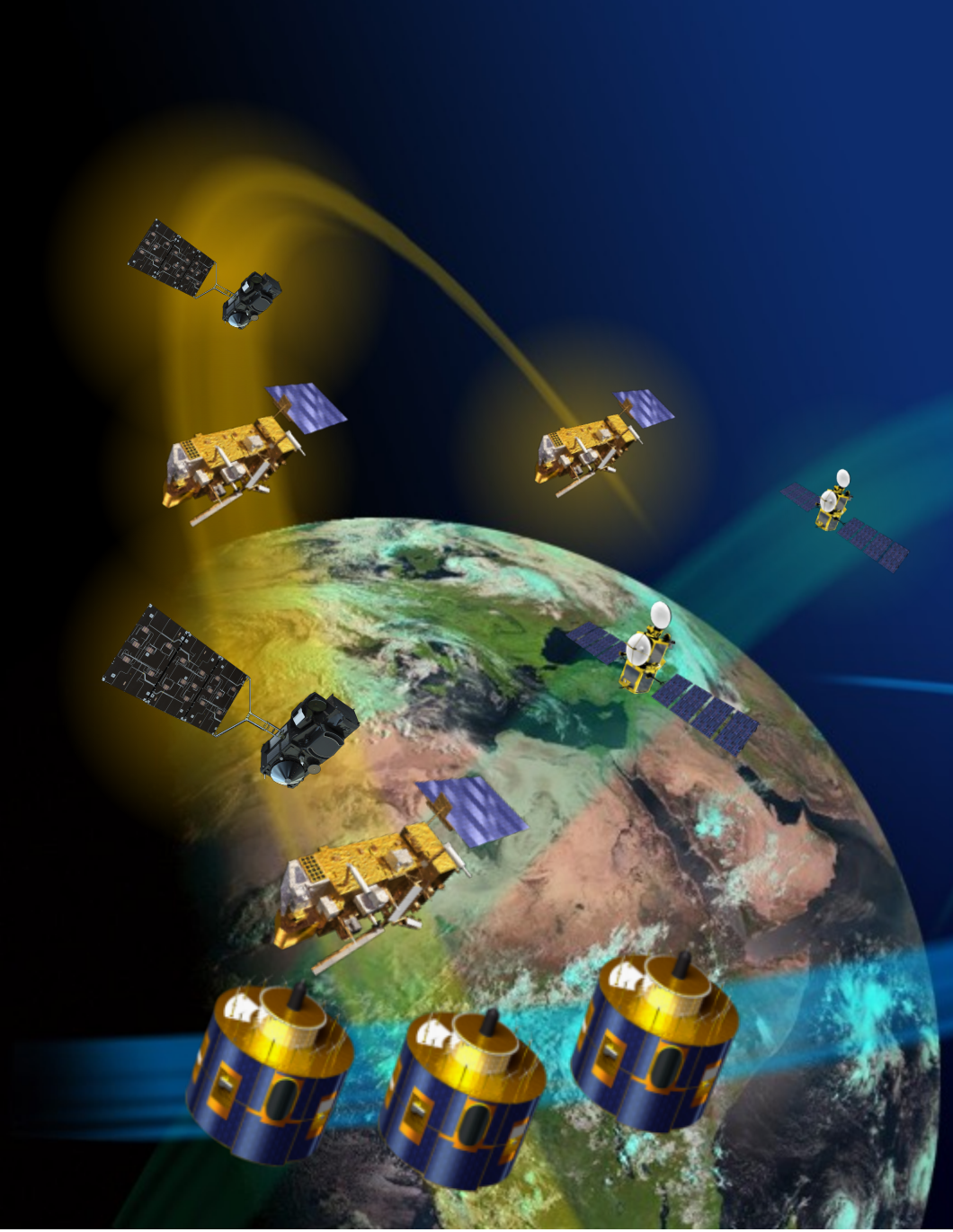


Climate Change

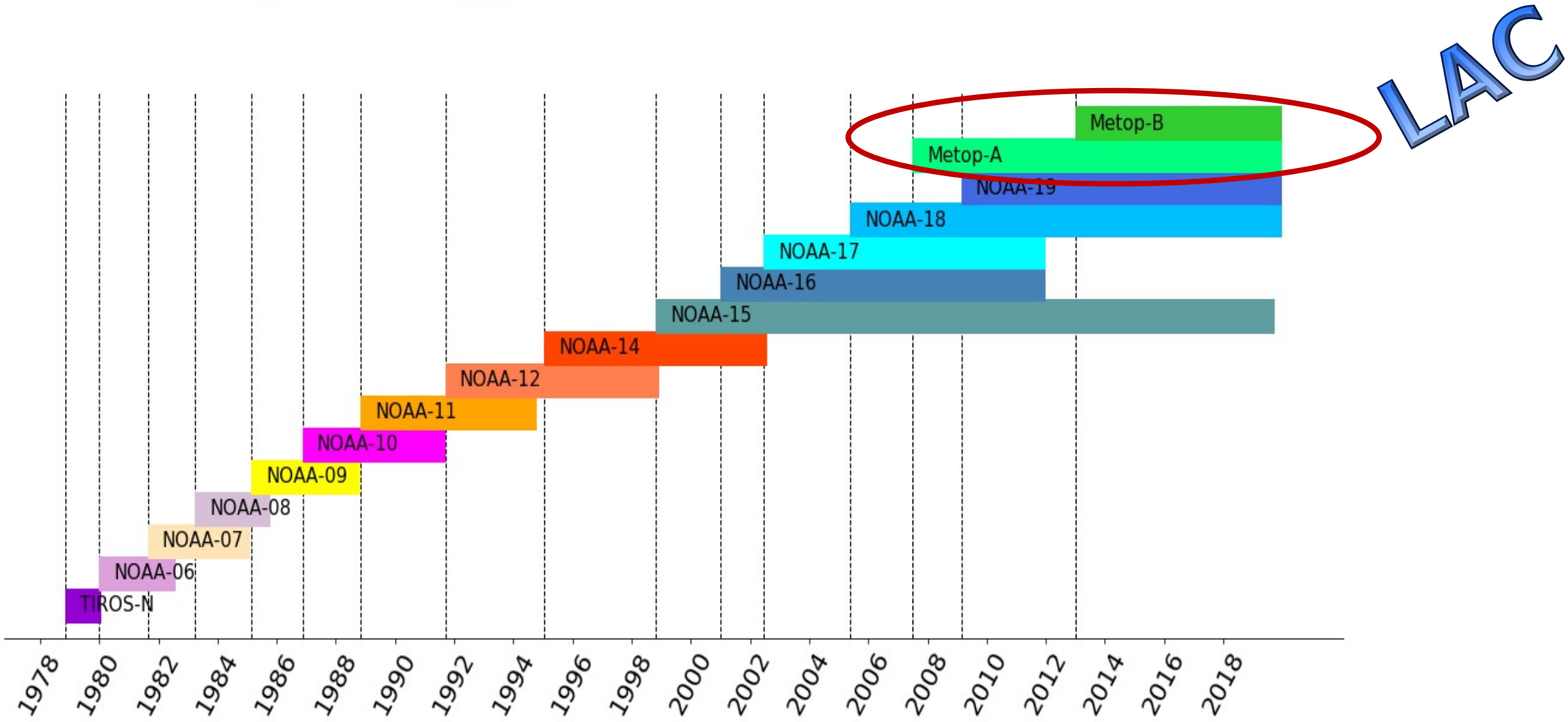
EUMETSAT

Copernicus
Europe's eyes on Earth

Climate Data Record from LEO AMVs

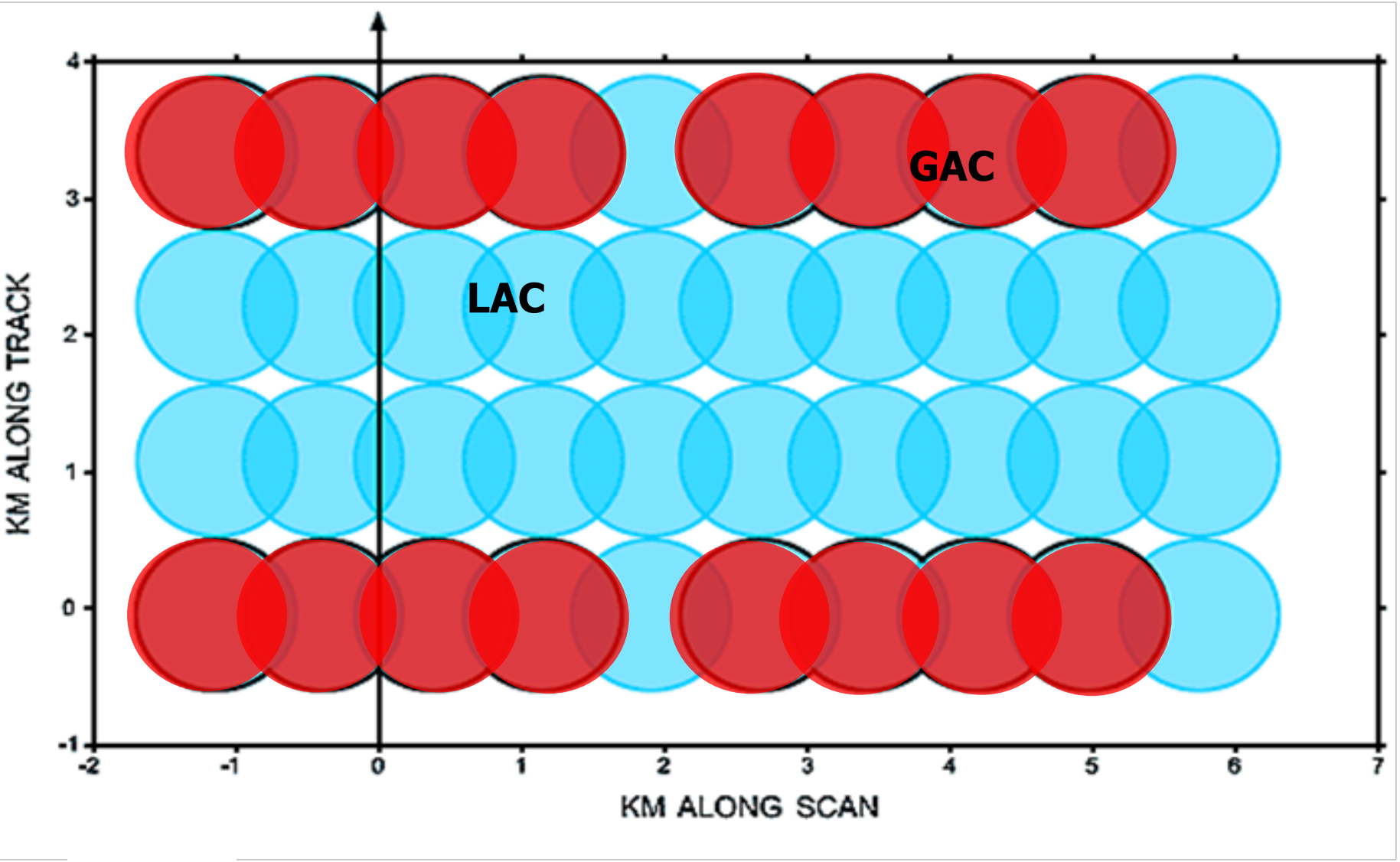
Roger Huckle, Marie Doutriaux-Boucher, Alessio Lattanzio,
Oliver Sus, Jaap Onderwaater, Lorenzo Medici,
Régis Borde, Olivier Hautecoeur and Joerg Schulz

AVHRR - Instruments

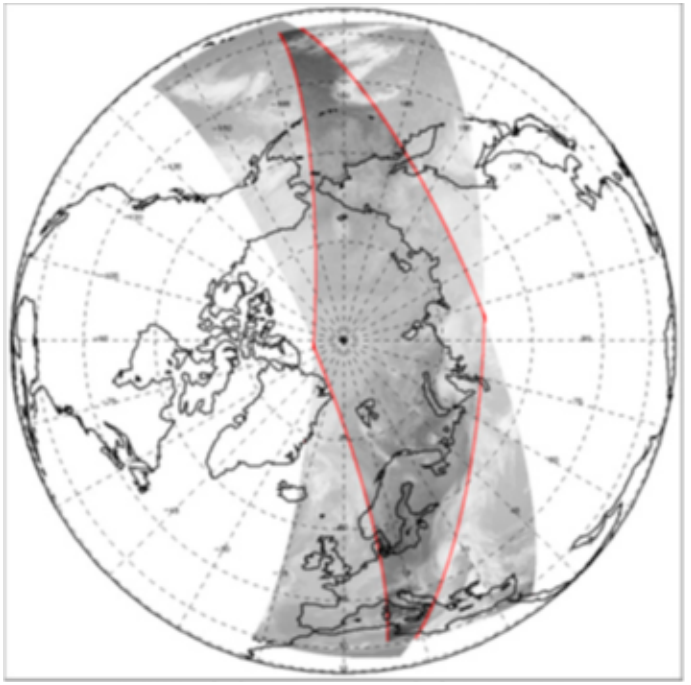


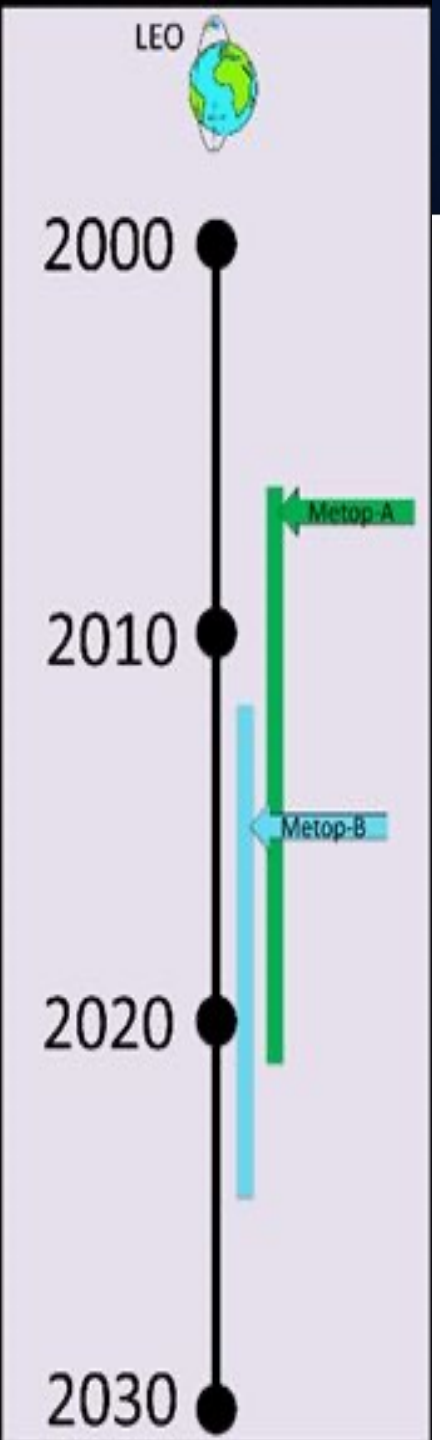
AVHRR instruments: 2 spatial resolutions

Pixel resolution: 1.1x1.1 km at nadir



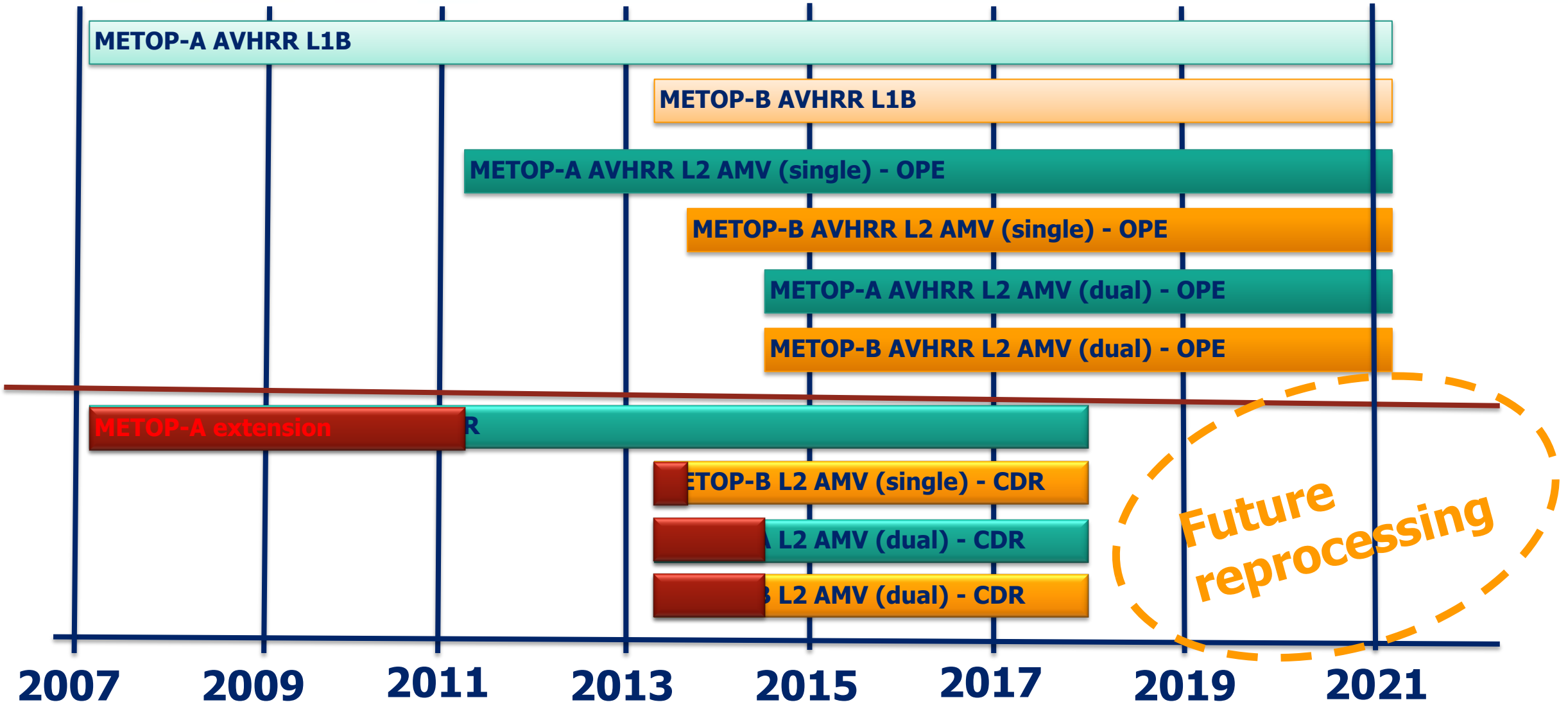
The AMV retrieval is done using 2 successive orbits



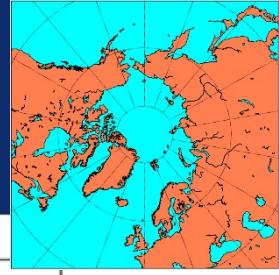


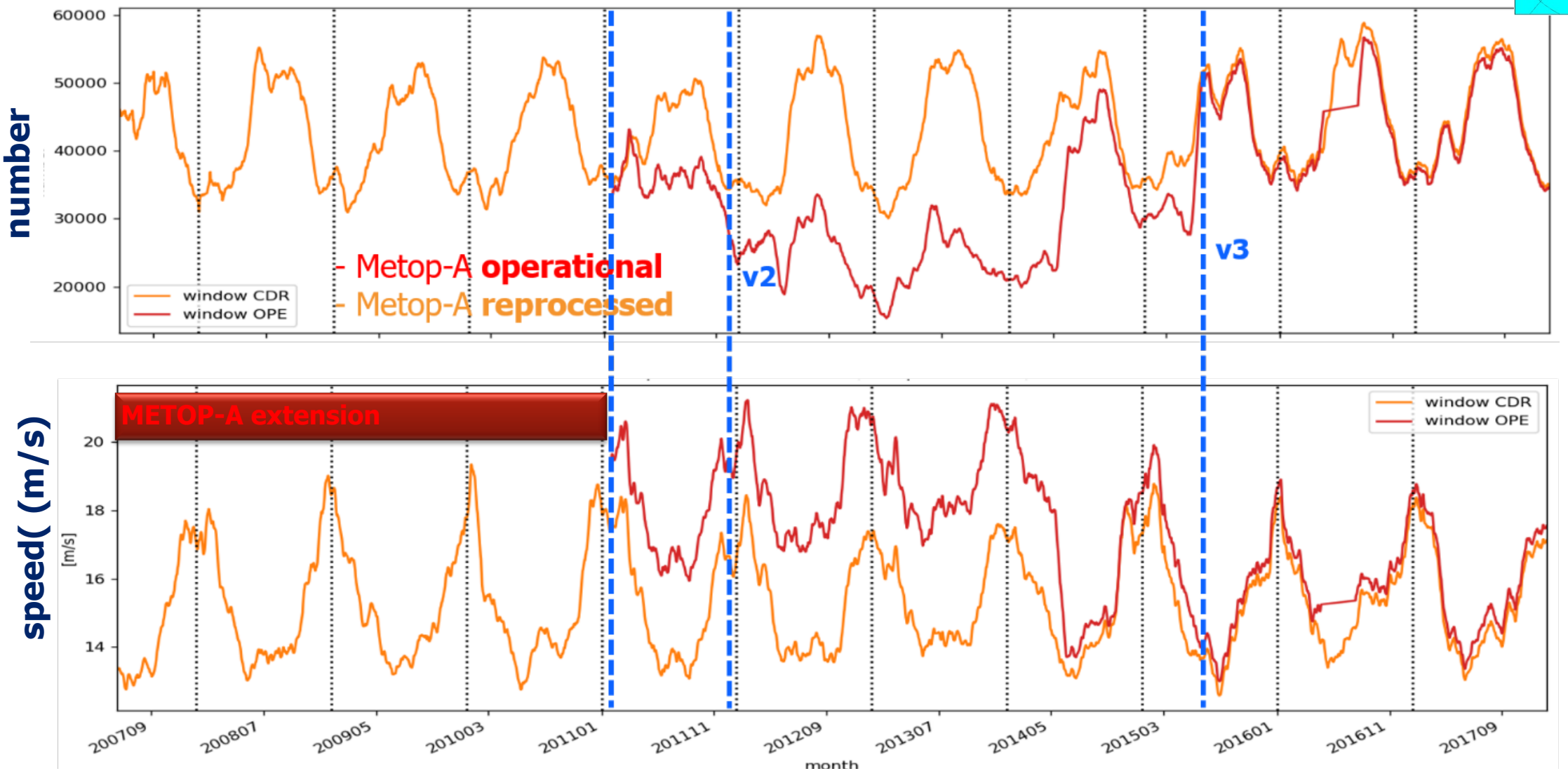
AVHRR - LAC

METOP-A and -B polar satellite – AVHRR - availability

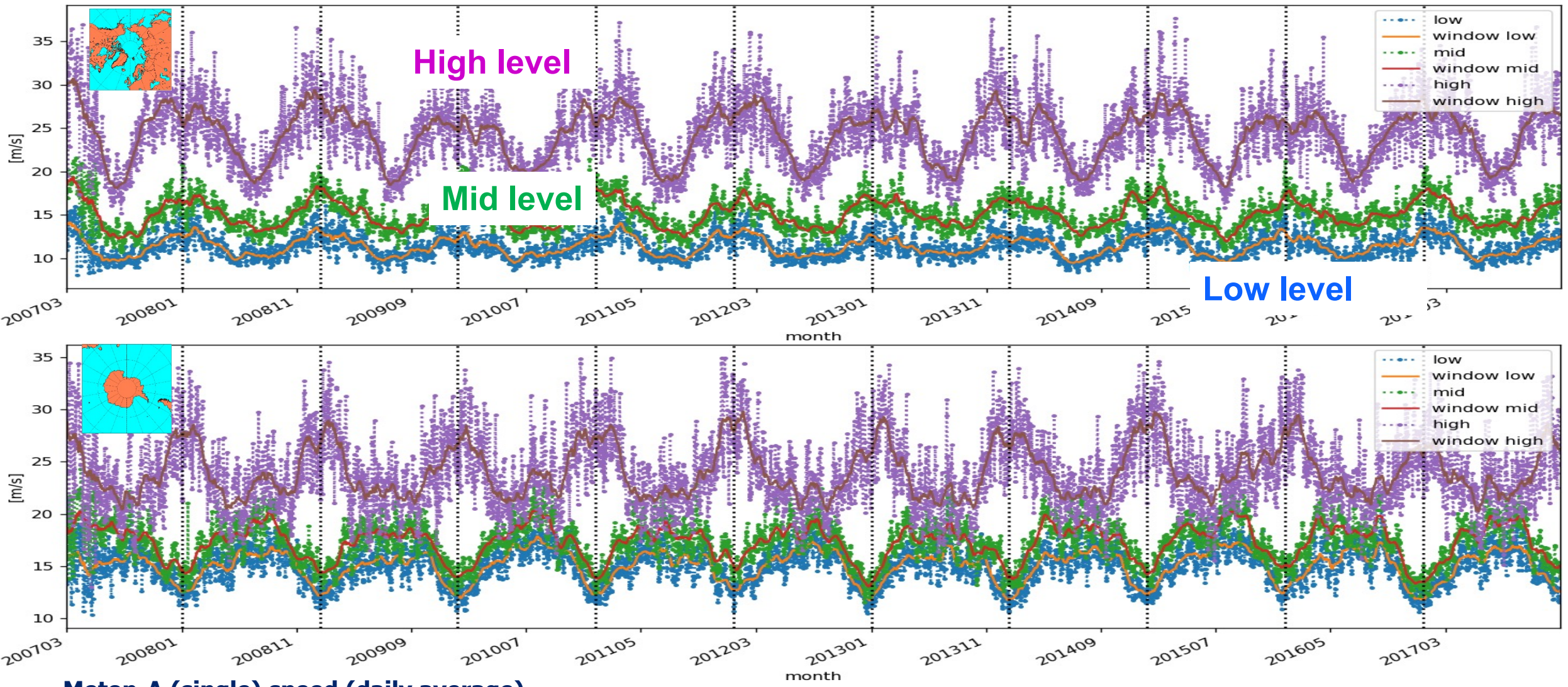


Daily num and speed of METOP-A AVHRR polar AMV CDR vs. NRT



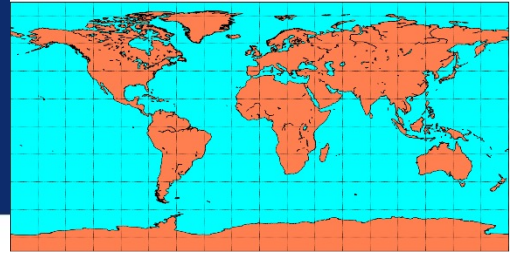


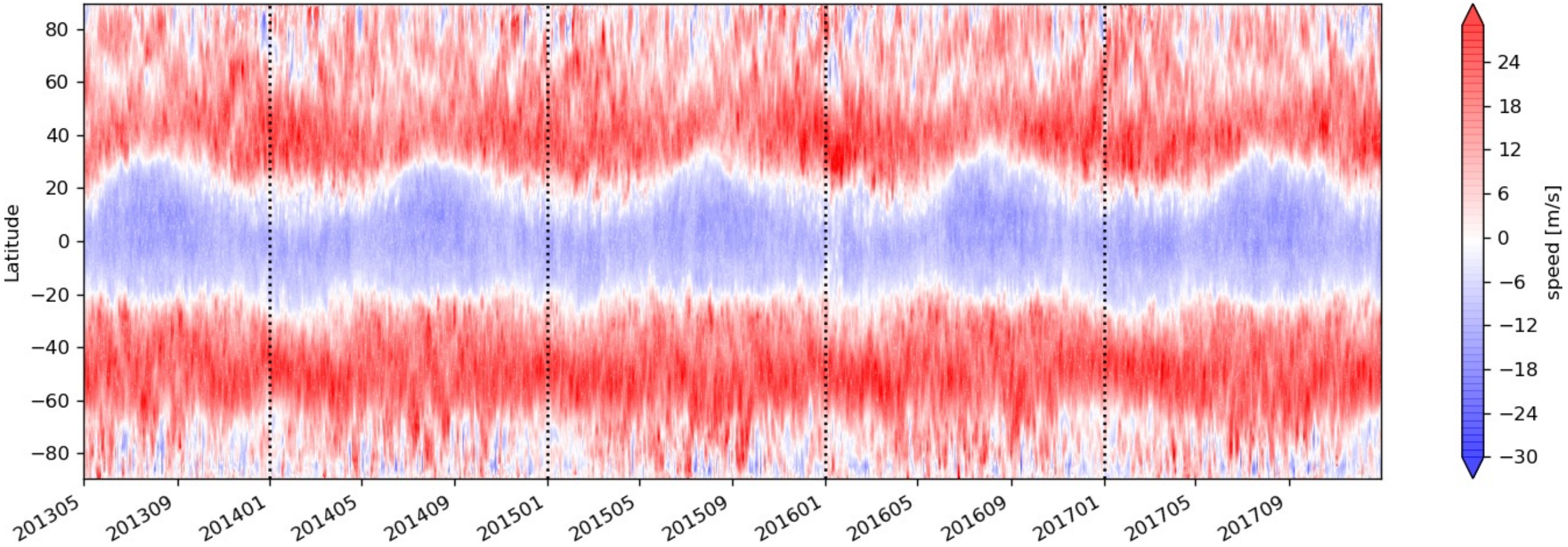
AMV speed (m/s) METOP – AVHRR – single



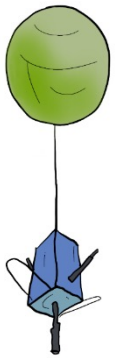
Metop-A (single) speed (daily average)

Global average of the zonal component of the daily AMV spped (m/s) METOP-A/B – AVHRR – dual



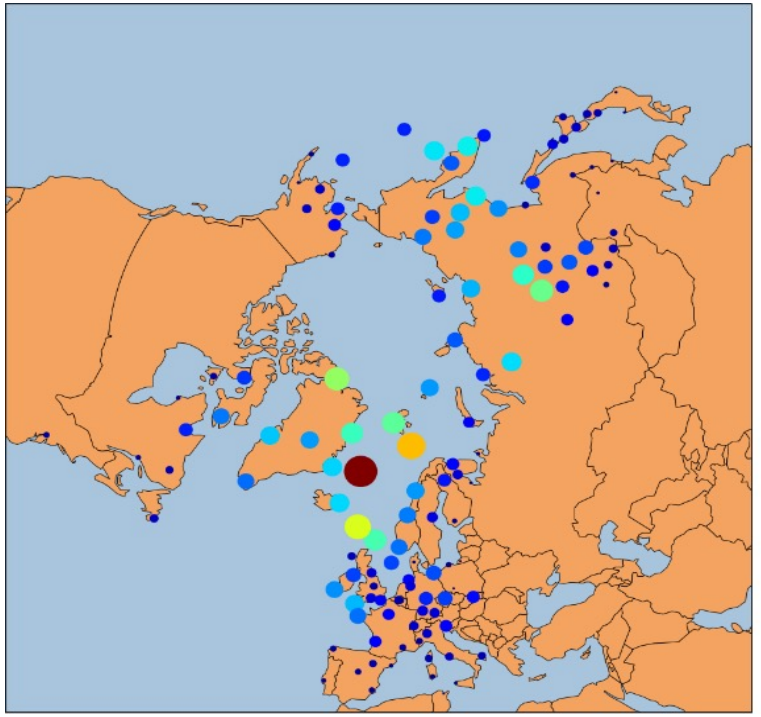


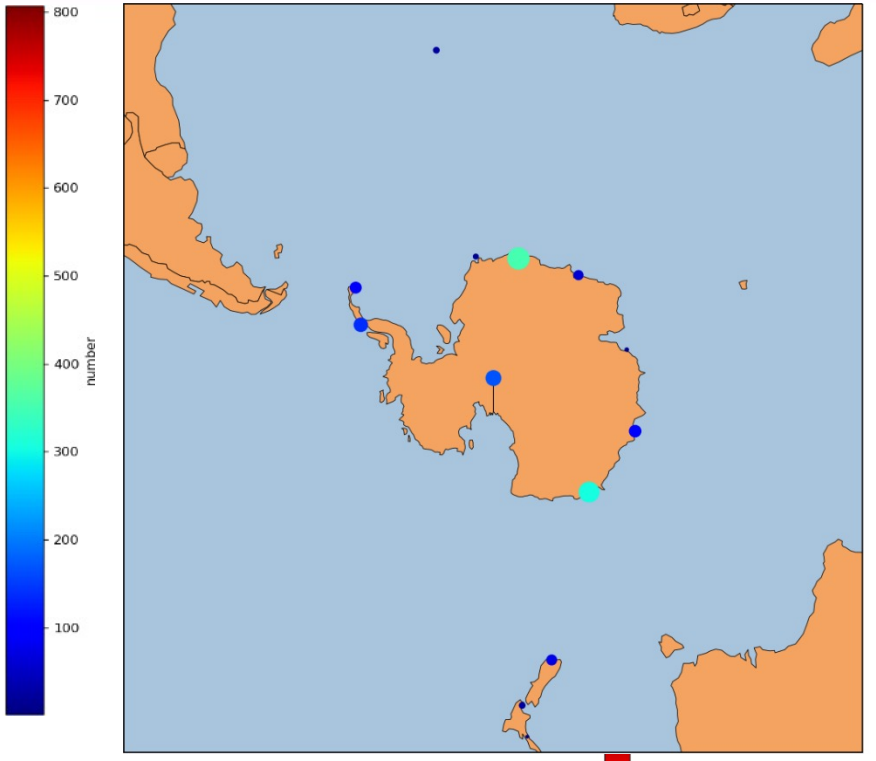
Comparison with radiosonde (RAOBCORE) data – number of monthly collocation for Jan 2014

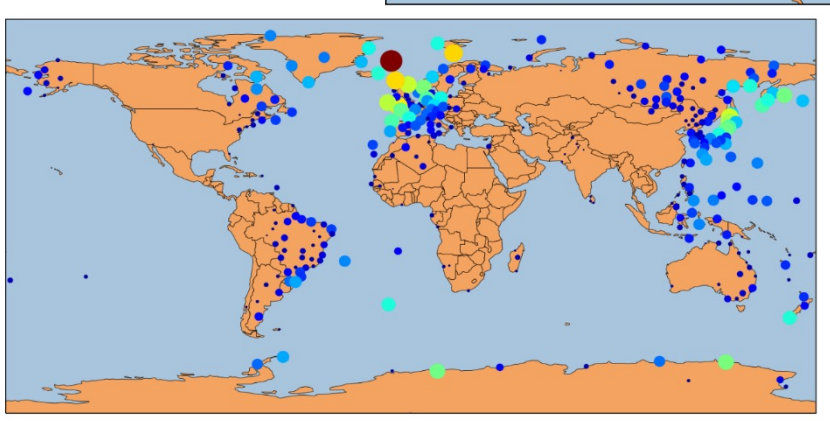


Colocation criteria
Horizontal distance: 150 km
Vertical distance: 25 hPa
Temporal: 90 minutes
Dir diff: 60°

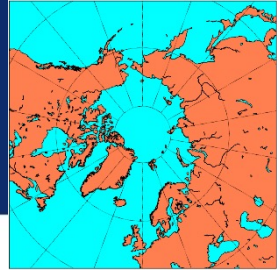
RAOBCORE link

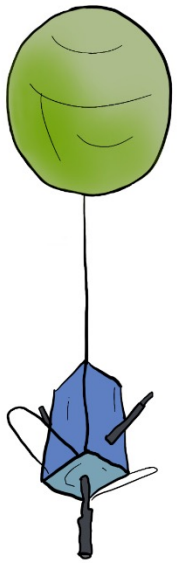


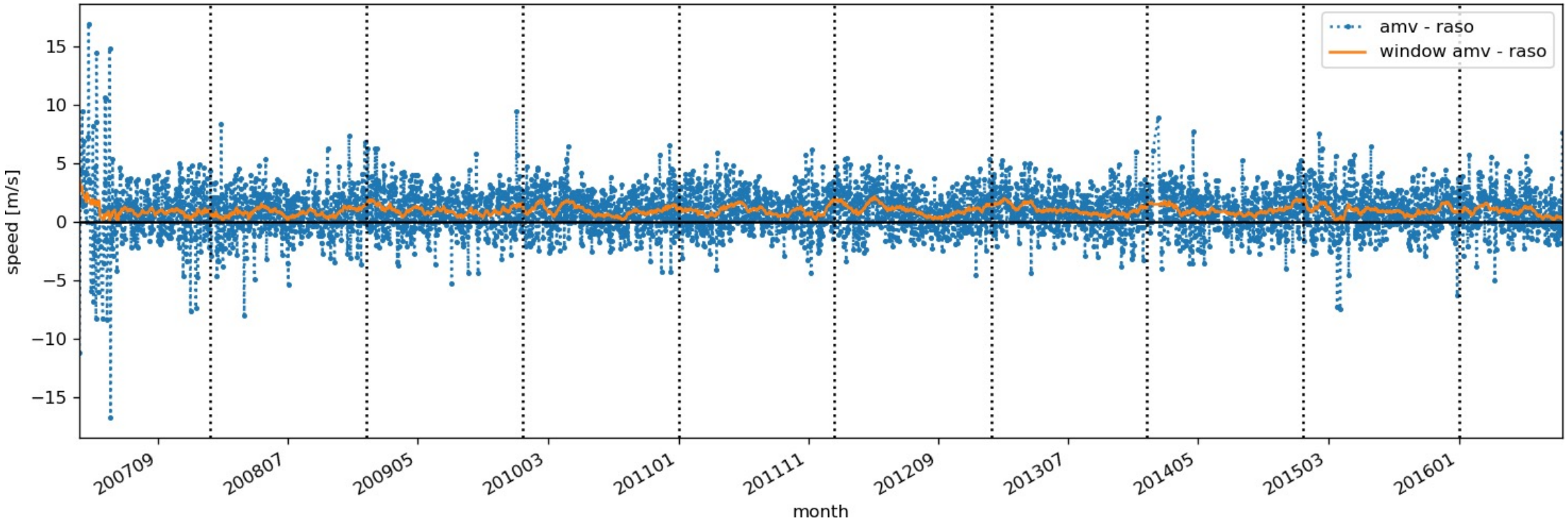




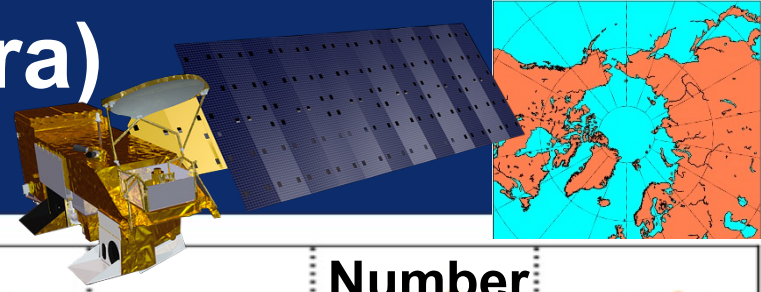
AMV speed difference (m/s)
METOP-A – AVHRR – single vs. radio sondes (Arctic)

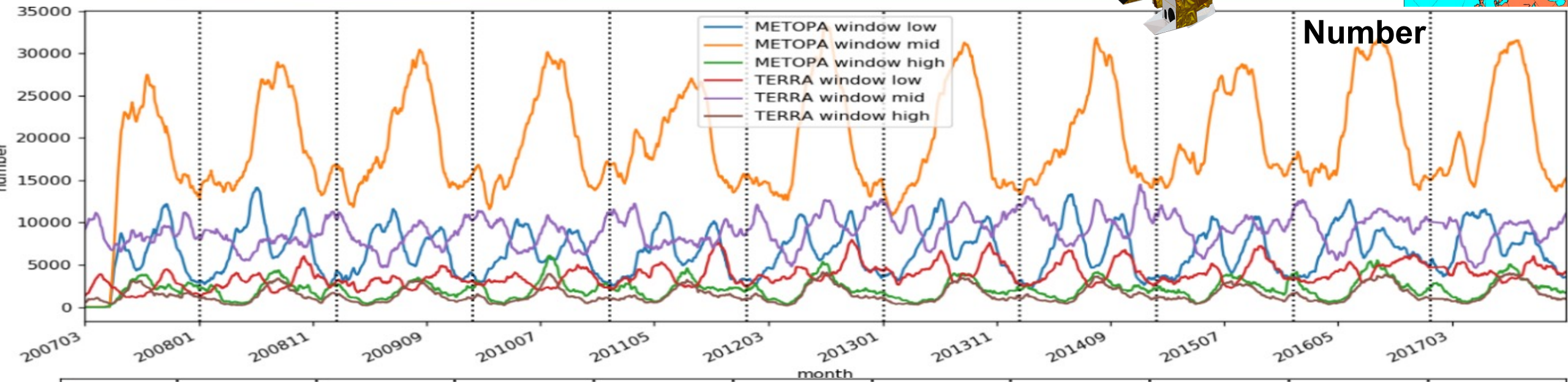


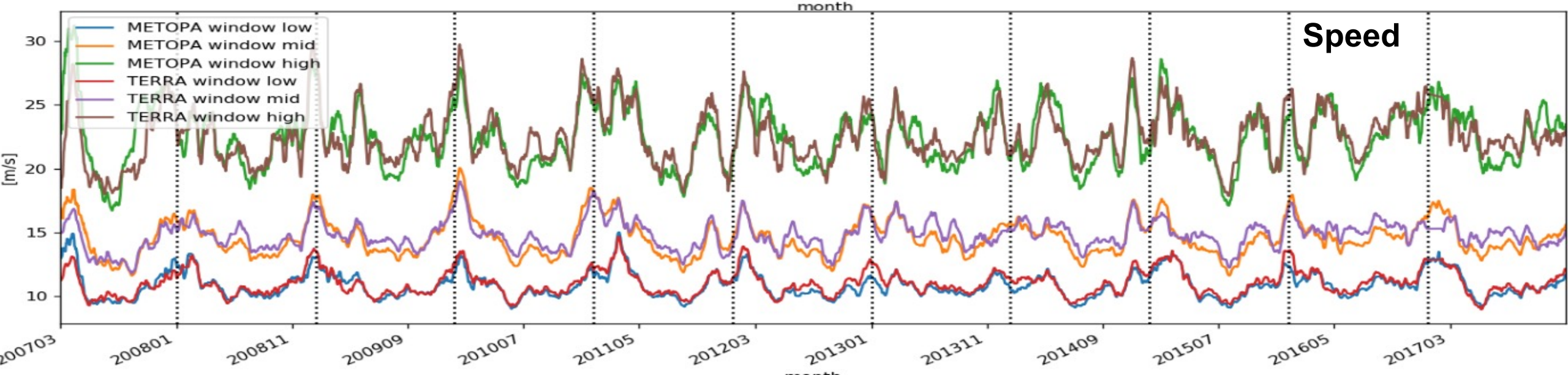




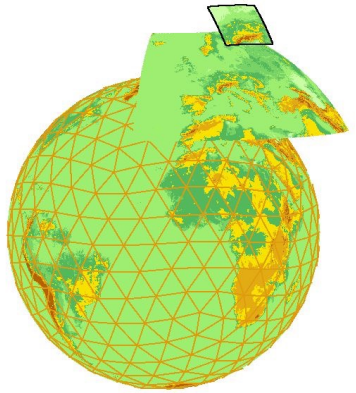
Comparison METOP-A with MODIS (Terra) daily average speed over the NP >65°

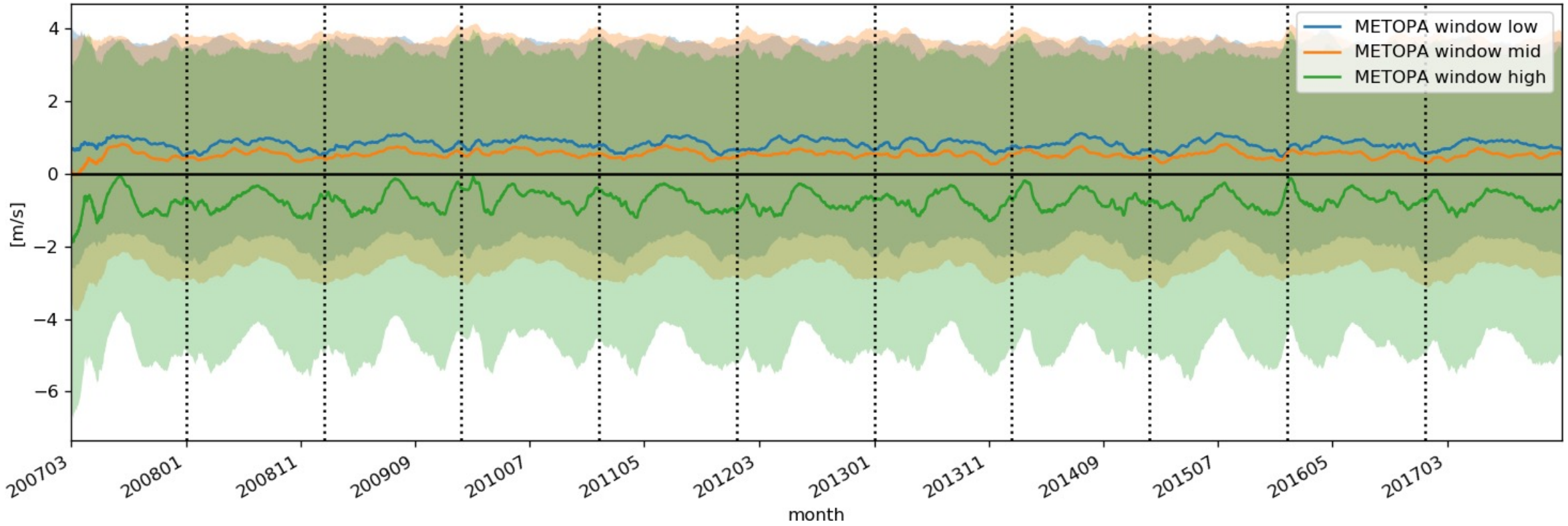


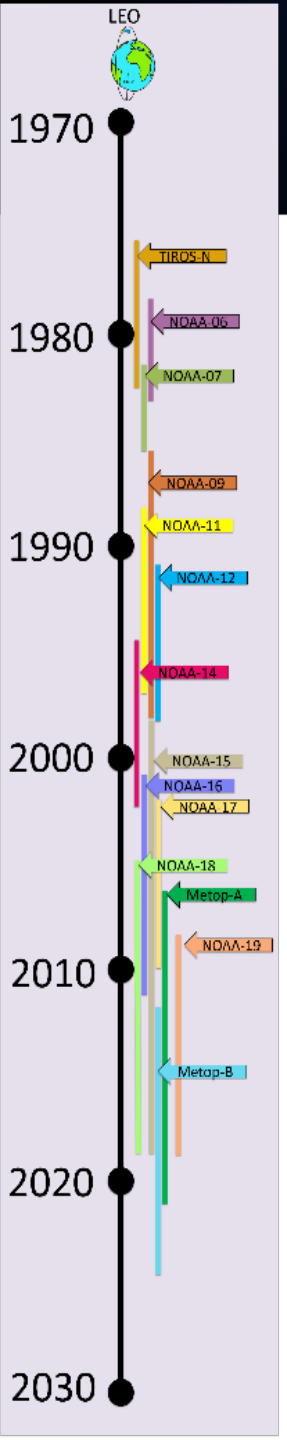




AMV speed difference (m/s)
METOP-A – AVHRR – single vs. ERA-interim (Arctic)

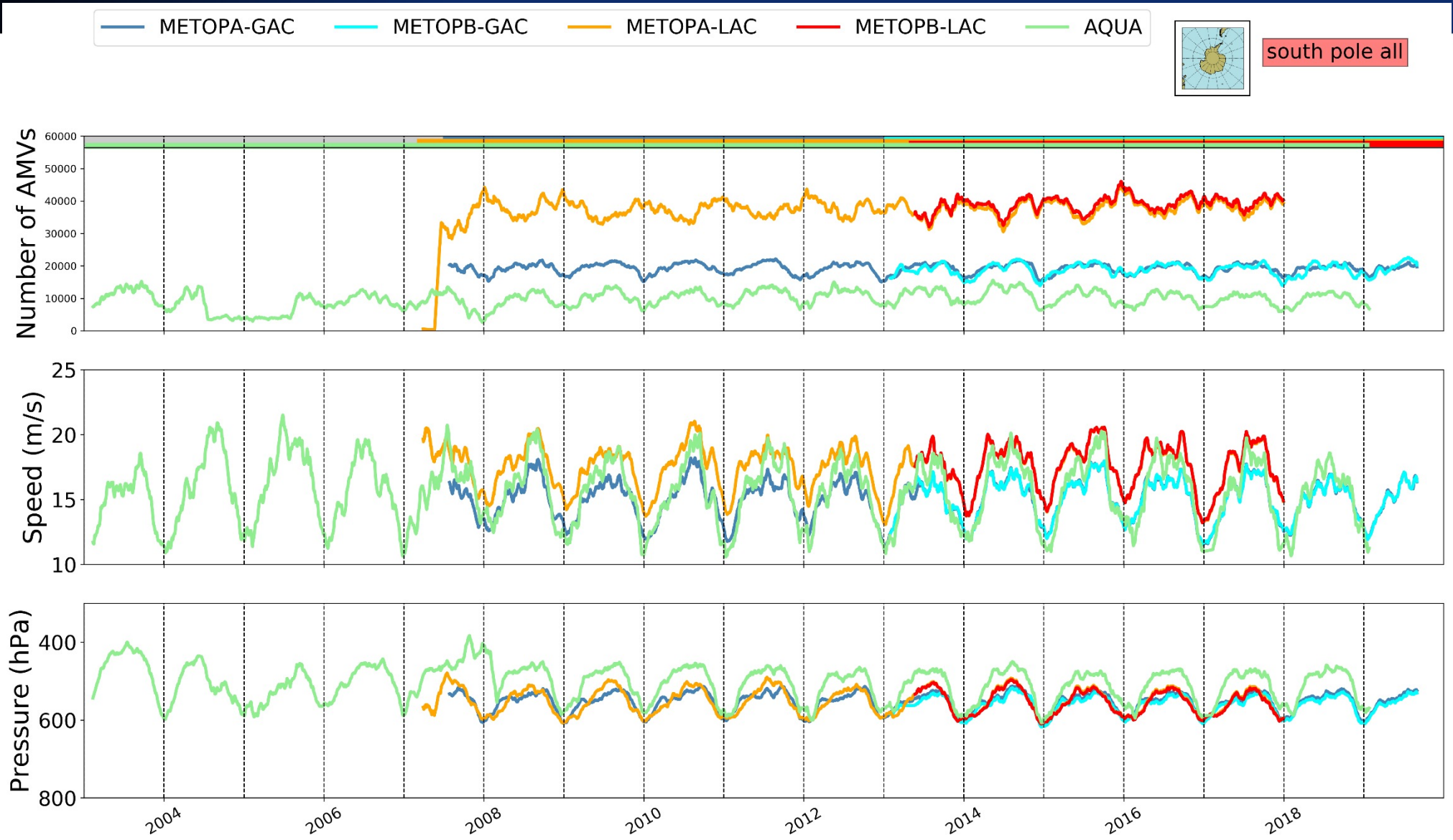




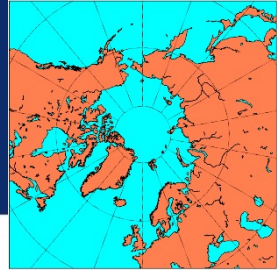

LEO
1970
1980
1990
2000
2010
2020
2030
TIROS-N
NOAA-06
NOAA-07
NOAA-09
NOAA-11
NOAA-12
NOAA-14
NOAA-15
NOAA-16
NOAA-17
NOAA-18
Metop-A
NOAA-19
Metop-B

AVHRR - GAC

LAC versus GAC AMVs Metop + Modis (Aqua)

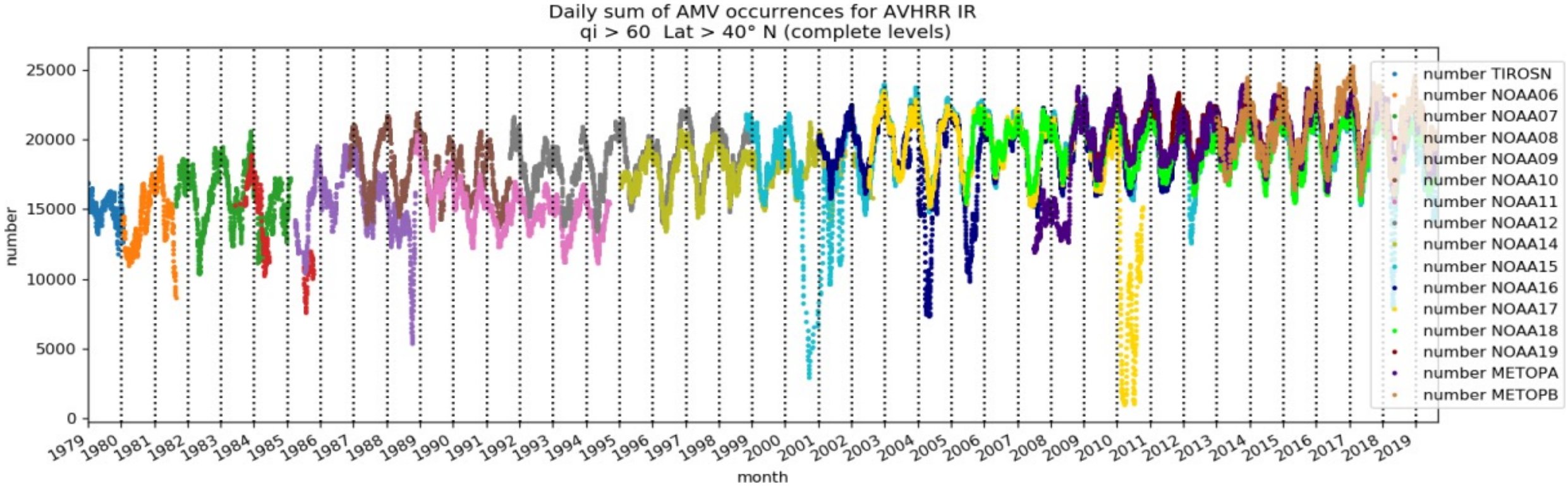


Daily number of AMVs for each of the 16 AVHRR instruments: example for the north pole

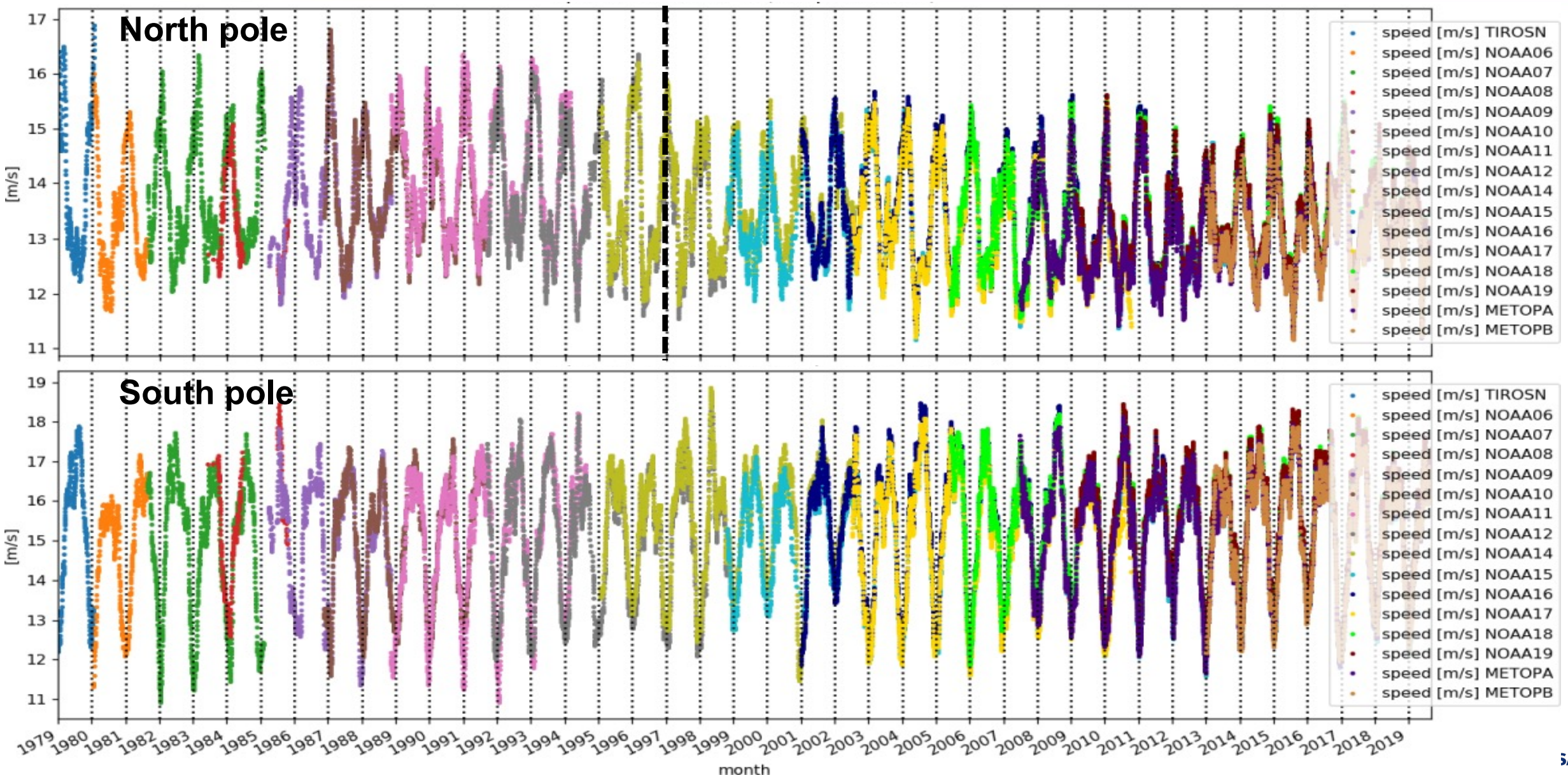


- CDR is one of the longest AMV records produced to date : 41 years.

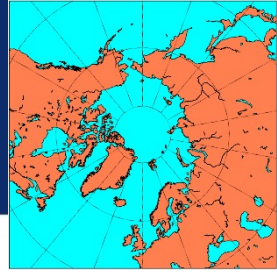
- Three versions of the AVHRR instrument were used, flying on 16 different platforms.

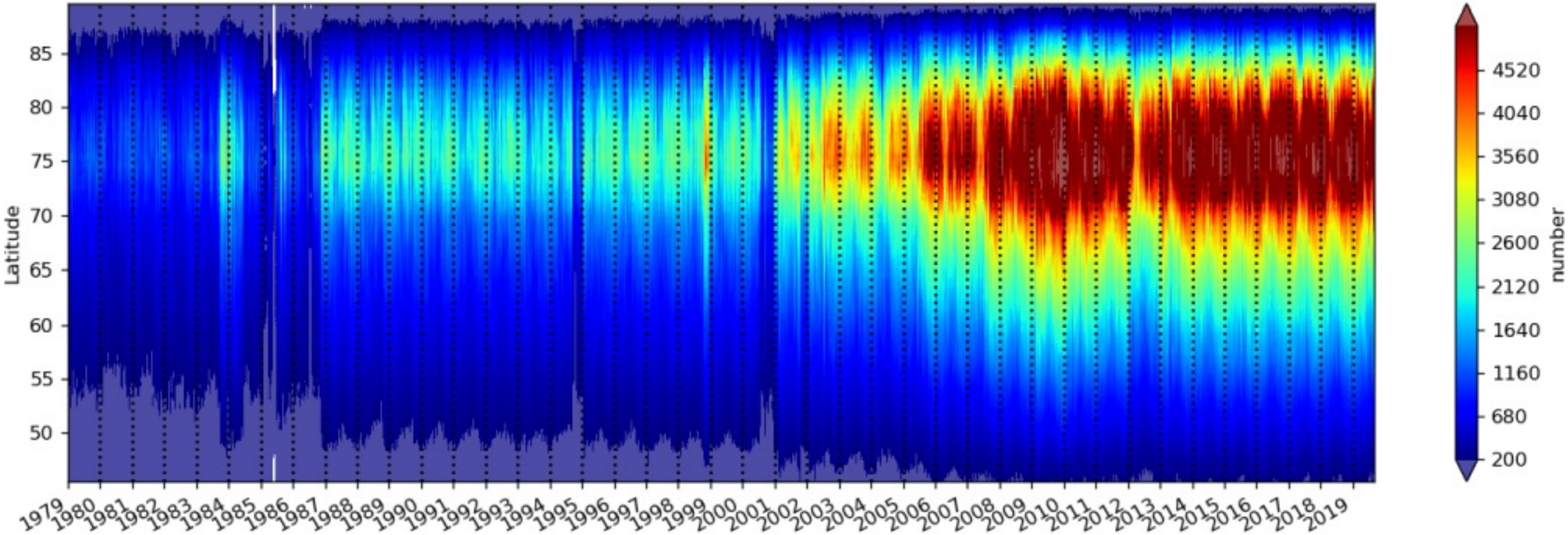


Daily averaged speed of AMVs for each polar satellite

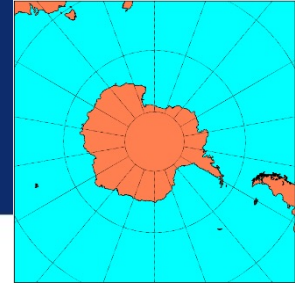


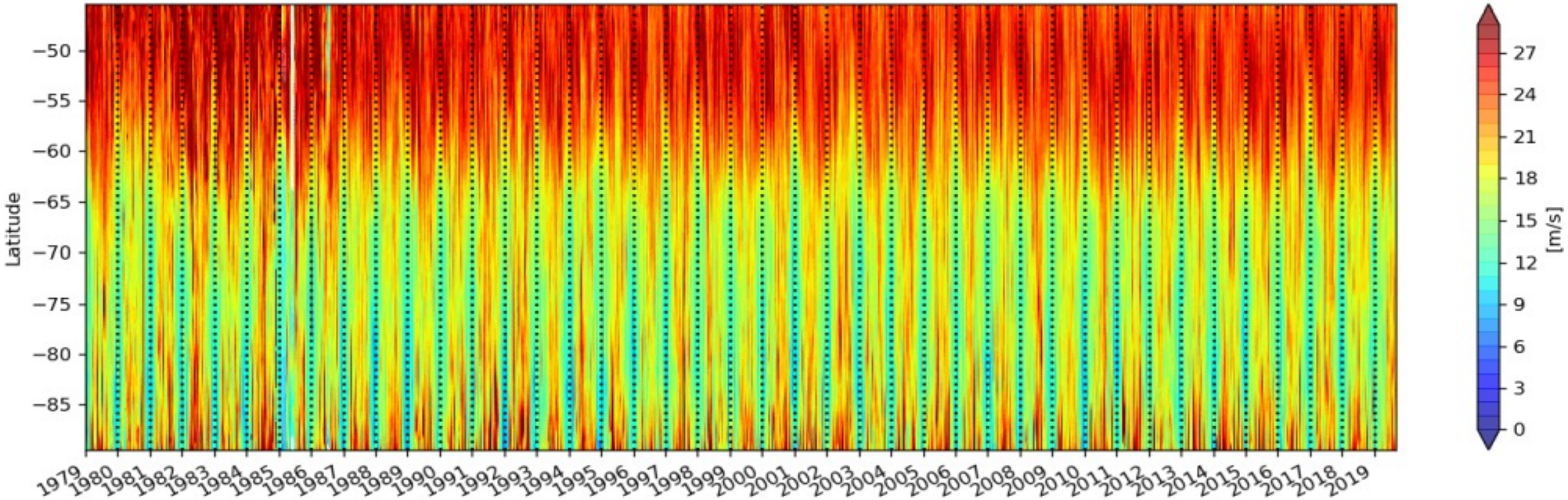
Hovmoeller plot – daily numbers of AMVs (north)



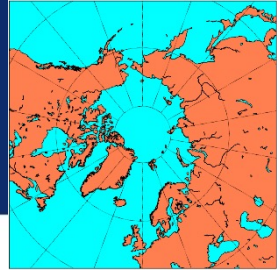


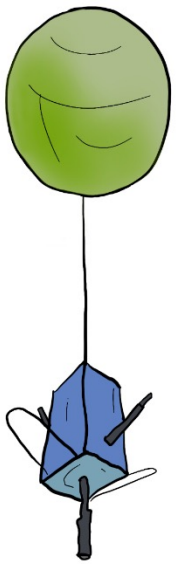
Hovmoeller daily average speed (south)

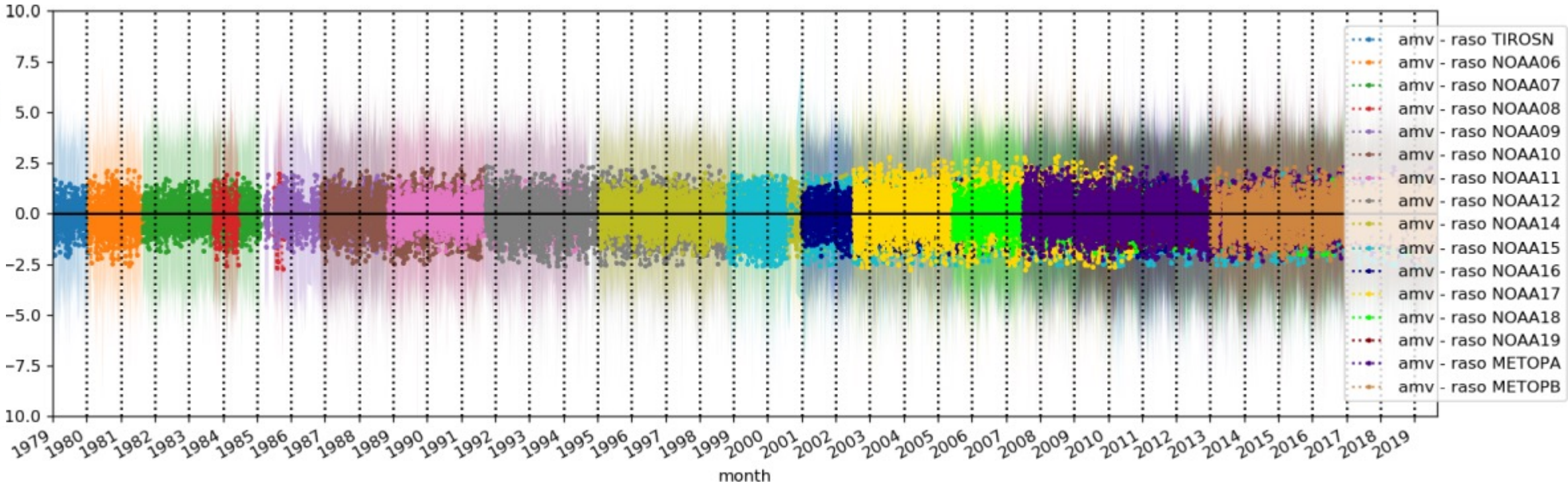




AMS vs. radiosondes – speed bias + STD

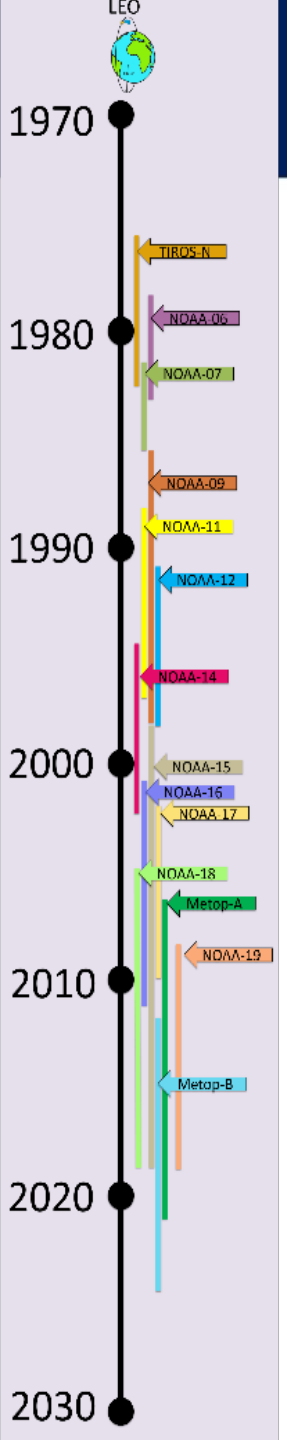






Summary

- CDR AVHRR AMVs GAC and LAC are stable and homogeneous
- GAC AMVs CDR: very good consistency between AMVs retrieved using AVHRR instruments on-board different satellites
- There is a very good agreement with external independent data such as ERA-interim, RAOBCORE radiosondes, MODIS AMVs
- All CDR AVHRR AMVs produced are suitable for usage in reanalysis and climate trends analysis
- All CDR are available from EUMETSAT



Summary of available LEO AMV CDRs

To get data email: ops@eumetsat.int and look at our product navigator and data store https://navigator.eumetsat.int/

Product	Release: Period	Coverage	Reference doi
LAC Metop-A and -B AVHRR AMV (EUMETSAT algorithm)	R1: 2007-2014	Poles: lat > 40°	10.15770/EUM_SEC_CLM_0016
LAC Metop-A and -B AVHRR AMV (CIMSS algorithm)	R1: 2007-2014	Poles: lat > 65°	10.15770/EUM_SEC_CLM_0040
LAC Metop-A and -B AVHRR single	R2: 2007-2017	Poles: lat > 40°	10.15770/EUM_SEC_CLM_0037
LAC Metop-A/B B/A AVHRR dual	R1: 2013-2017	Entire globe	10.15770/EUM_SEC_CLM_0038
GAC from 13 AVHRRs	R1: 1979-2012	Poles: lat > 40°	10.15770/EUM_SEC_CLM_xxxx
GAC from 16 AVHRRs	R2: 1979-2019	Poles: lat > 40°	10.15770/EUM_SEC_CLM_xxxx

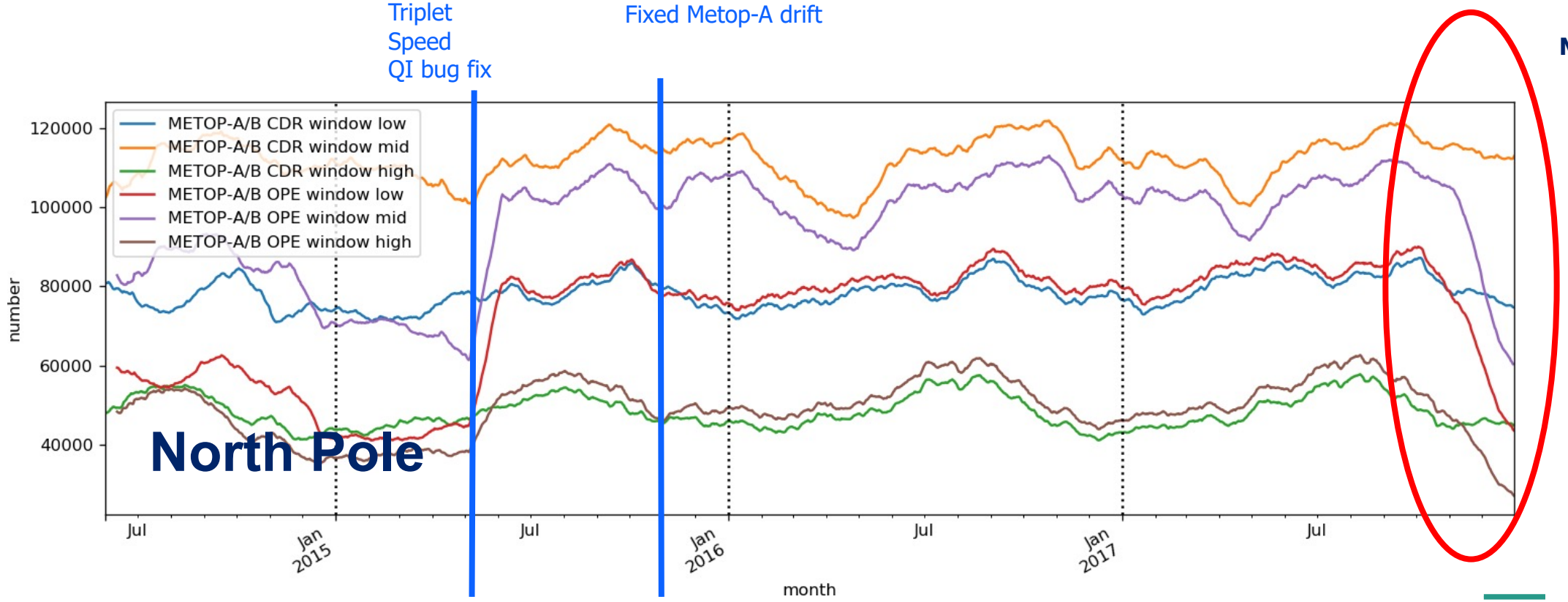
Backup slides … all the goodies that did not make it into the main presentation

METOP – AVHRR – dual – CDR vs. NRT

V3
Triplet
Speed
QI bug fix

V3.1
Fixed Metop-A drift

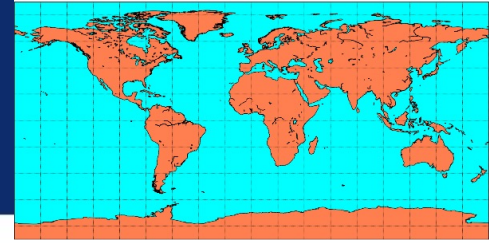
Metop-A drift

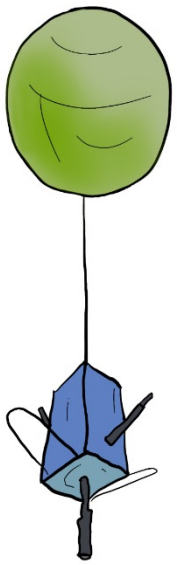


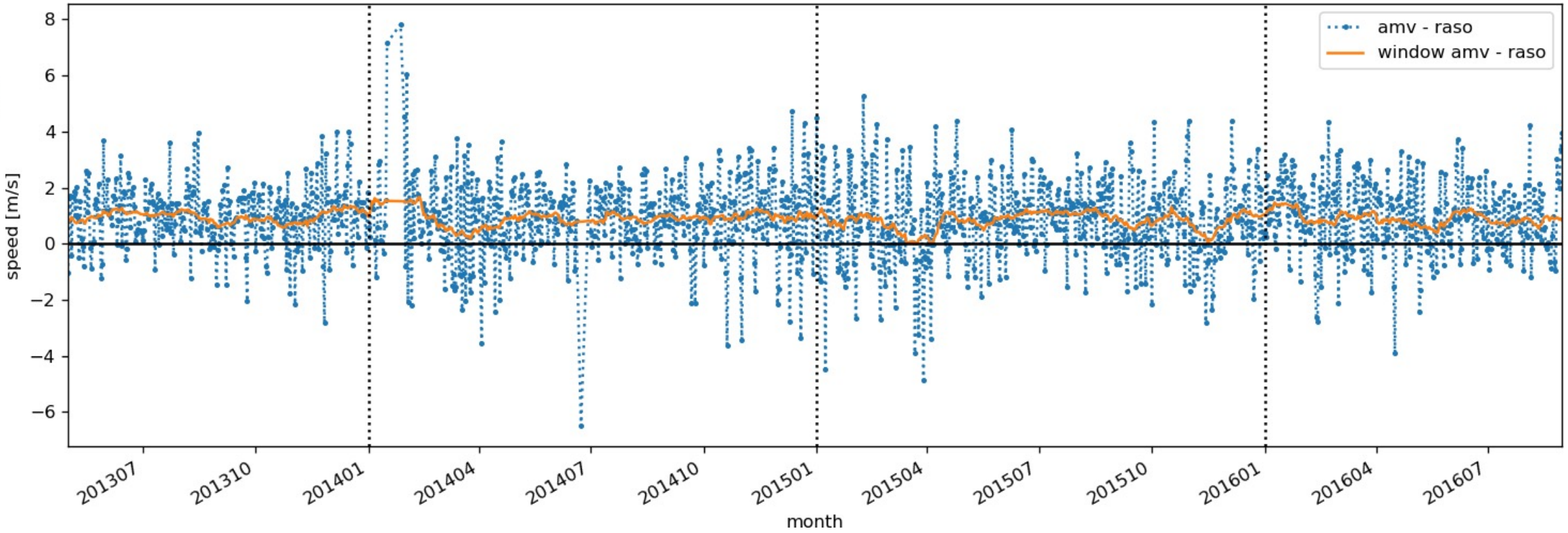
Change in the production rules Jan – Nov 2015
(Drift affects AMV_2D_M01. A satellite manoeuvre helps to recover winds and fix by an update of the production rules in Dec 2015)

Change in the production rules Nov 2017- Jan 2018
Drift affects AMV_2D_M02

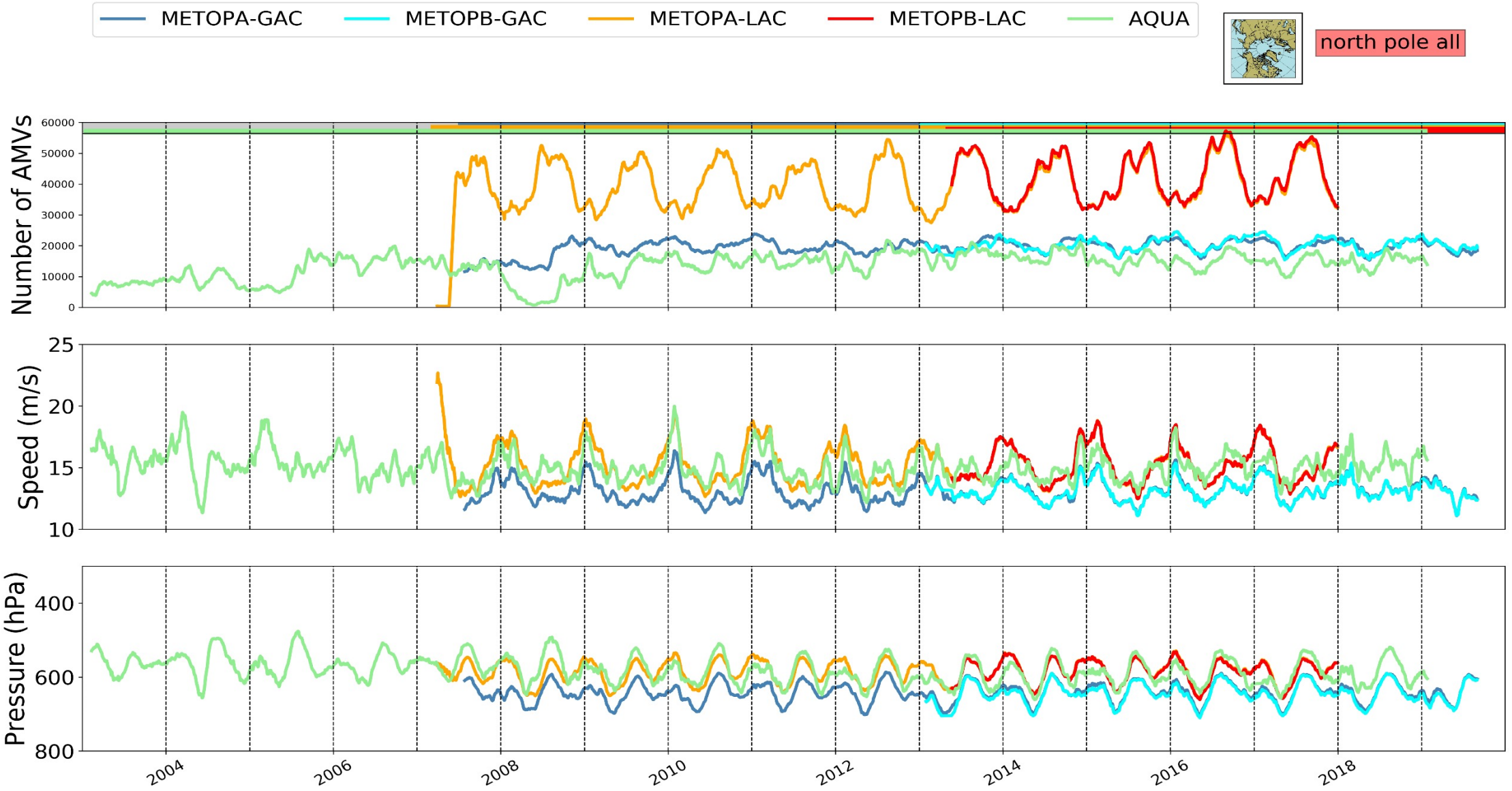
AMV speed difference (m/s)
METOP – AVHRR – dual vs. radio sondes (global)



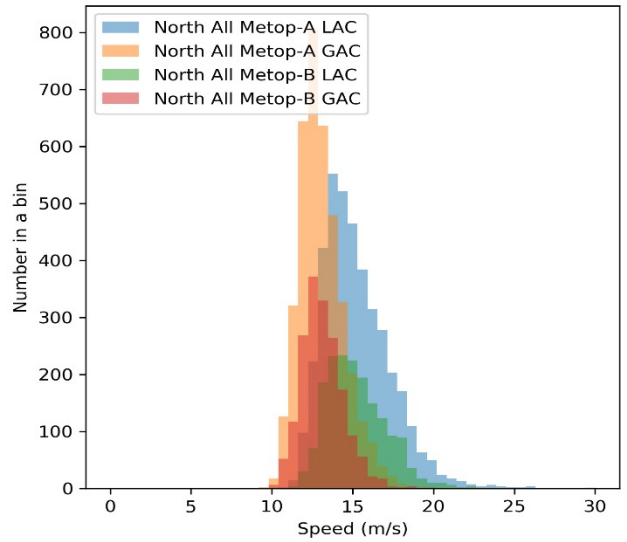


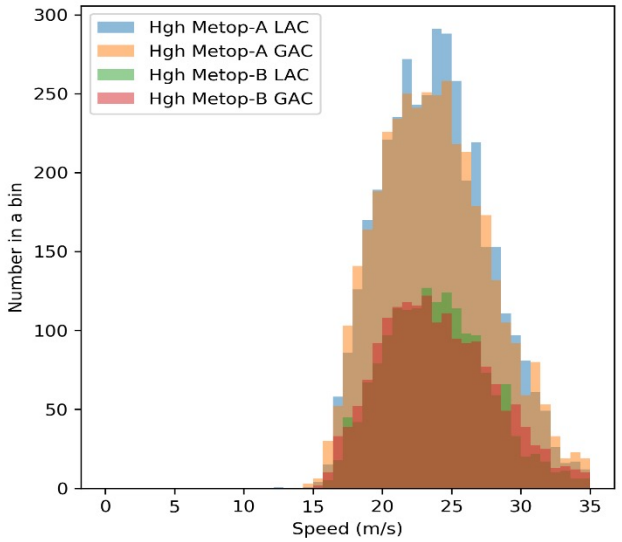


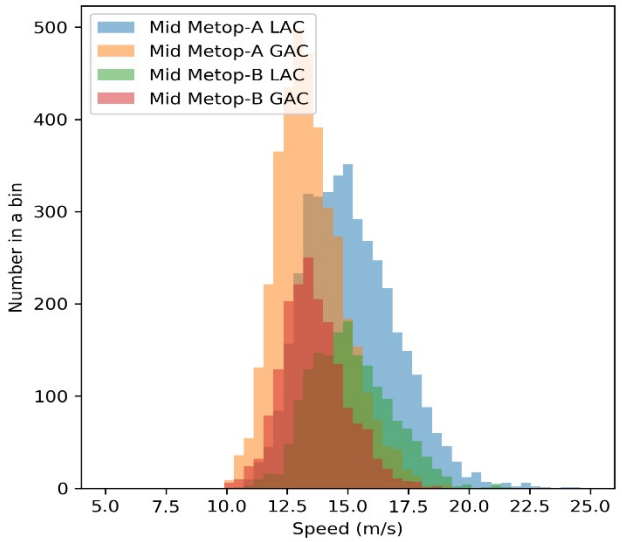
LAC versus GAC AMVs Metop + Modis (Aqua)

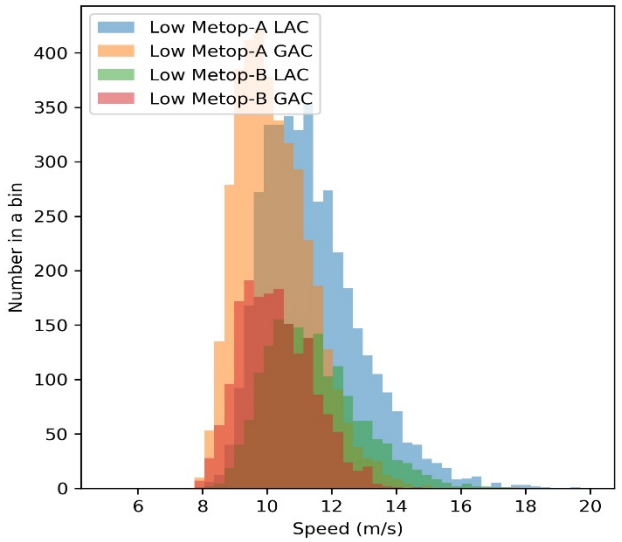


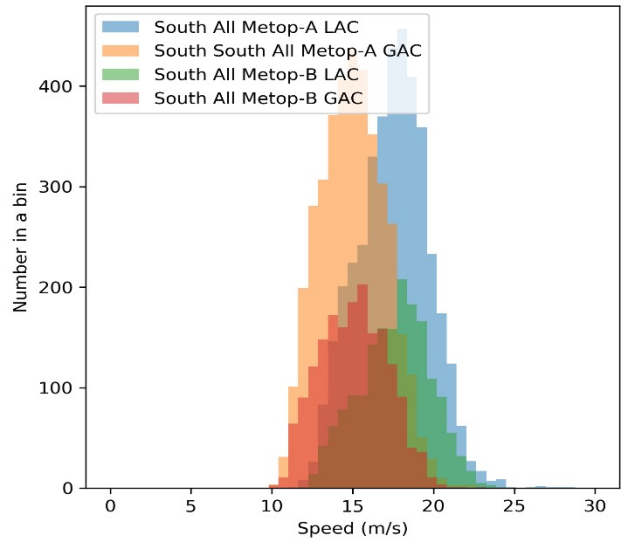
METOP – GAC vs. LAC - speed

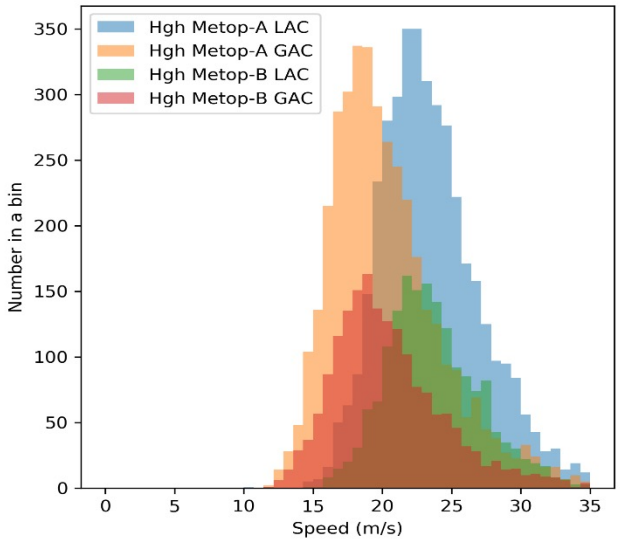


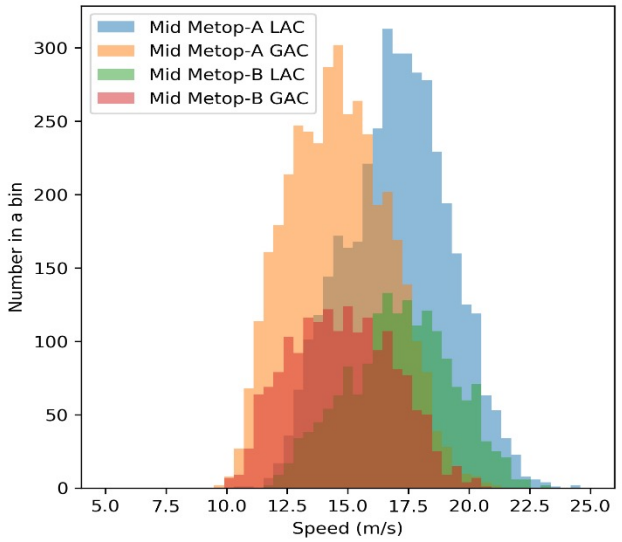


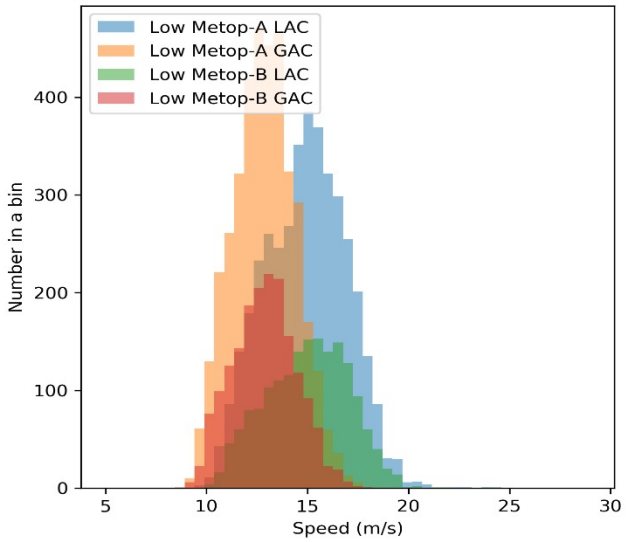




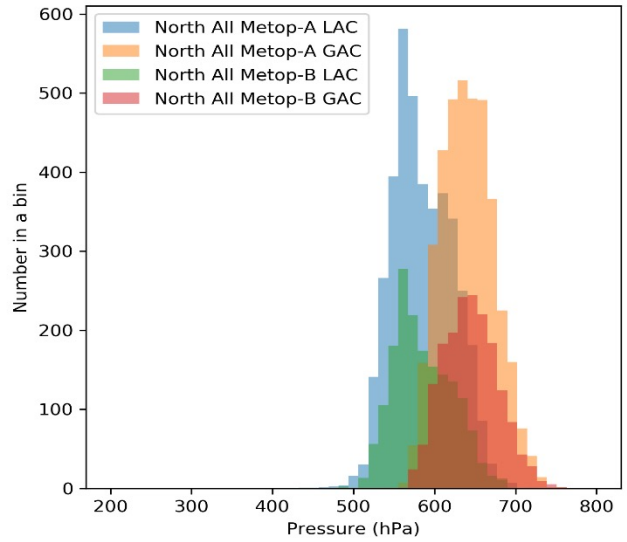


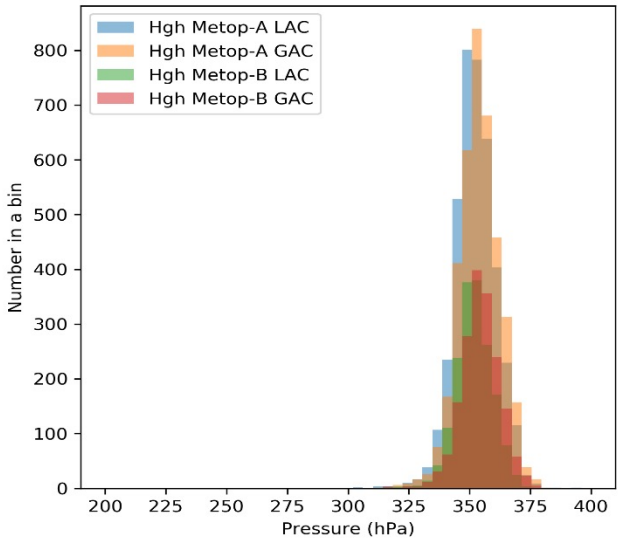


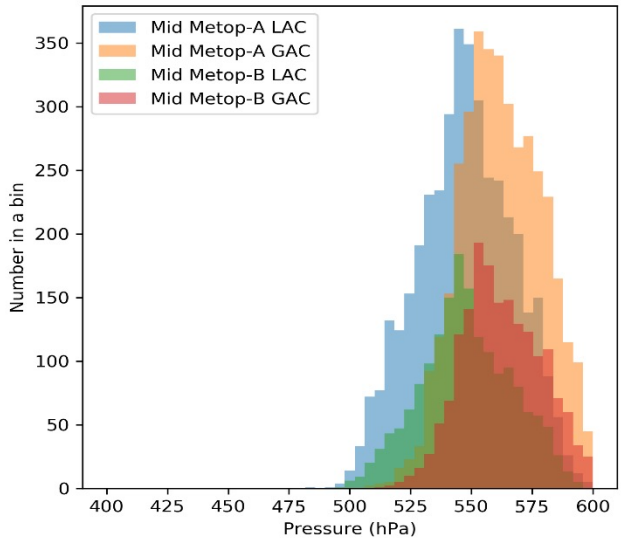


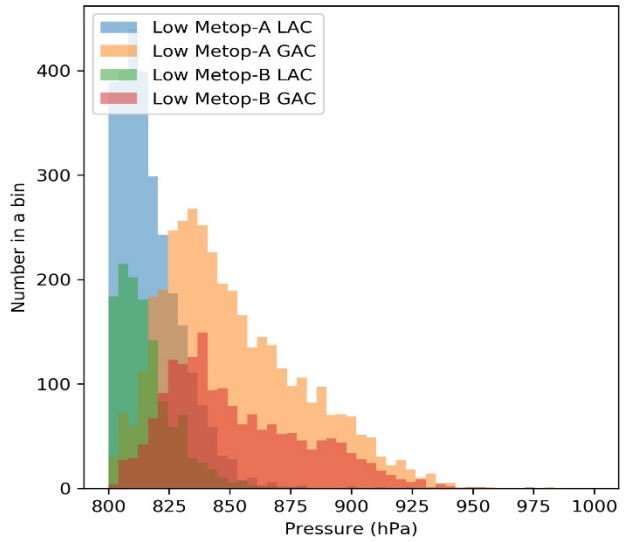


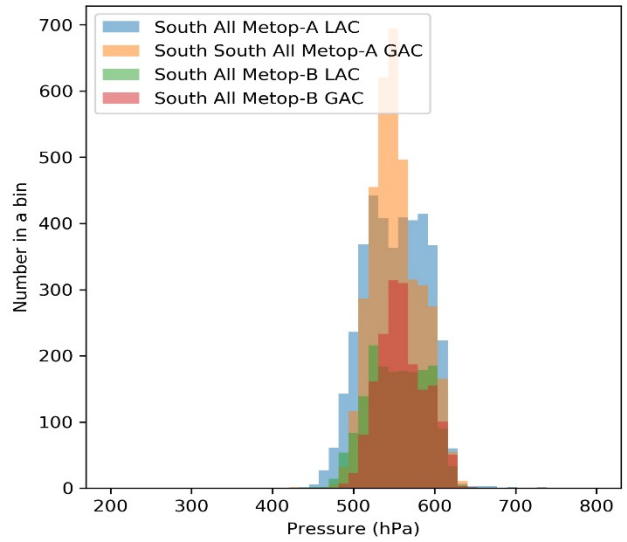
METOP – GAC vs. LAC - pressure

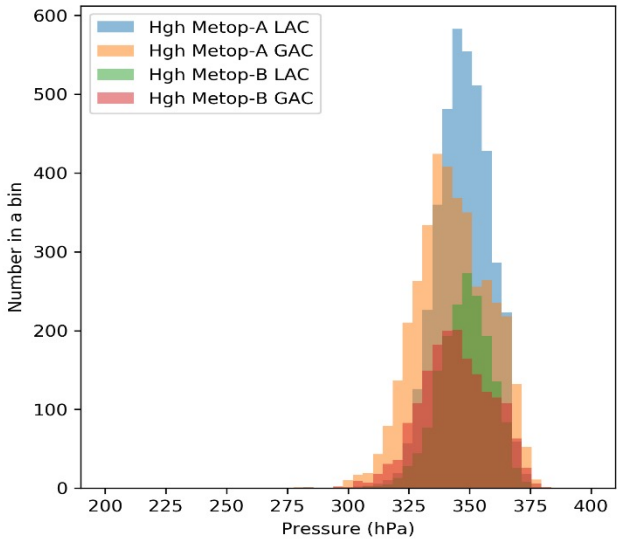


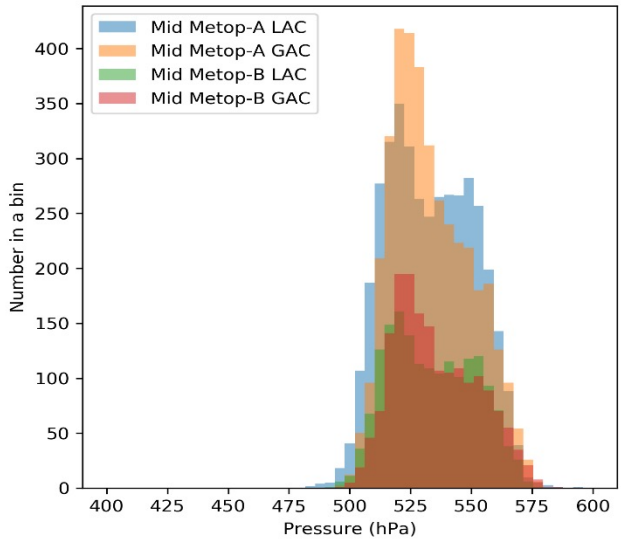


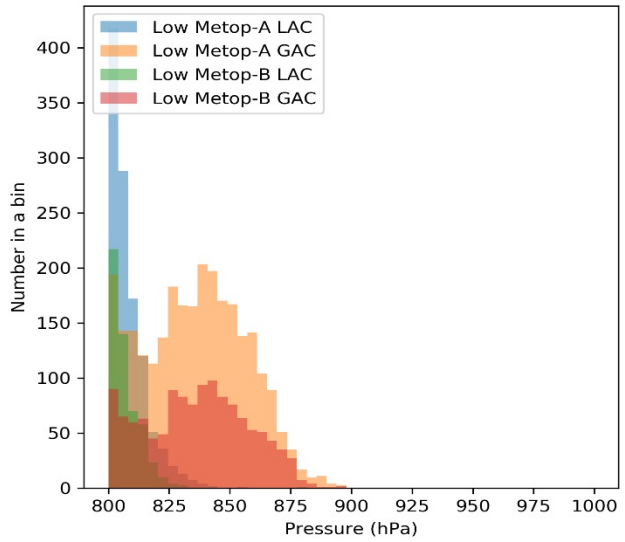




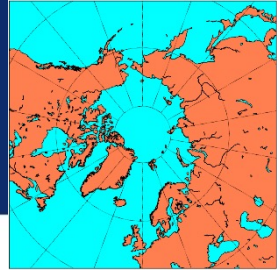


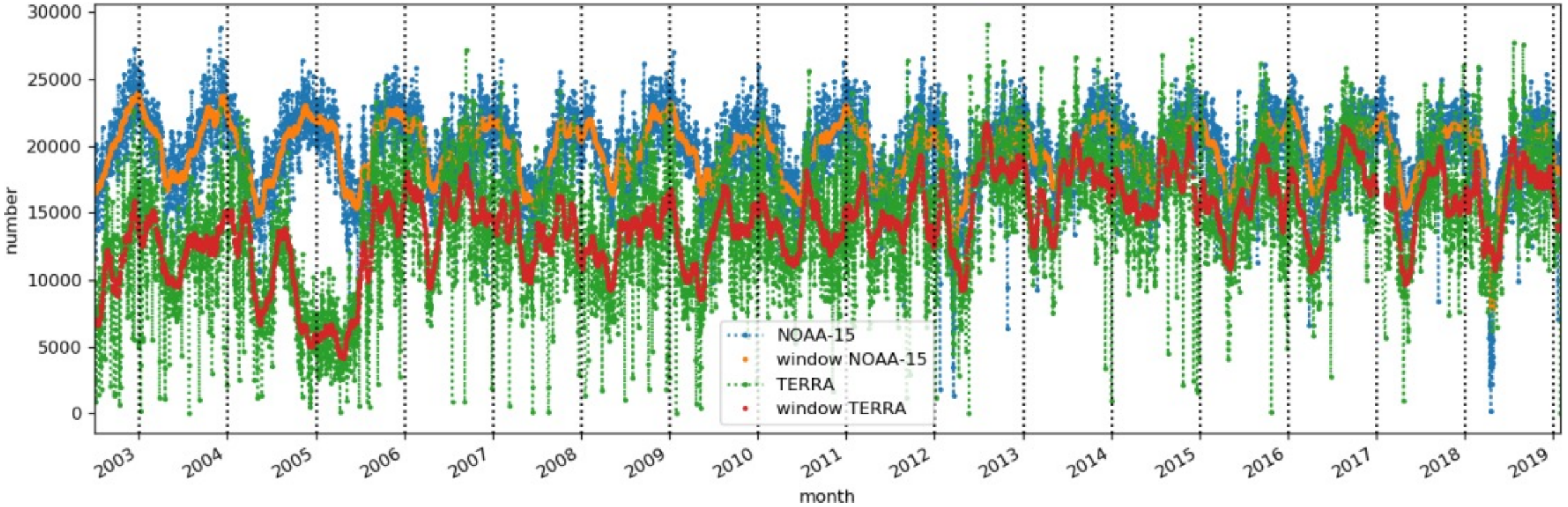






NOAA-15 vs. MODIS (TERRA) – daily number





NOAA-15 vs. MODIS (TERRA)
daily average speed in 3 height intervals