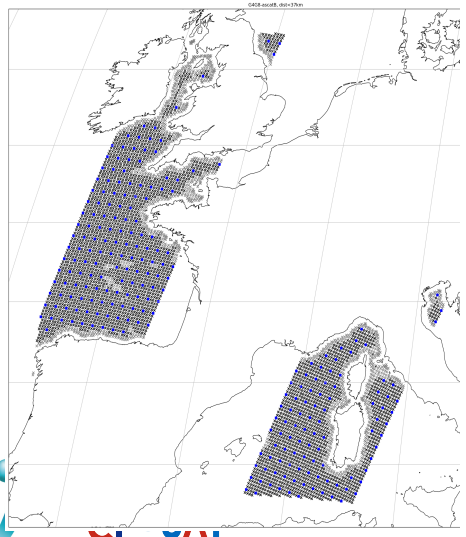
HR ASCAT winds (12.5 km grid) used in AROME with ASCAT-C adding

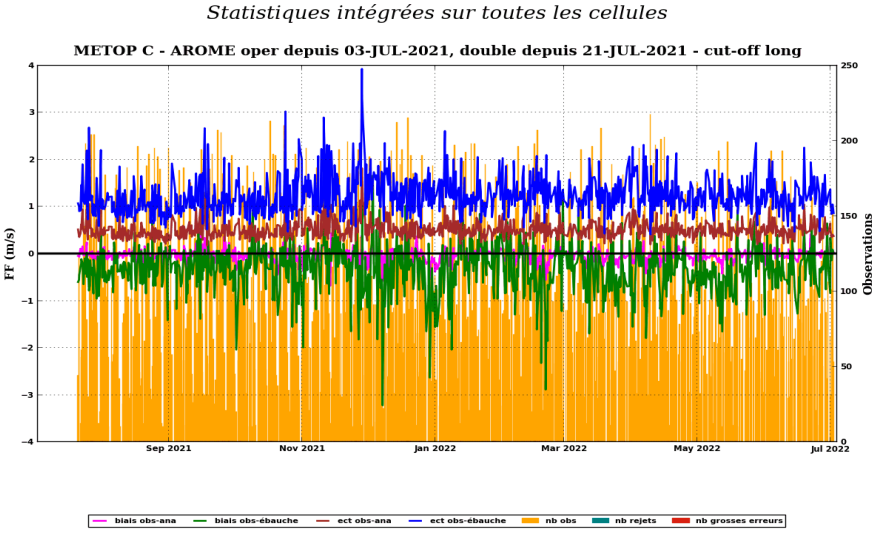
- Former : 25 km grid ASCAT with the legacy thinning, only ASCAT-B used





- New : 12.5 km grid ASCAT with the obs grid thinning, ASCAT-C added





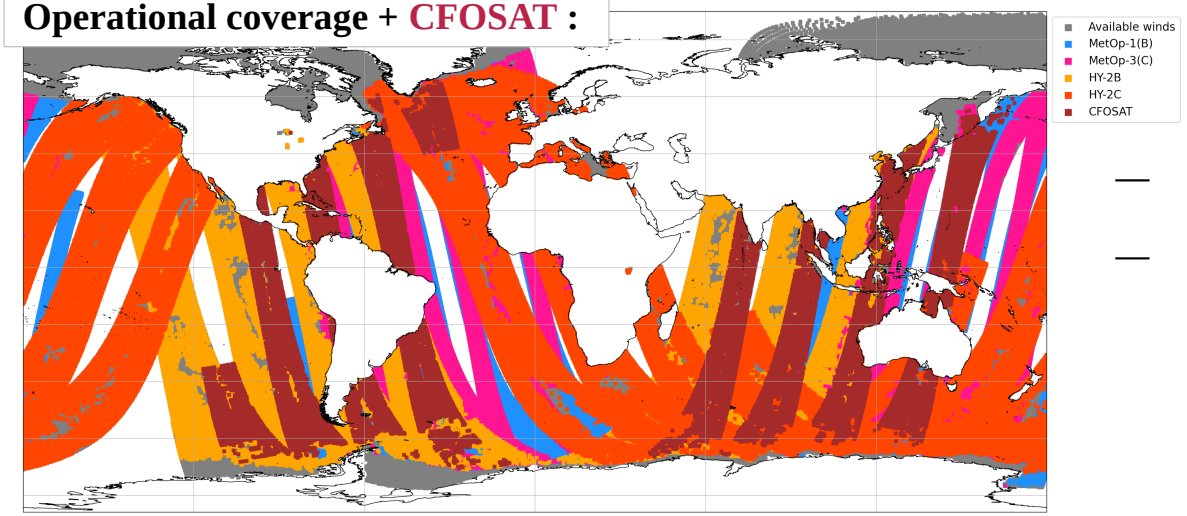
HR + ASCAT-C

4 times more assimilated data in AROME

CFOSAT SCAT monitoring

- CFOSAT SCAT coverage :

Operational coverage + CFOSAT :



— CFOSAT at 7:00 desc

— Fills the inter-swaths of HY-2B

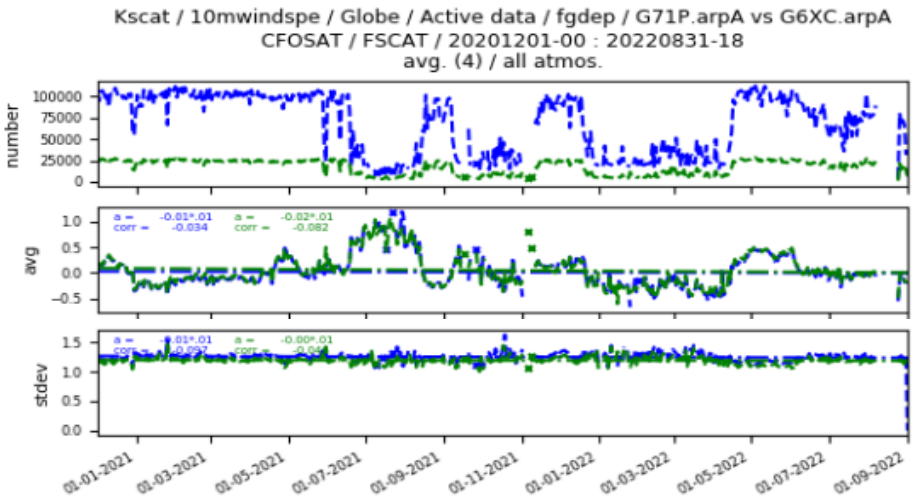
- Monitoring experiments (datasets, QC and periods):

experience id.	**G6XC (1)**	**G71P (2)**	**G7IO (3)**	**G71S (4)**
CFOSAT product	OSI SAF	OSI SAF	OSI SAF	CNES (NSOAS)
wvc resol./thinning	50 km	25 km	25 km	25 km
azimuth check (dir1,dir2) < 135° rejected (rotating beams)	used	used	not used	not used
period	10/09/20 to 31/08/22	10/09/20 to 31/08/22	01/12/20 to 31/08/22	10/09/20 to 31/08/22

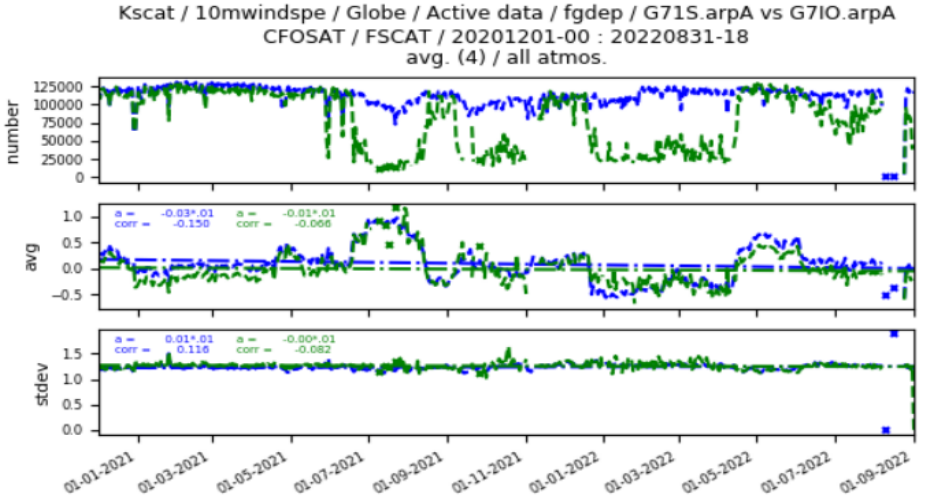
CFOSAT SCAT monitoring : (O-B) wind speed time series

- **CFOSAT SCAT** :

OSI SAF : **25 km** versus **50 km**

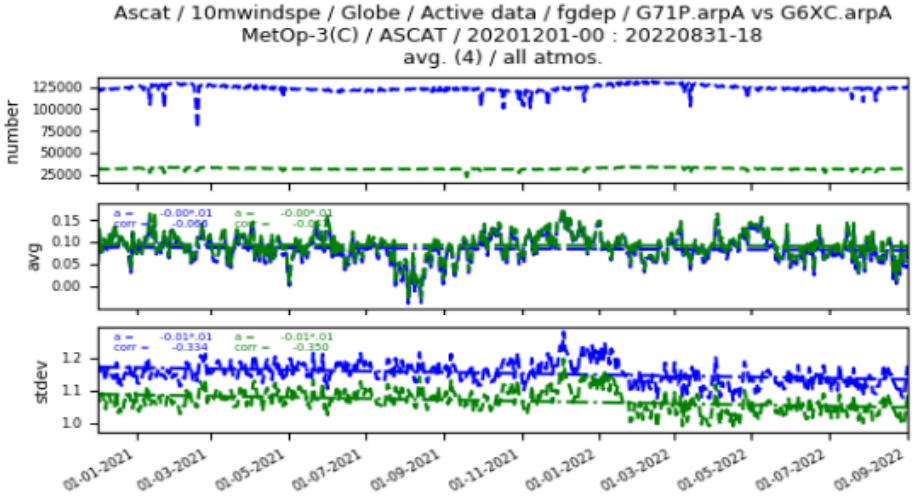


25 km : **NSOAS** versus **OSI SAF**



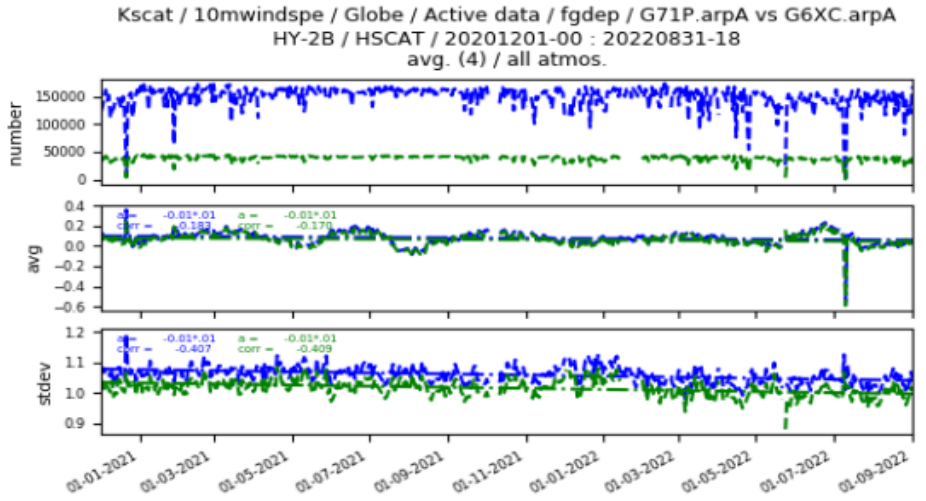
- **ASCAT-C** :

OSI SAF : **25 km** versus **50 km**



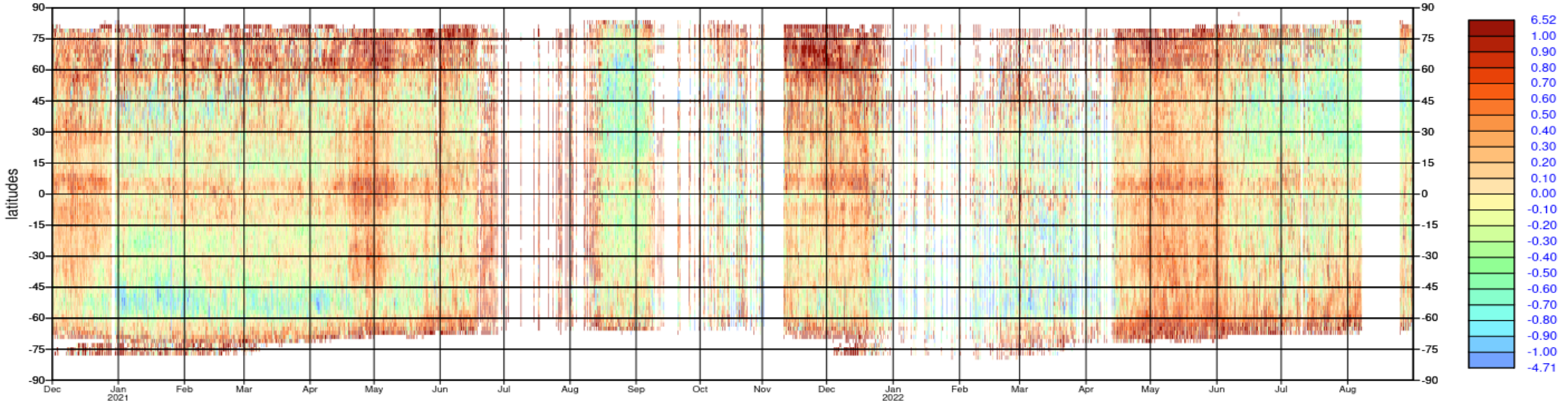
- **HSCAT-B** :

OSI SAF : **25 km** versus **50 km**

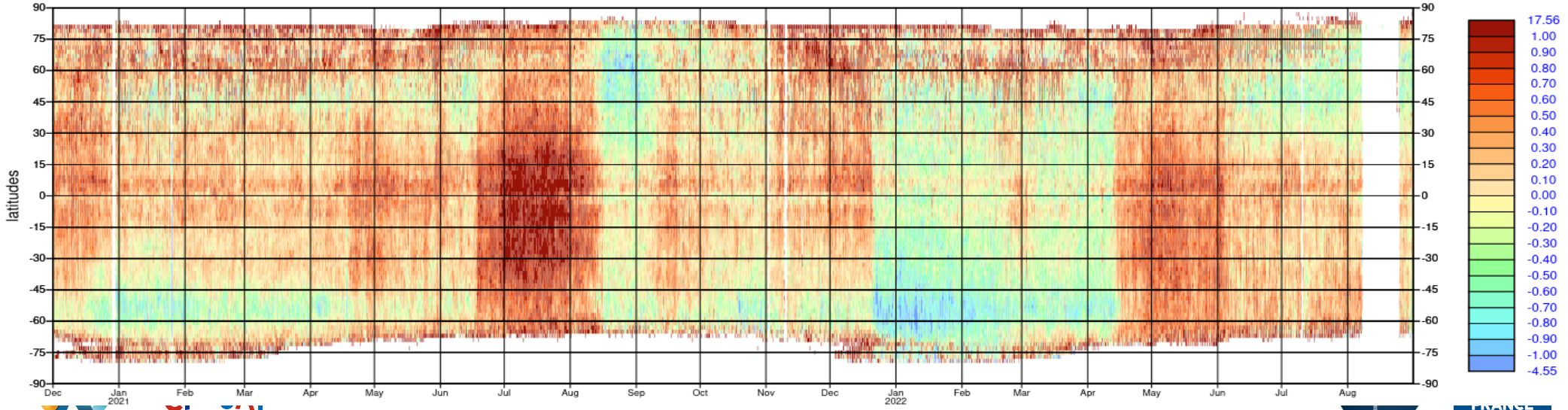


CFOSAT SCAT monitoring : (O-B) wind speed bias latitude hovmöller

- **OSI SAF 25 km** :

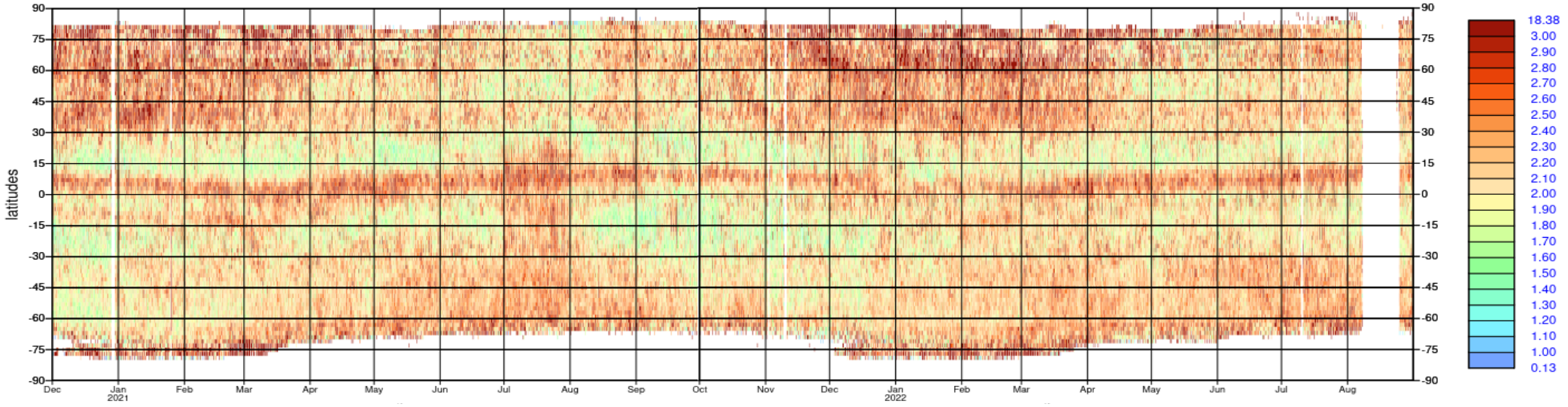


- **CNES (NSOAS) 25 km** :

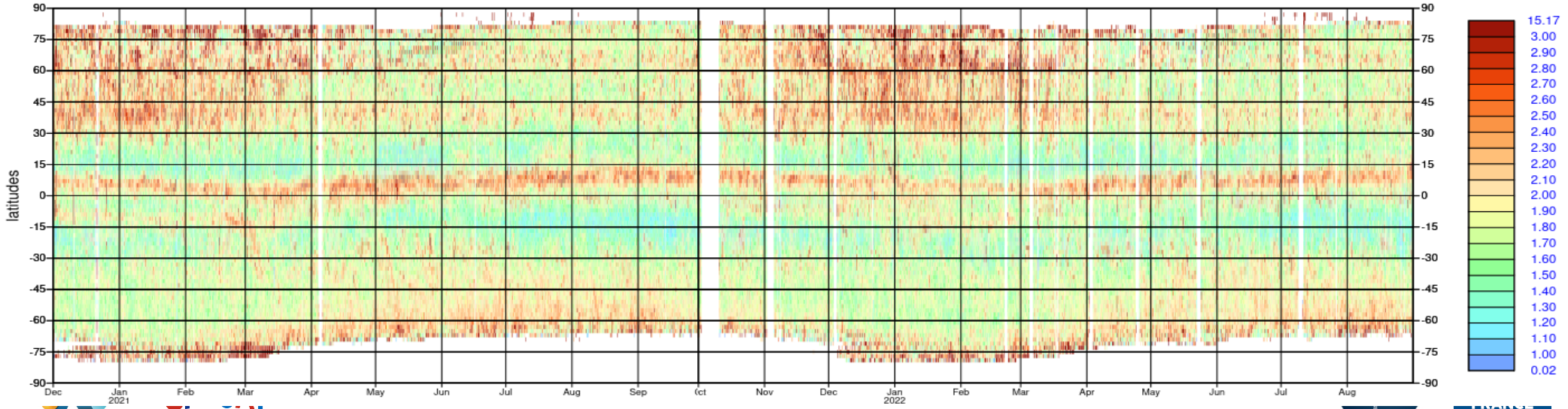


CFOSAT SCAT monitoring : (O-B) RMS vector latitude hovmöller

- **CFOSAT 25 km CNES (NSOAS)** :



- **HY-2B 25 km OSI SAF** :



Conclusions / Outlook

- Developing and maintaining a NWP system is a continuous work
- Some recent improvements and changes were shown regarding the use of scatterometer winds in assimilation, but with relative weak impacts on the forecast scores beyond 24/36 hours lead time (not shown)
- CFOSAT SCAT data monitoring will continue, a stable quality is a requirement for an operational use in assimilation
- New instruments HY-2D, FY-3E (?), OceanSat-3 (launch planned on September 30)
- In the same time, other ways of improvement will continue to be investigated

Thank you for your attention!