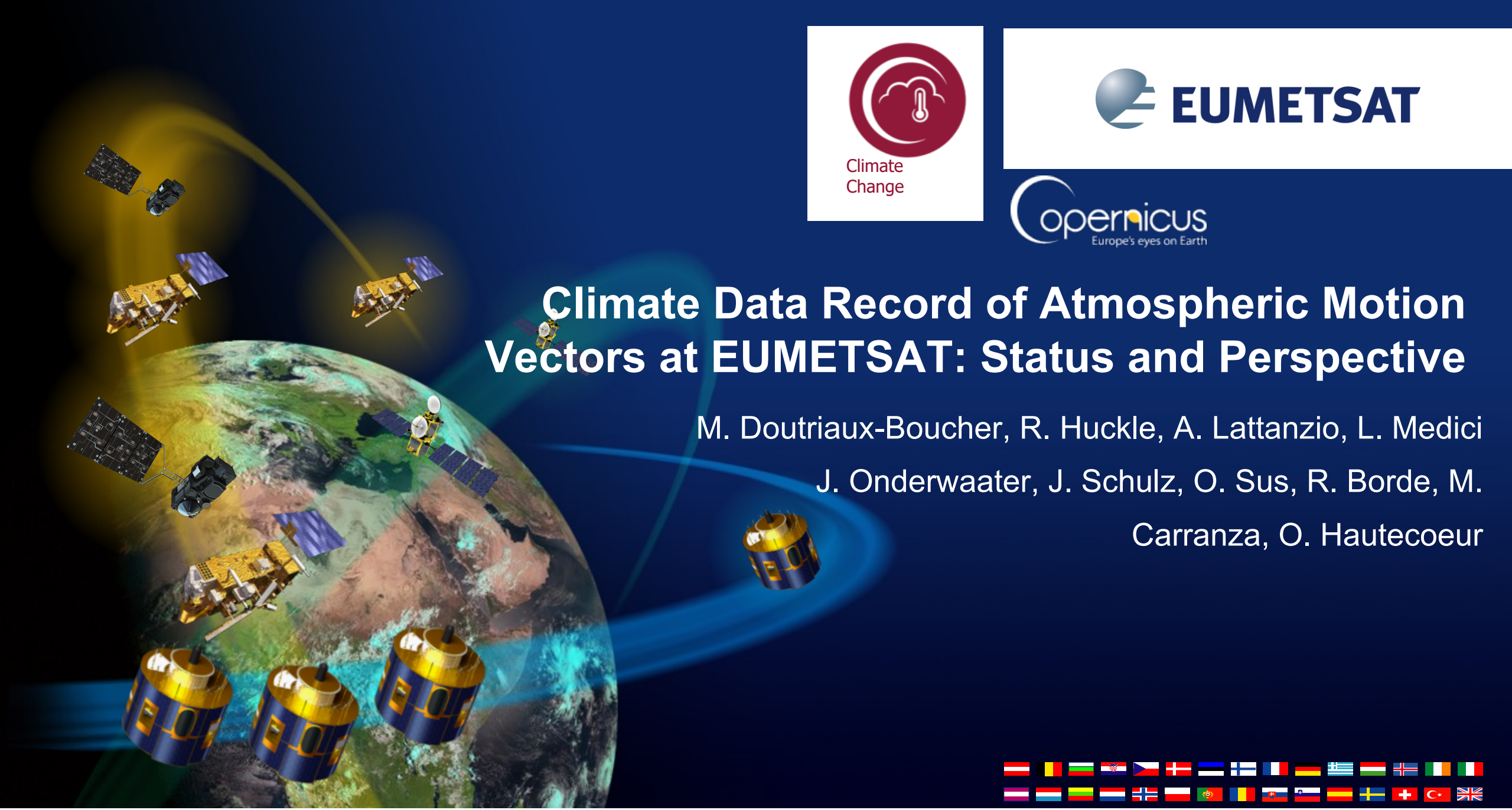


Climate Change

EUMETSAT

Copernicus
Europe's eyes on Earth

Climate Data Record of Atmospheric Motion Vectors at EUMETSAT: Status and Perspective

M. Doutriaux-Boucher, R. Huckle, A. Lattanzio, L. Medici

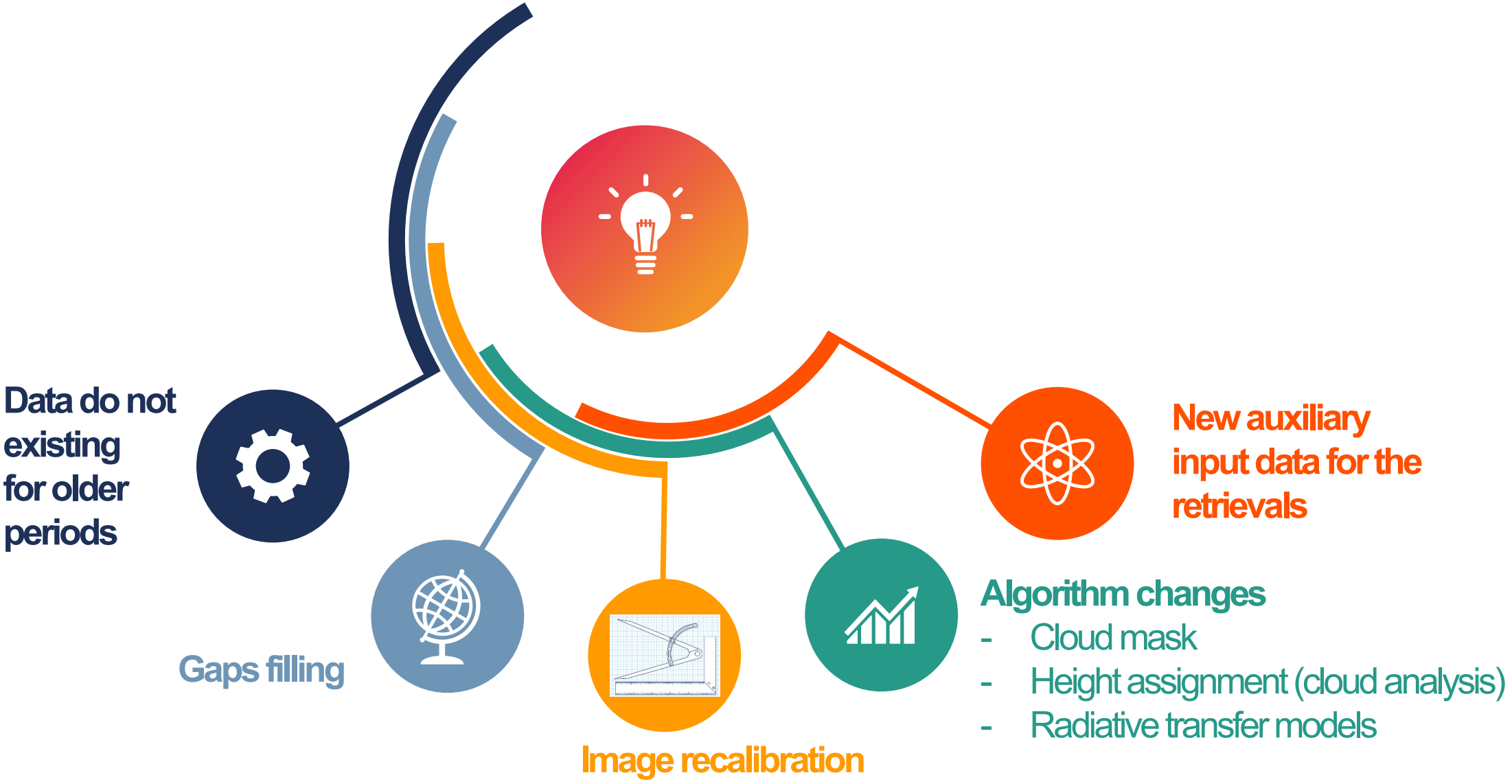
J. Onderwaater, J. Schulz, O. Sus, R. Borde, M. Carranza, O. Hautecoeur

Outline

- Reprocessing of AMV: the need
- GEO AMV
- LEO AMVs
- iCDR production
- Future activities

- Next presentations by A. Lattanzio and R. Huckle will bring more details

Operational AMVs are archived but need to be reprocessed



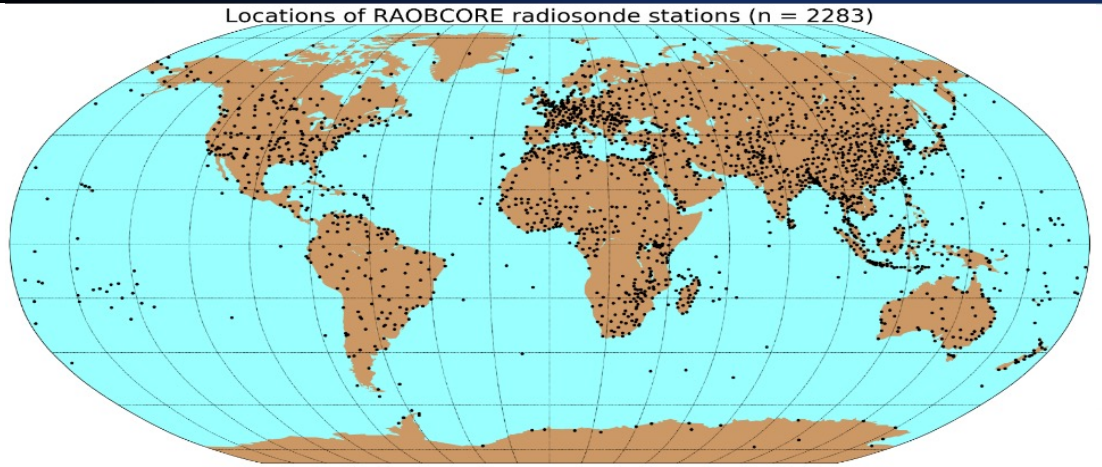
Processing and validation/verification at EUMETSAT

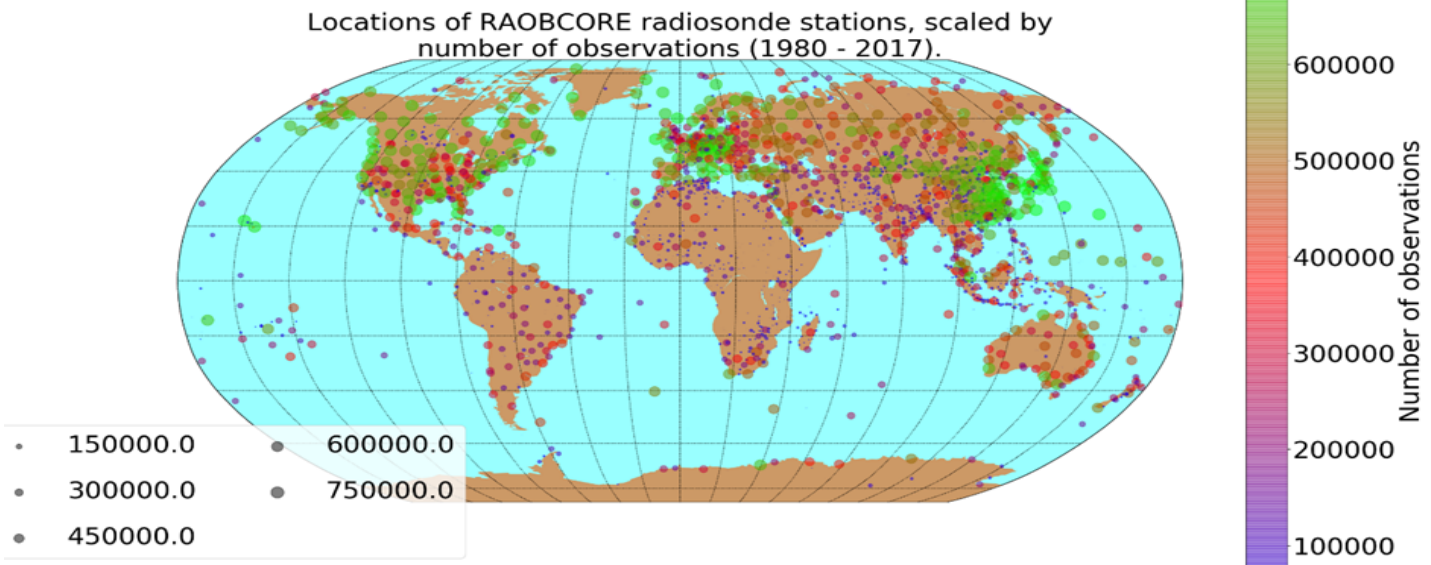
All AMV reprocessing is done at EUMETSAT

Validation is done using independent dataset such as

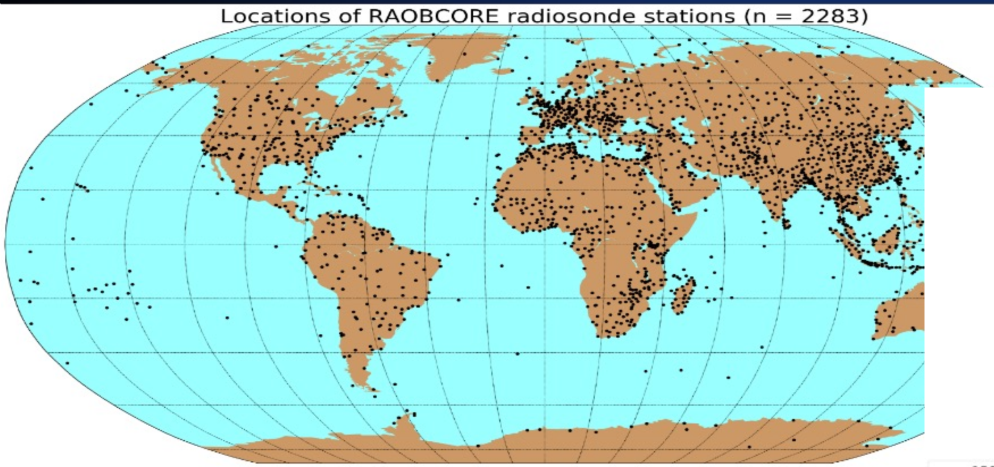
- ground base radiosonde
- other satellite data like MODIS AMVs
- model data

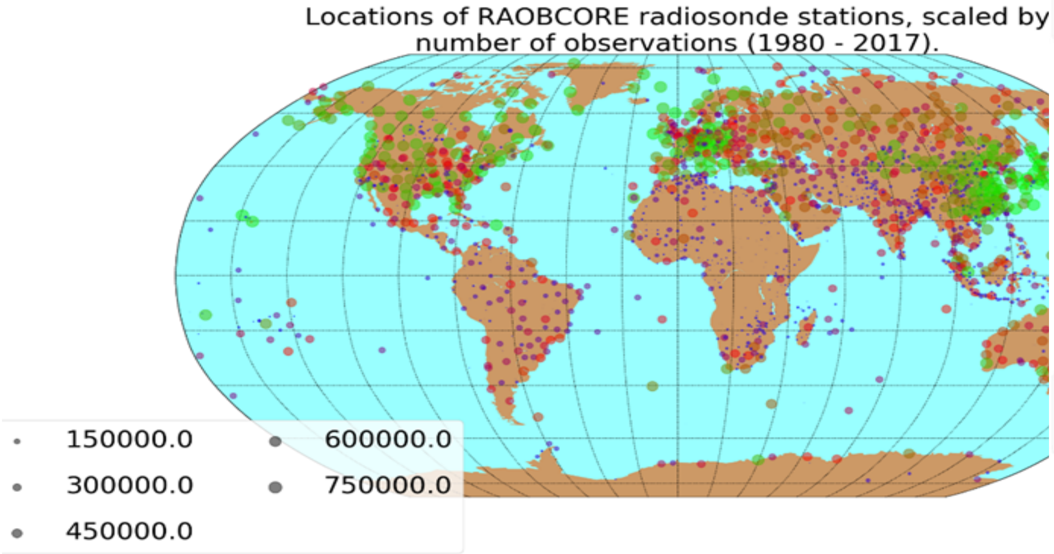
RAOBCORE radiosonde data over the period 1980-2017

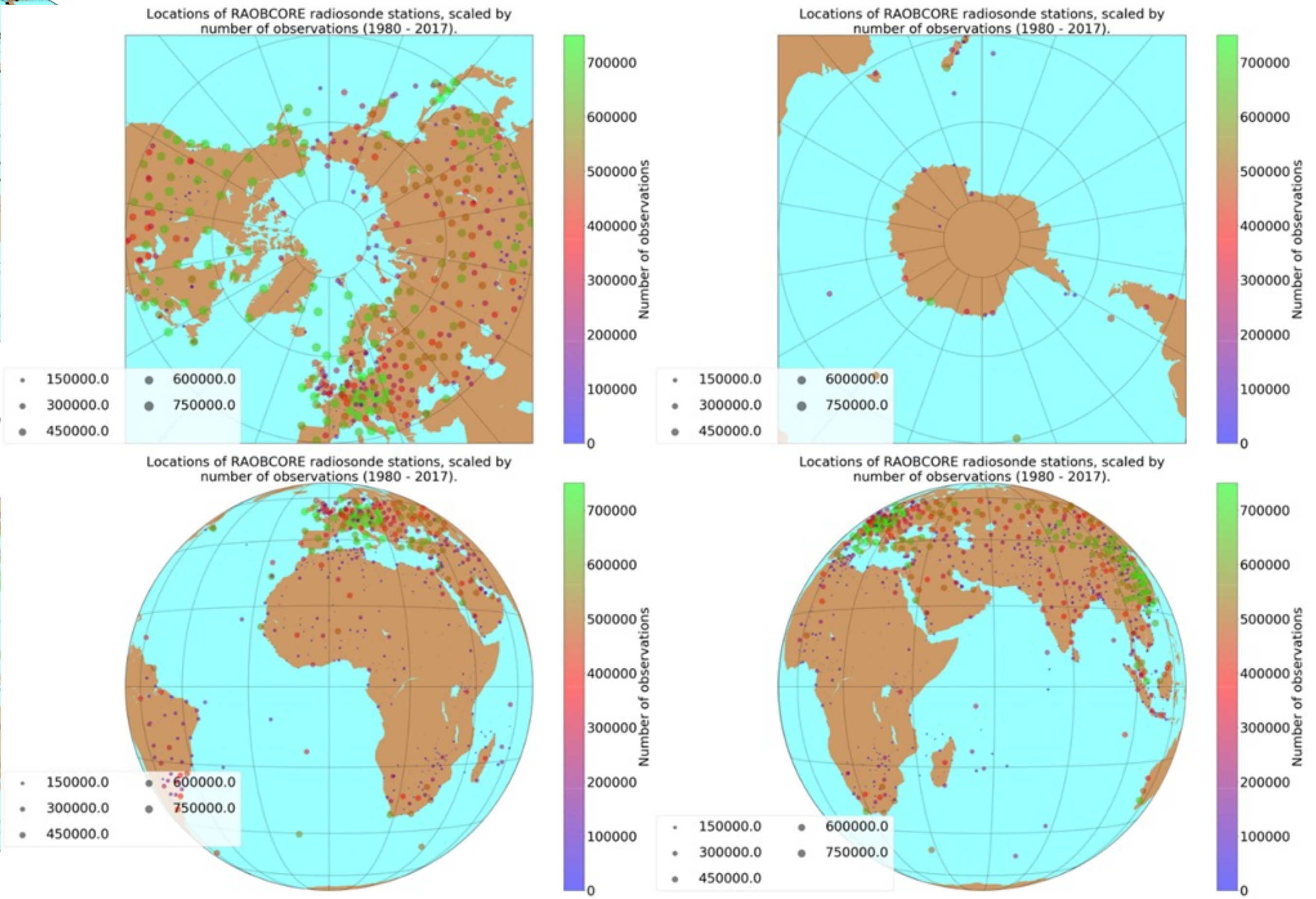


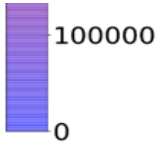


RAOBCORE radiosonde data over the period 1980-2017









“The Meteosats”: the European GEO satellite family

MFG
08/1981

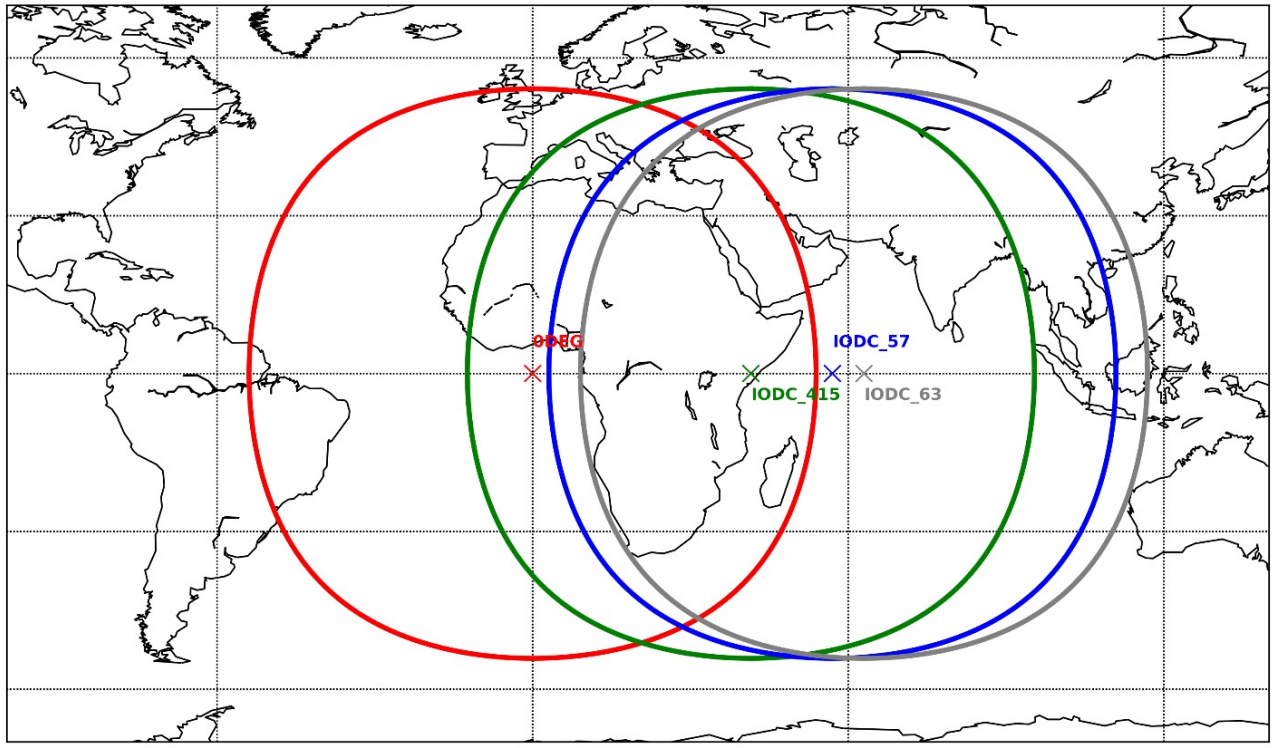
MSG
02/2004

0DEG

MET5 (MFG)
1998

63E

Meteosat field of view



MET7 (MFG)
2007

57E

MET8 (MSG)
2017

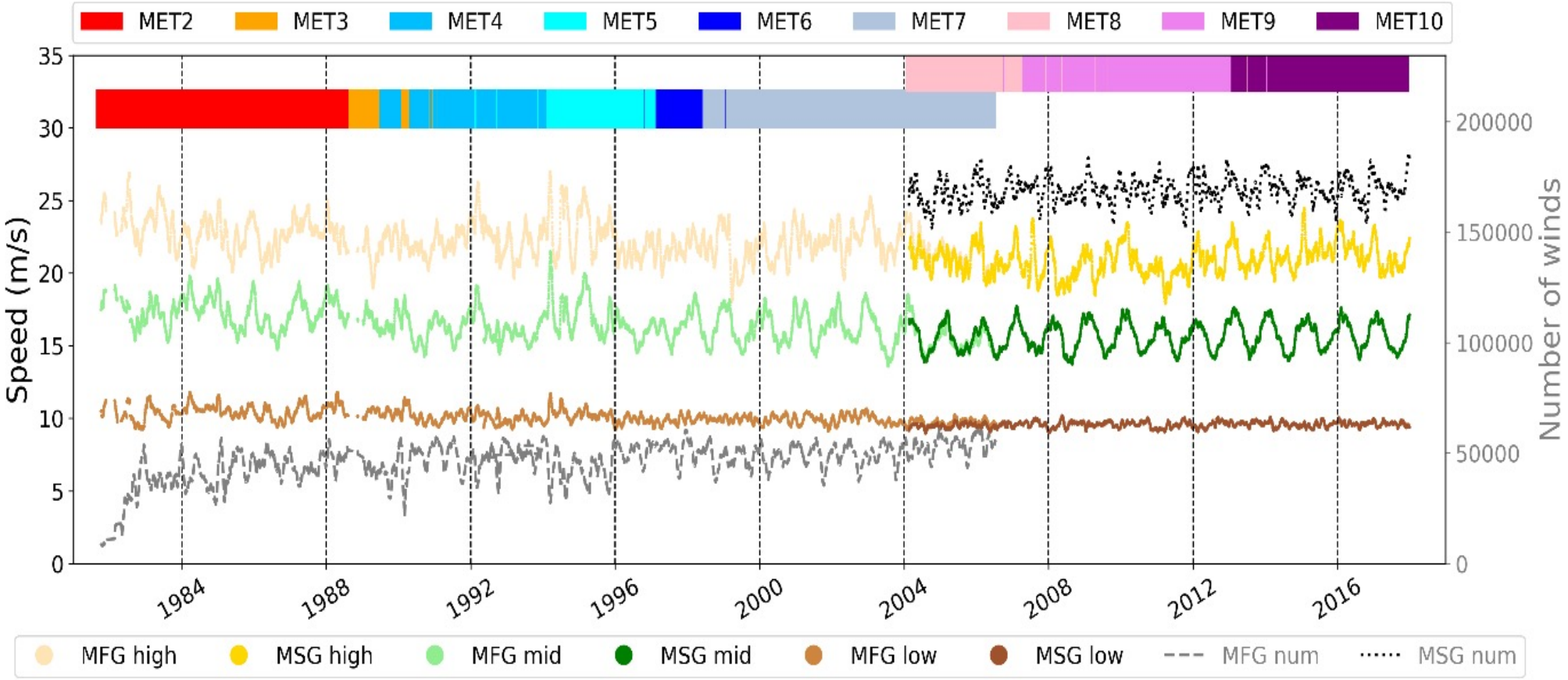
41.5E

	Rep Cycle	Bands	Pixel Size
MFG (2-7)	**30 min**	2 (WV/IR) 1 (VIS)	**5 km** 2.5 km
MSG (8-11)	**15 min**	11 (WV/IR/VIS) 1 (HRV)	**3 km** 1 km

Meteosat IR GEO AMV climate data record at 0°

- a unique Climate Data Record of geostationary AMV using the operational EUMETSAT algorithm adapted for time series processing;
- first AMV CDR based on cross-calibrated geostationary radiances;
- 38 years (1982-2019) years of Atmospheric Motion Vectors from 9 Meteosat satellites.

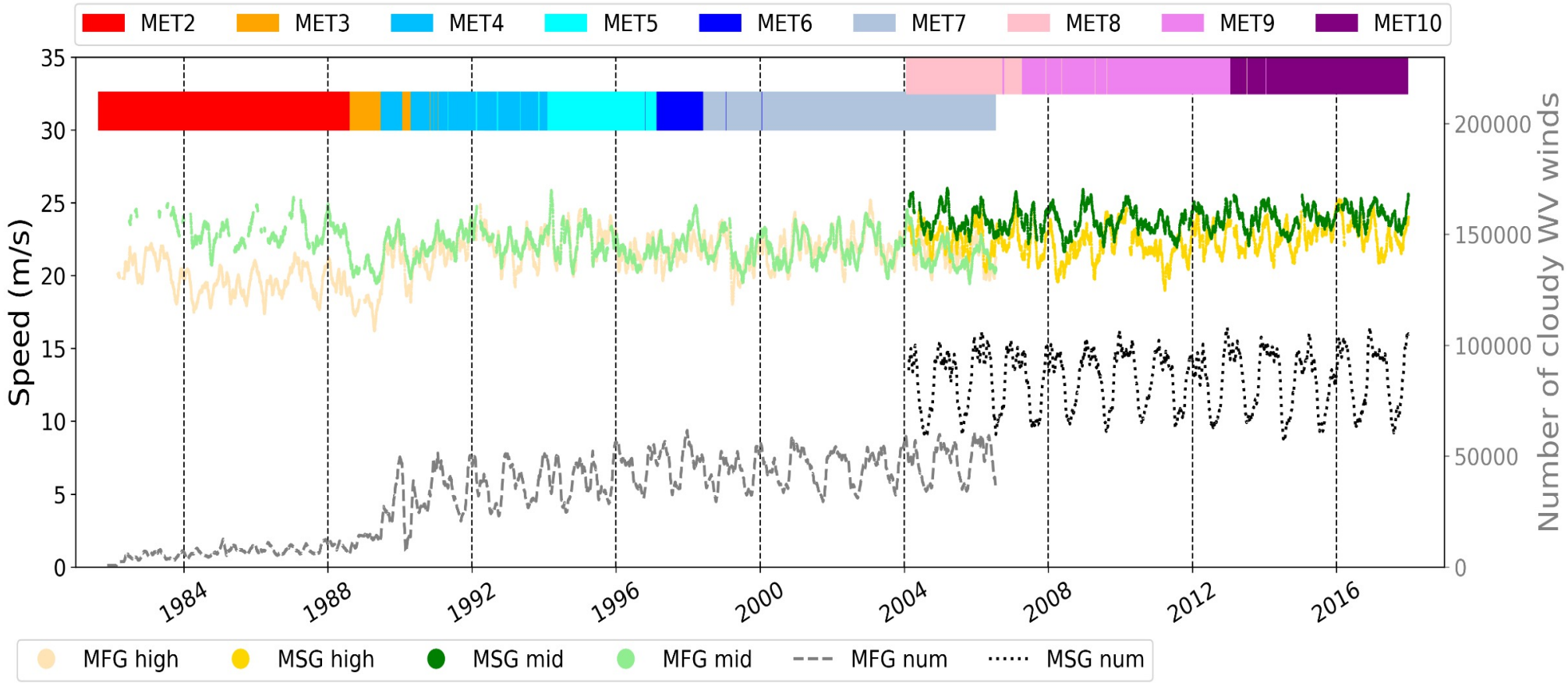
Average daily **number** of infrared wind vectors and their associated average **speed**



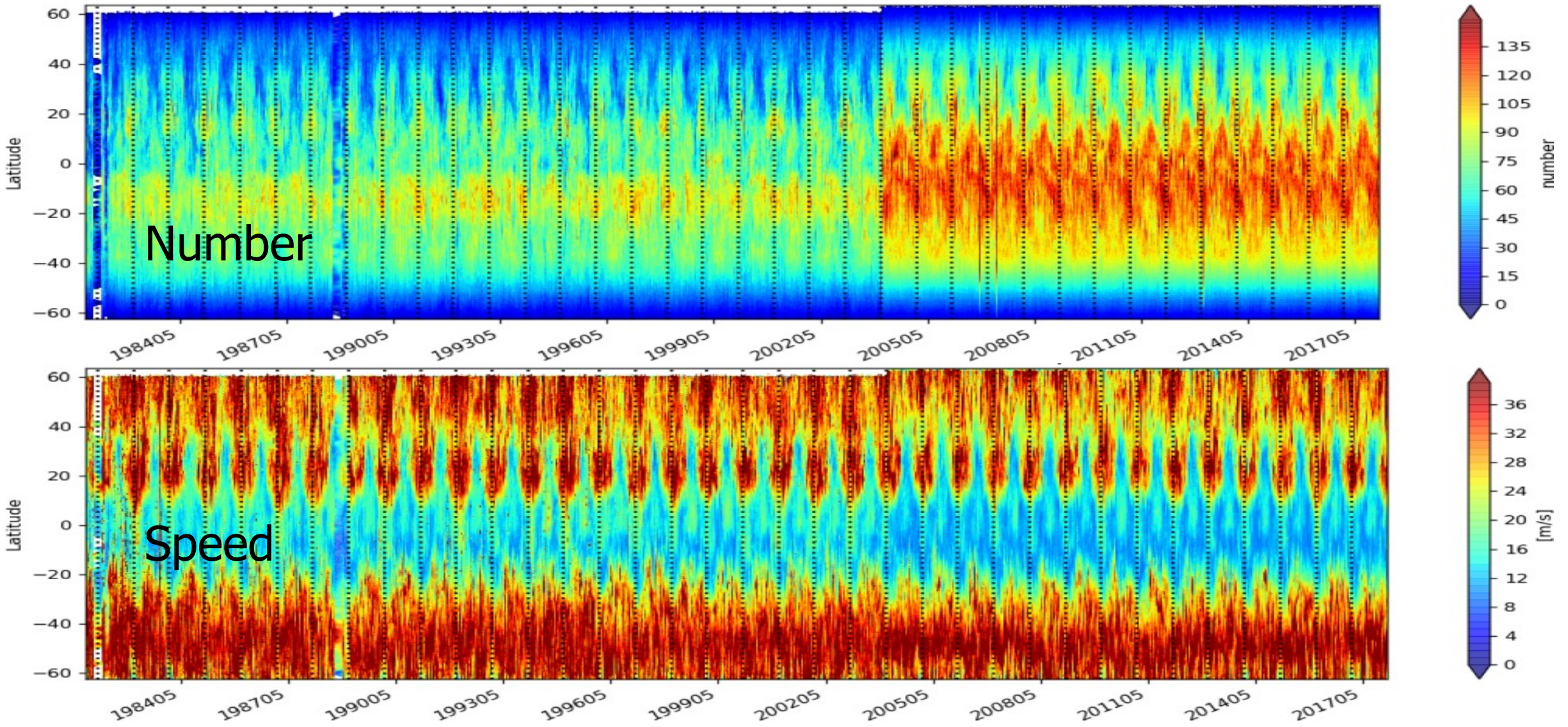
Meteosat WV GEO AMV climate data record at 0°

- a unique Climate Data Record of geostationary AMV using the operational EUMETSAT algorithm adapted for time-series processing;
- first AMV CDR based on cross-calibrated geostationary radiances;
- 38 years (1982-2019) years of Atmospheric Motion Vectors from 9 Meteosat satellites.

Average daily **number** of cloudy water vapor wind vectors and their associated average **speed**



IR GEO AMVs from 9 Metosat imagers (MVIRI + SEVIRI)



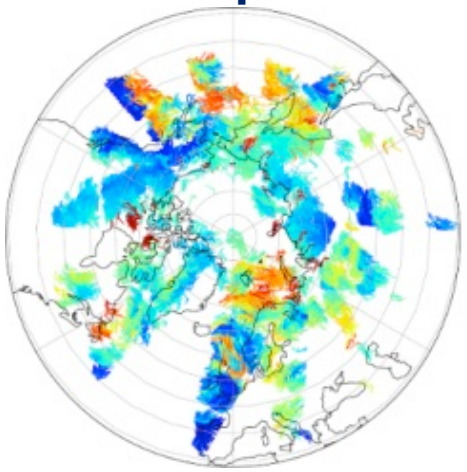
EUMETSAT

Metop (A and B) global and polar AVHRR AMV TCDR

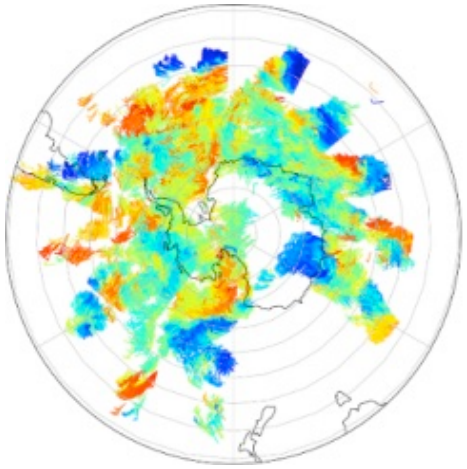
Input data:
AVHRR LAC in channel 4

AMVs are reprocessed using the EUMETSAT algorithm using **2 orbits** allowing to retrieve AMVs until about 45° North and South

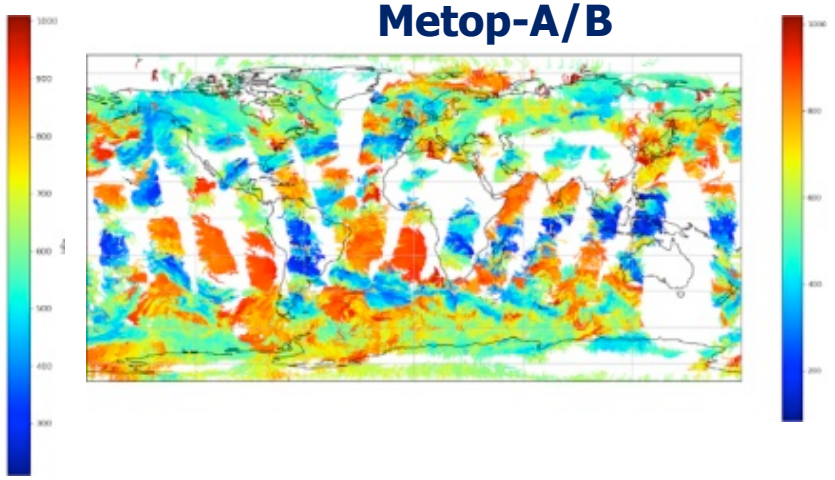
Metop-A



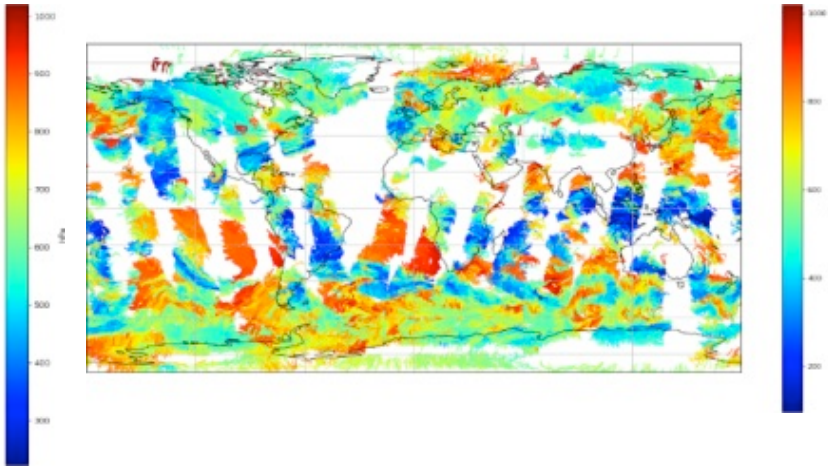
Metop-B



Metop-A/B

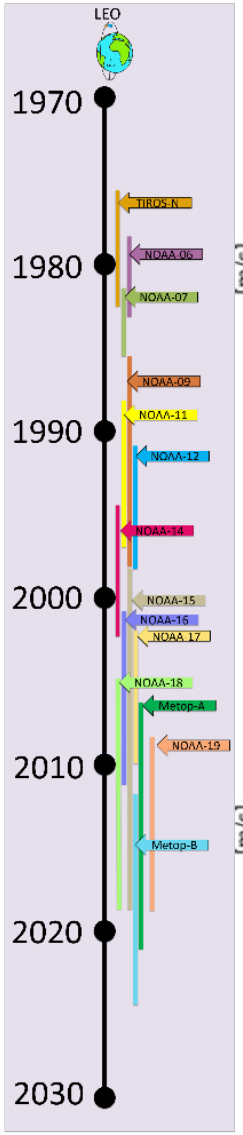


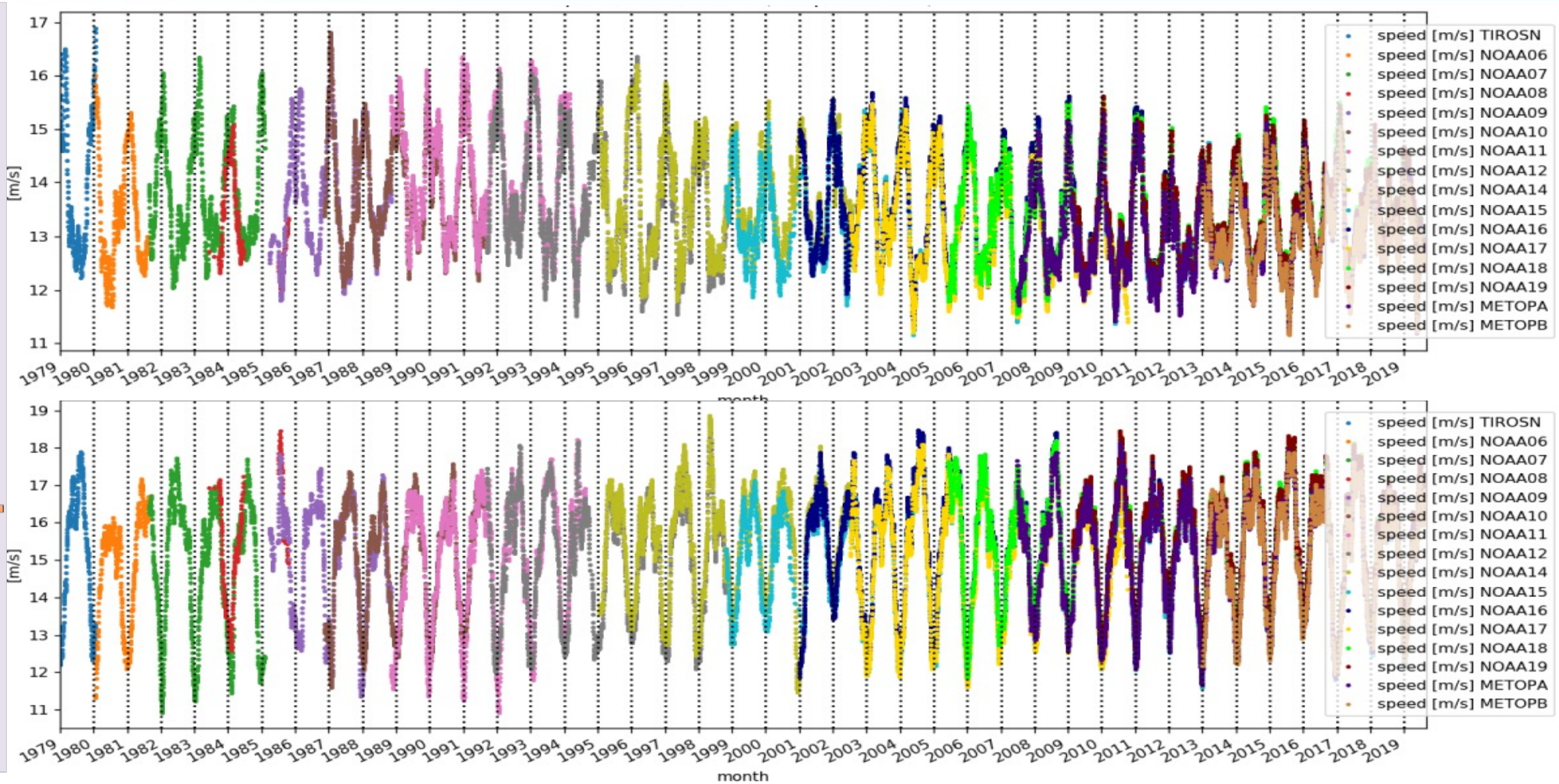
Metop-B/A



Example for the 1st January 2014, 0 to 12 UTC

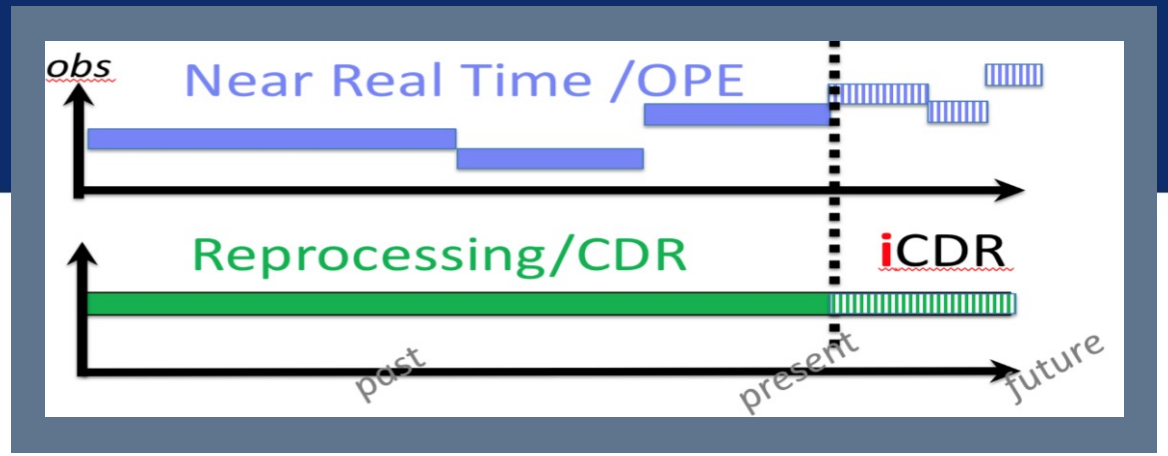
41 years of GAC polar AMV speed from 16 AVHRR instruments



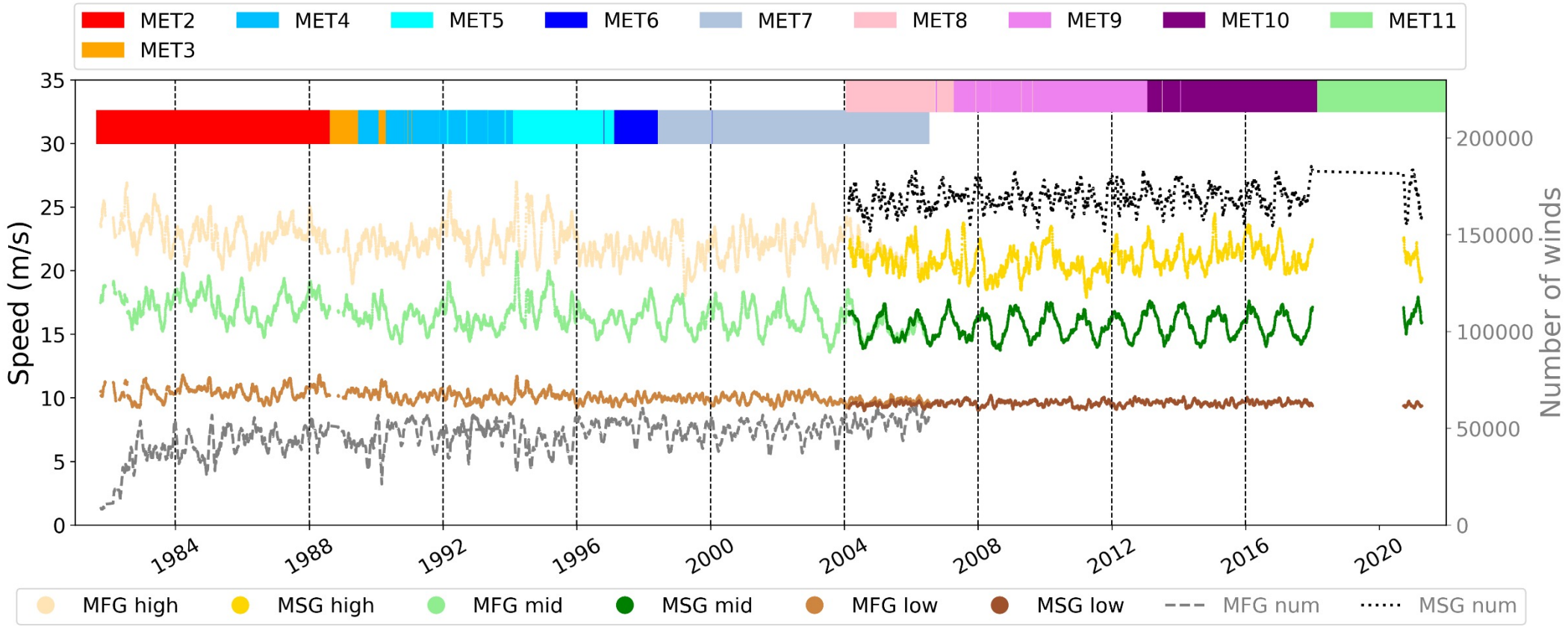


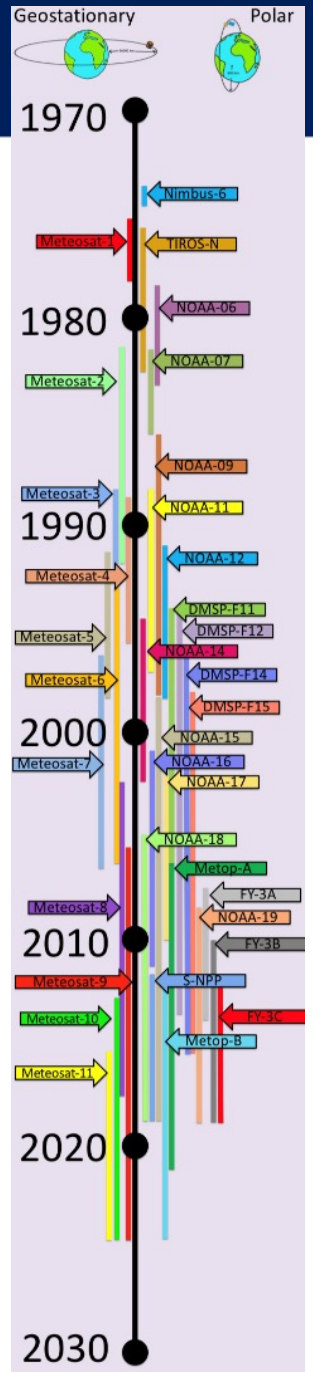
EUMETSAT

AMVs ICDR production



MFG + MSG GEO AMV at 0°, MET11 AMVs not shown here





Summary of available EUMETSAT 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
MSG AMV 0°	R1: 2004-2012	lat 60°-60°, lon 60-60°	10.15770/EUM_SEC_CLM_006
MSG/MFG AMV 0°	R2: 1982- 2019	lat 60°-60°, lon 60-60°	10.15770/EUM_SEC_CLM_0020
LAC Metop-A and -B AVHRR AMV EUMETSAT algo	R1: 2007-2014	Poles: lat > 40°	10.15770/EUM_SEC_CLM_0016
LAC Metop-A and -B AVHRR AMV CIMSS algo	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	R1: 2013-2017	Entire globe	10.15770/EUM_SEC_CLM_0038
GAC from 13 AVHRR	R1: 1979-2012	Poles: lat > 40°	10.15770/EUM_SEC_CLM_xxxx
GAC from 16 AVHRR	R2: 1979-2019	Poles: lat > 40°	10.15770/EUM_SEC_CLM_xxxx

Future foreseen reprocessing activities at EUMETSAT

- ❑ MFG/MSG IODC
- ❑ MSG AMV using OCA cloud products
- ❑ SEVIRI rapid scan

- ❑ Release 3 of AVHRR LAC AMVs

- ❑ Infrared imagers on polar-orbiters
  - Assess feasibility of generating Atmospheric Motion Vectors (AMV) from early imagers onboard polar-orbiting satellites like the Temperature-Humidity Infrared Radiometer THIR onboard Nimbus-4 to -7 e.g.
  - Generate level 2 AMV climate data records (CDRs) for the early satellite era

List of future EUMETSAT AMV CDR reprocessing foreseen

Product	Release: Period	Coverage	Reference doi
MFG/MSG AMV IODC	R1: 1998 -2012	lat 0°-120°, lon 60-60°	Foreseen in 2022 10.15770/EUM_SEC_CLM_xxxx
MSG rapid scan AMVs	R1: 2004- 20xx	Europe	Foreseen in 2024 10.15770/EUM_SEC_CLM_xxxx
MFG rapid scan AMVs	R1: 2004- 20xx	Europe	Foreseen in 2027 10.15770/EUM_SEC_CLM_xxxx
MSG AMV 0° using OCA	R1: 2004- 2019	lat 60°-60°, lon 60-60°	Foreseen in 2023 10.15770/EUM_SEC_CLM_xxxx
LAC Metop-A , -B, -C AVHRR AMV EUMETSAT algo	R3: 2007-2024	Poles: lat > 40°	Foreseen in 2024 10.15770/EUM_SEC_CLM_xxxx
AMVs from THIR	R1: 1971 - 1985	Poles	Foreseen in 2027 depending on feasibility 10.15770/EUM_SEC_CLM_xxxx

What next to for the AMV community for reprocessing?

- Upper air winds produced from geostationary and polar-orbiting satellites are an essential source of information used for the climate reanalysis. Only a few of them are or were used to produce operationally ERA-interim, ERA-5 and JRA operational reanalysis. AMVs from US (GOES), Japan (GMS, MTSAT), as well as polar AMVs using AVHRR and MODIS instruments on board US satellites.

- Currently the **ECV inventory** (https://climatemonitoring.info/ecvinventory/ v3.0) reports only 10 dataset of upper-air winds climate ECV (It is very a very small number considering the number of instruments potentially suitable to derive AMVs. To add planned or released CDR please email: ecv_inventory@eumetsat.int

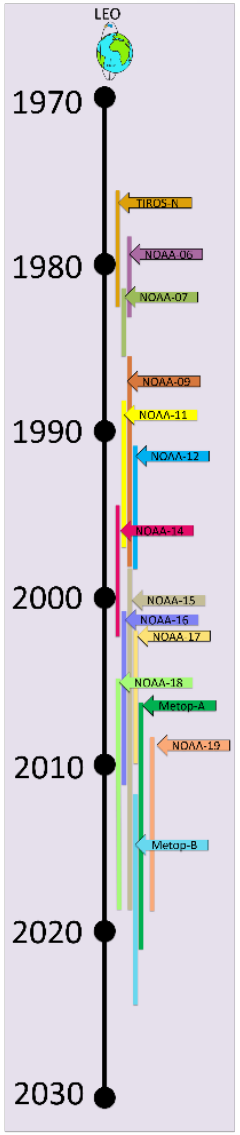
- To achieve a higher geographical coverage the development of a **multi-instrument AMV products** could be an option for the future. The already existing CIMSS LEO-GEO AMV data record is an example. However combining different instrument datasets is not necessarily the solution as the time difference between images in case of multi-instrument will affect the number of derived vectors. For assimilation purpose, it is probably simpler to ingest several individual datasets. Ideally having a unique GEO-ring AMV product + a polar AMV dataset could be the goal

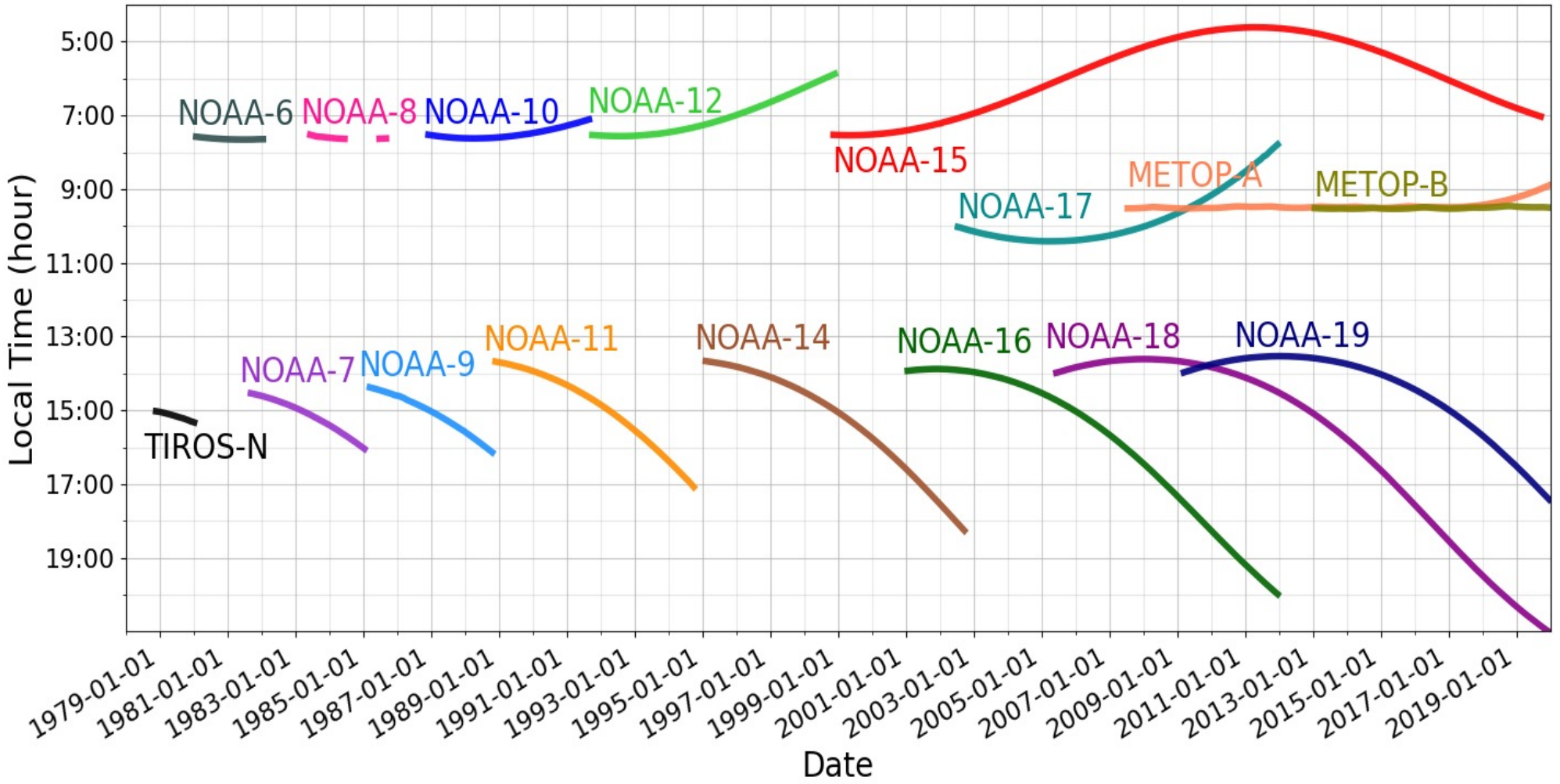
- Would it be better to have many **single sensor** data having different biases **or** if one should construct a **global AMV dataset** (that may enable more usage than only assimilation)?

The end

Thank you ☺

NOAA AVHRR Polar AMV





Daily AMV speed over each pole from the 16 AVHRR