ATMOPHERIC MOTION VECTORS CLIMATE DATA RECORD PRODUCED AT EUMETSAT

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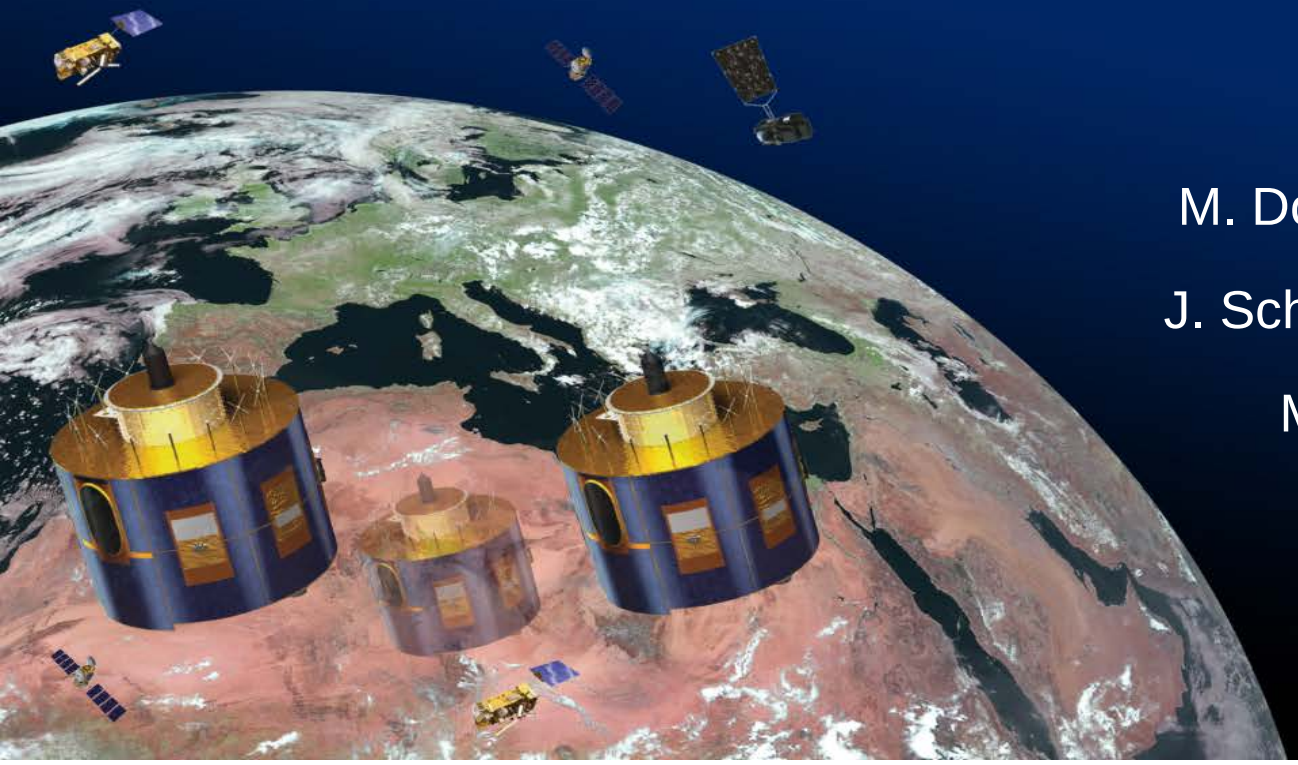


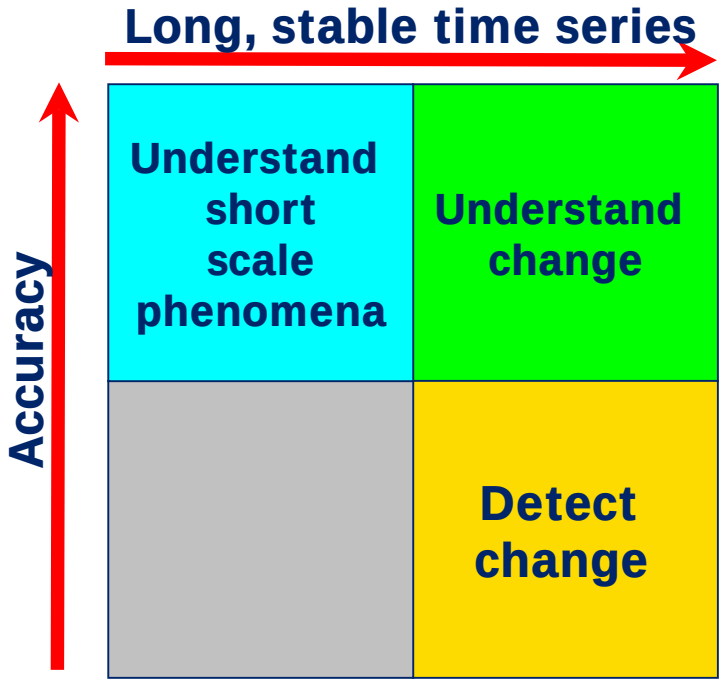
AMV reprocessing for climate: why ?

At EUMETSAT we produce in real time meteorological products from polar and geostatinary satellites. Those data are mainly used for weather forecasting application.

Because we have several decade of satellite data. We have a long enough time series to use it to try to understand climate and climate change.

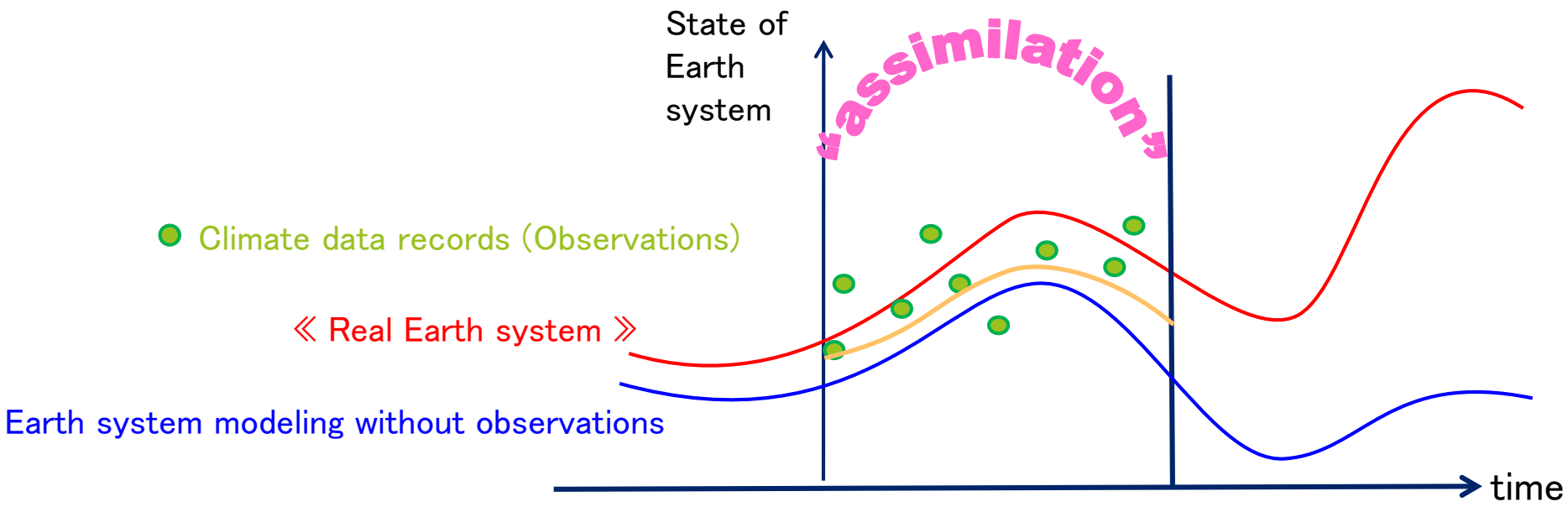
We reprocess AMV from our satellite products with 2 objectives in mind:
1- a better accuracies, (e.g. better algorithm);
2- a longer homogeneous time series for monitoring (filling gaps).

The GEO reprocessing is done using new recalibrated (sensor equivalent) level1.5 images



AMV reprocessing for climate: to which usage ?

- **Reanalyses** using Earth system models

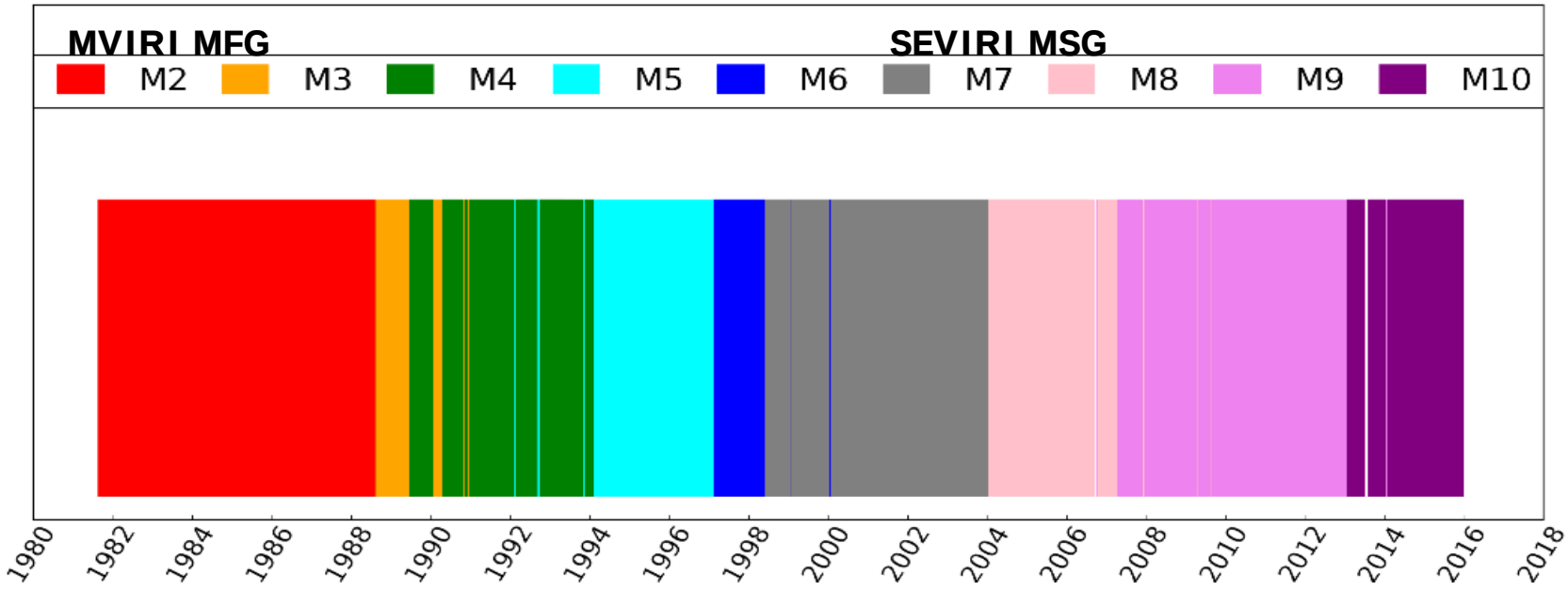


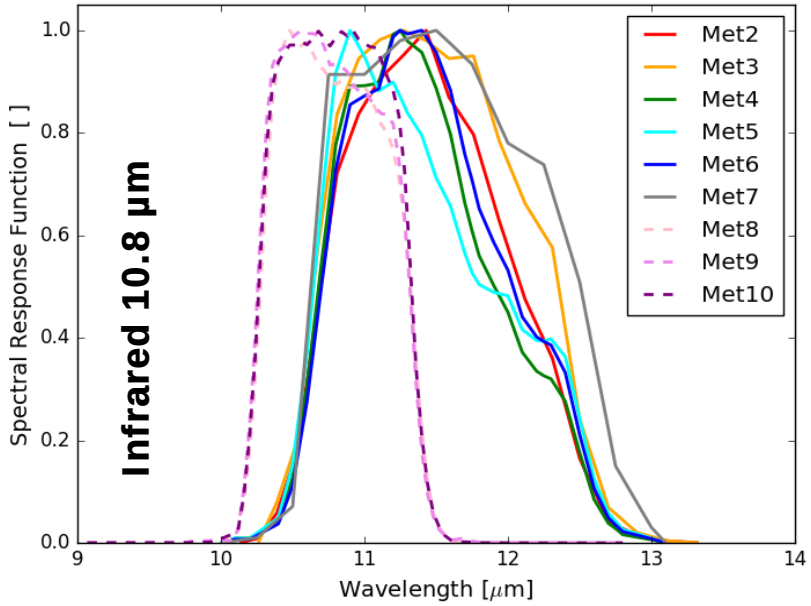
- **Climate change impact**: investigate changes in large scale circulation such as northward shift in the storm tracks or widening of the tropics.

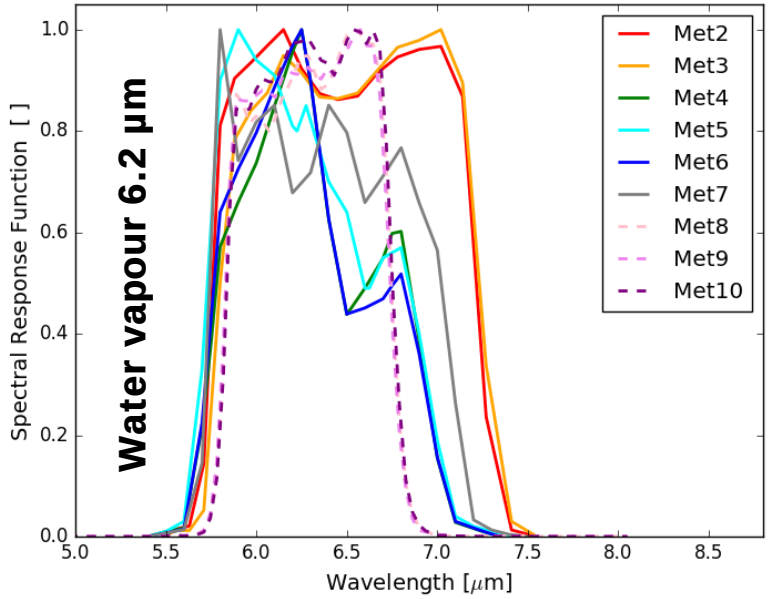
Geostationary AMVs from MVIRI and SEVIRI instruments

MVIRI:
3 channels
30 minutes
IFOV: 5.0 km

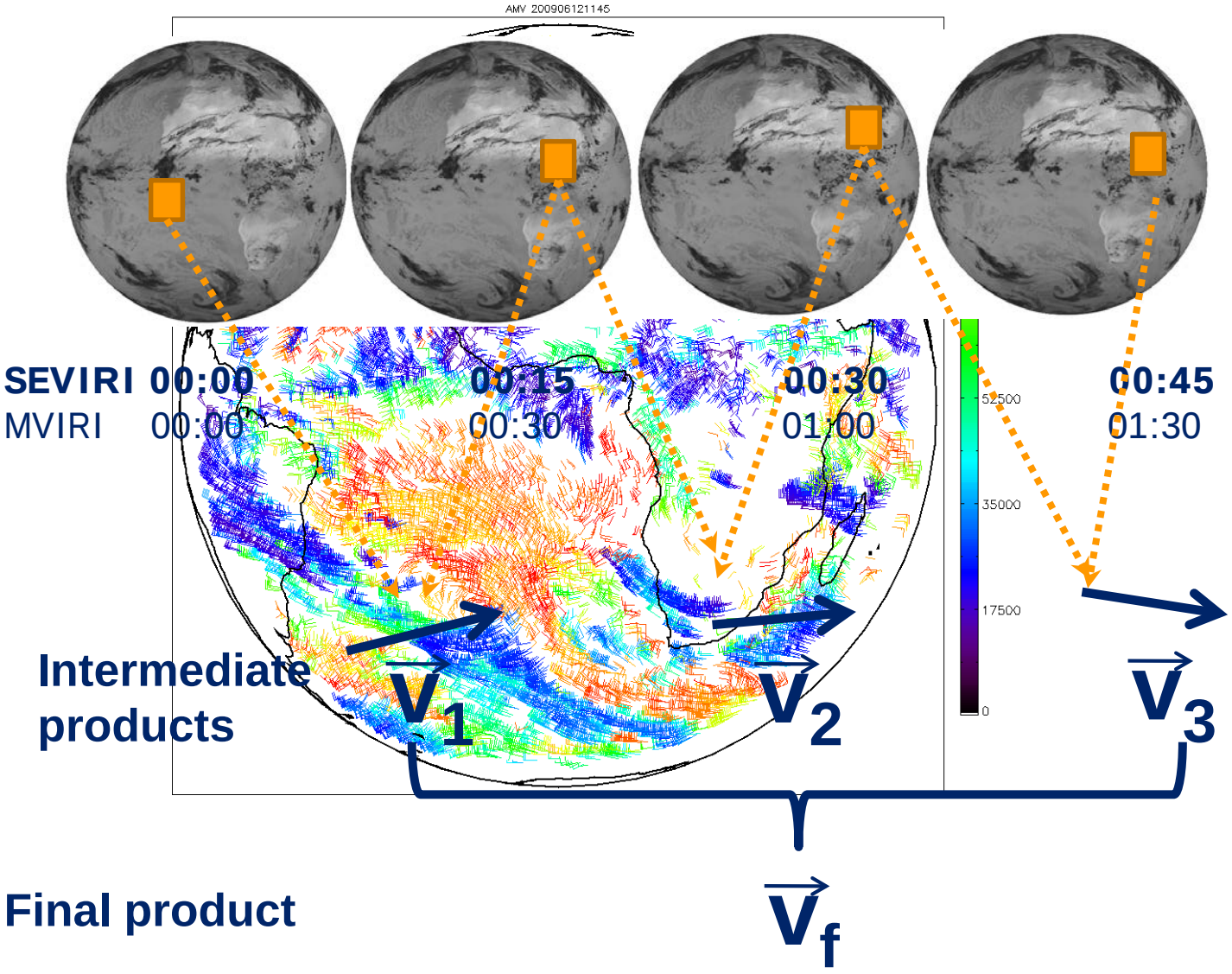
SEVIRI:
12 channels
15 minutes
IFOV: 3 km



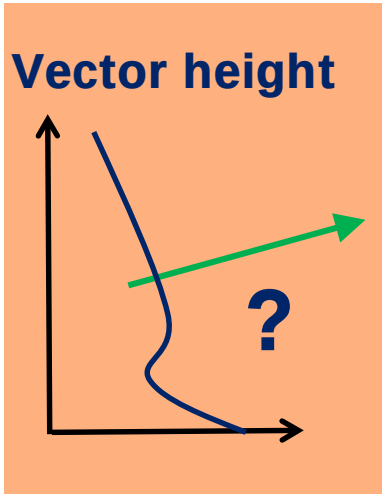




AMV from imager onboard geostationary satellite



About 10000 winds are detected.



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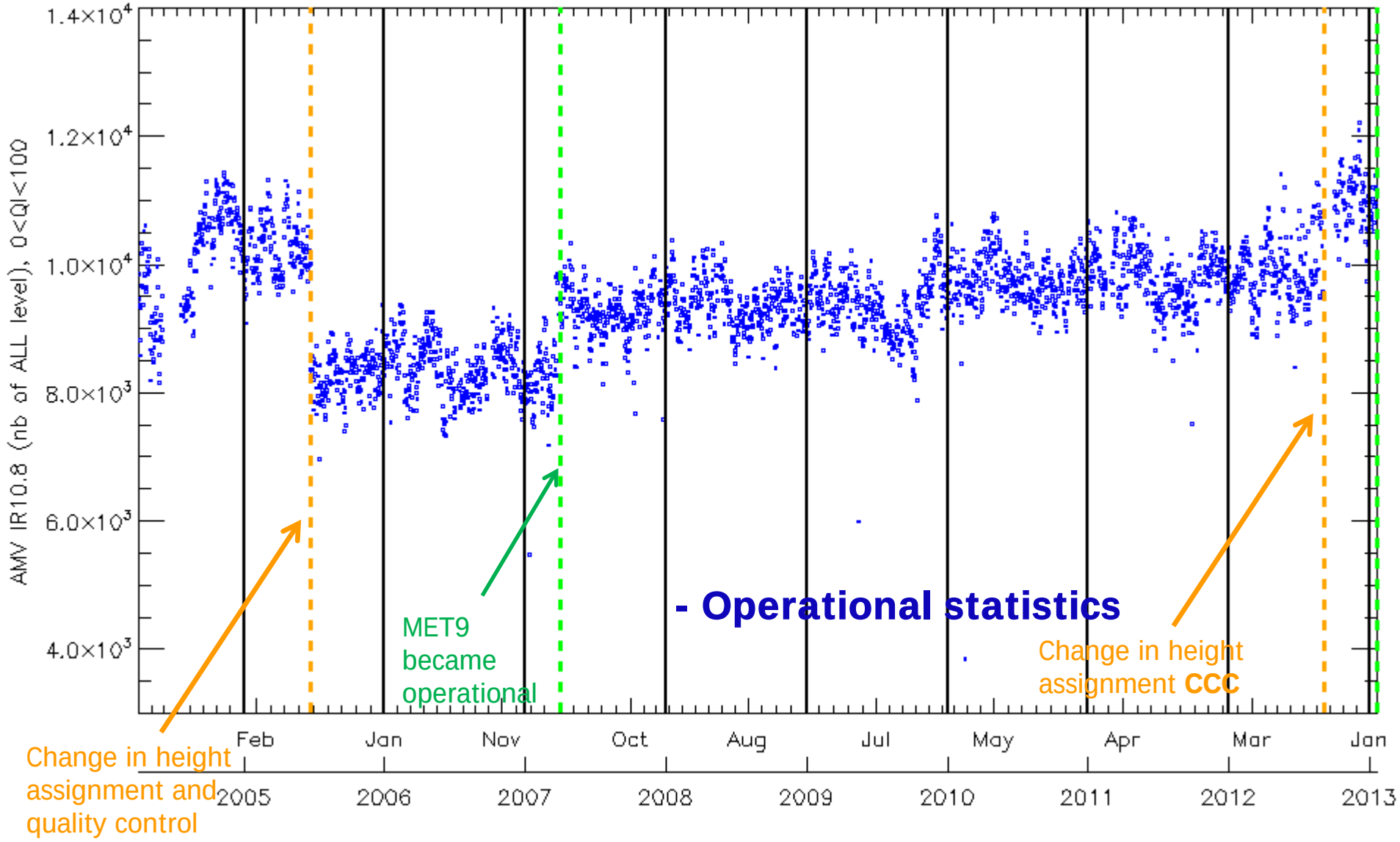
Example of the importance of the usage of a unique algorithm throughout the entire reprocessing period



Note: this is done using a previous reprocessing release

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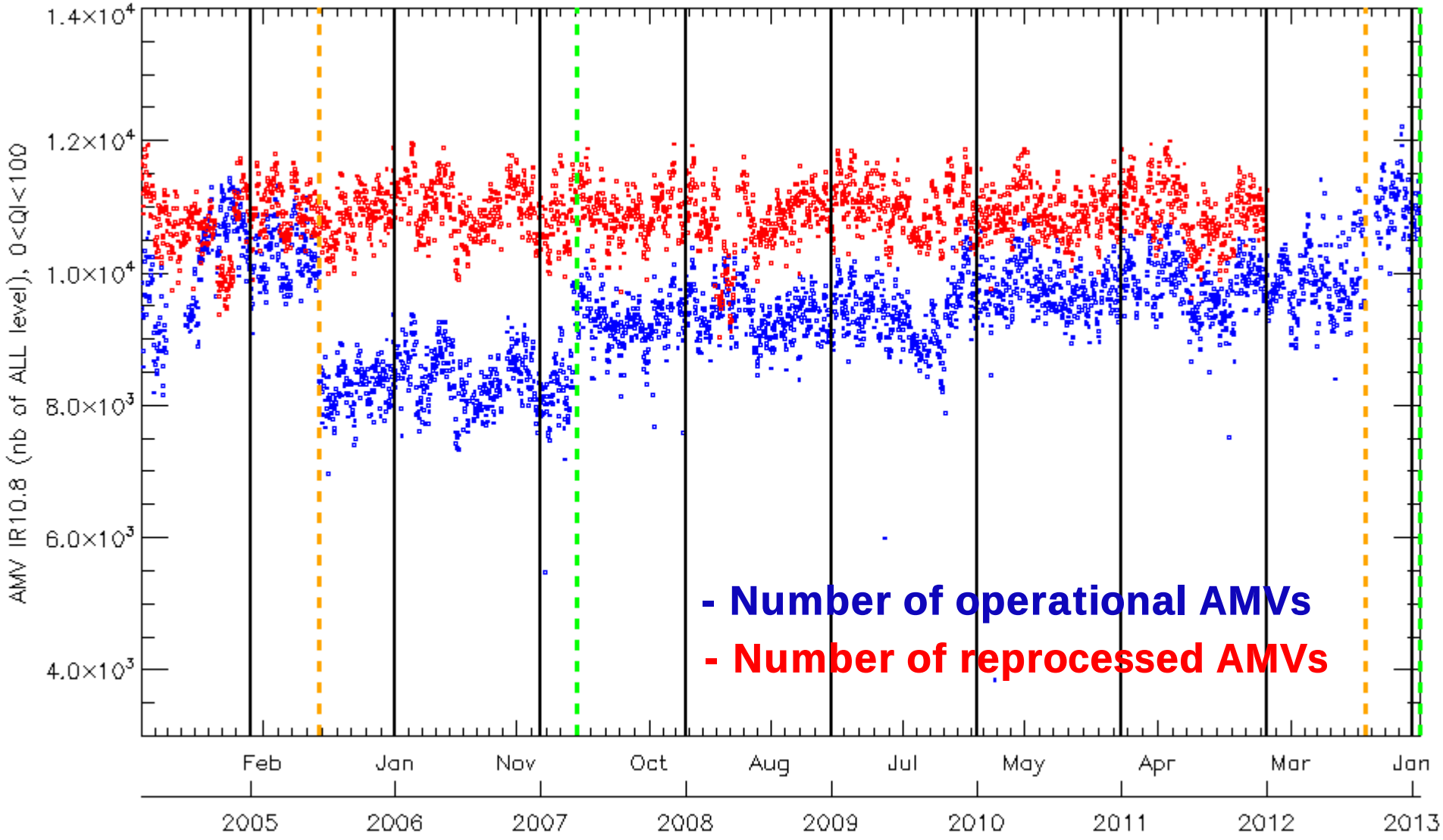
Example of the importance of the usage of a unique algorithm throughout the entire reprocessing period



Note: this is done using a previous reprocessing release

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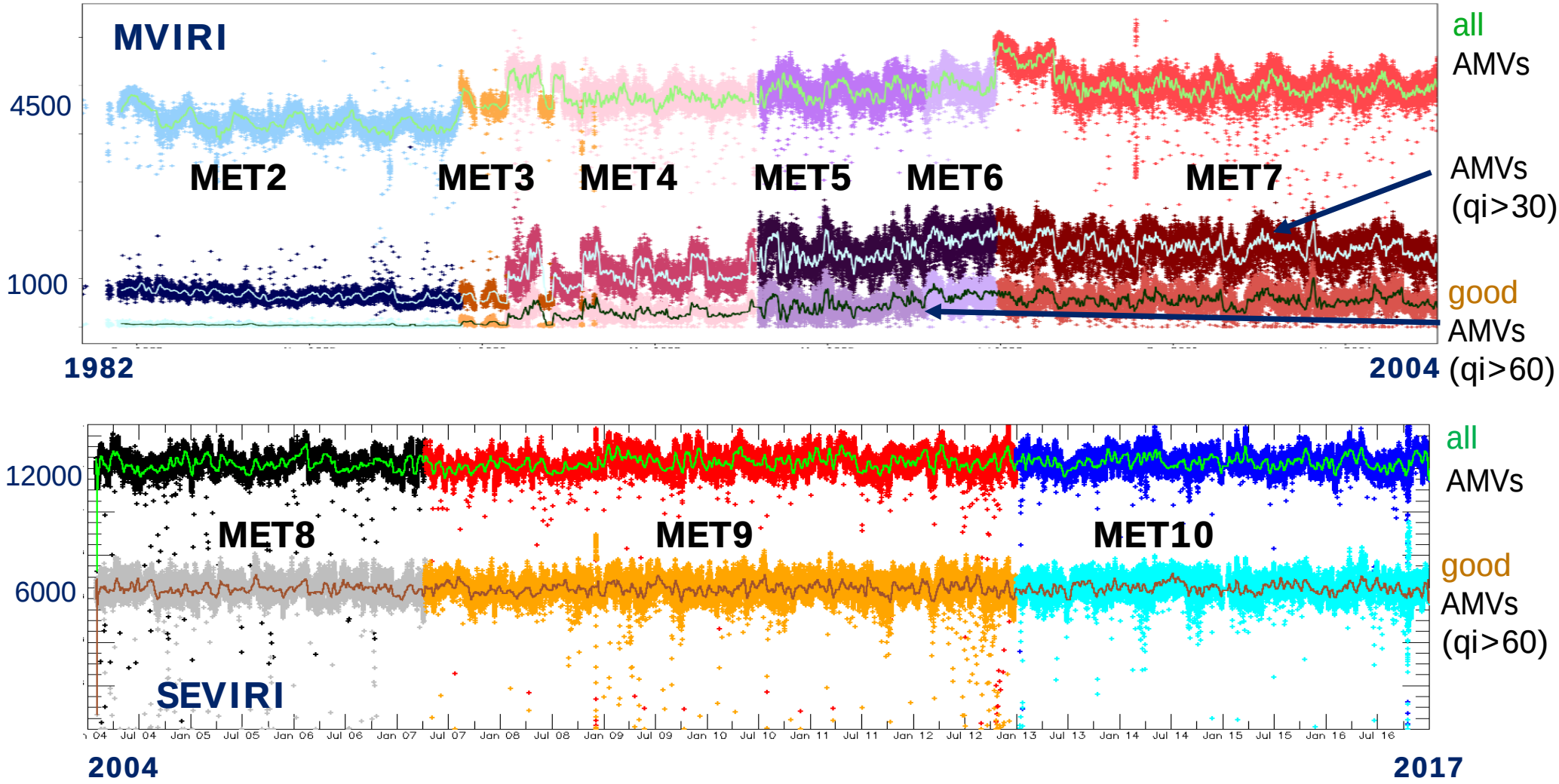
Number of IR10.8 AMVs retrieved using MVIRI and SEVIRI



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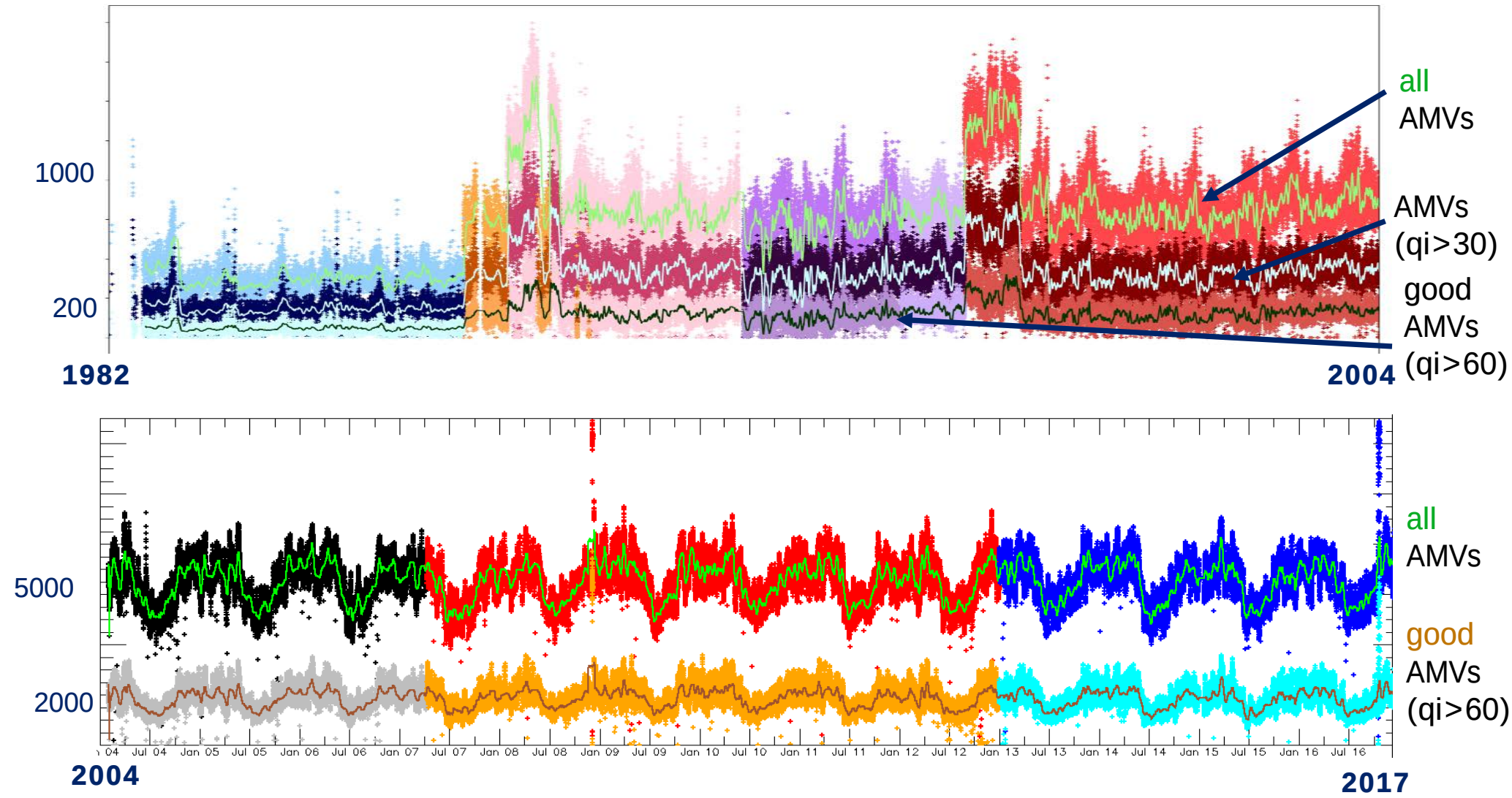
Number of WV AMVs retrieved using MVIRI and SEVIRI



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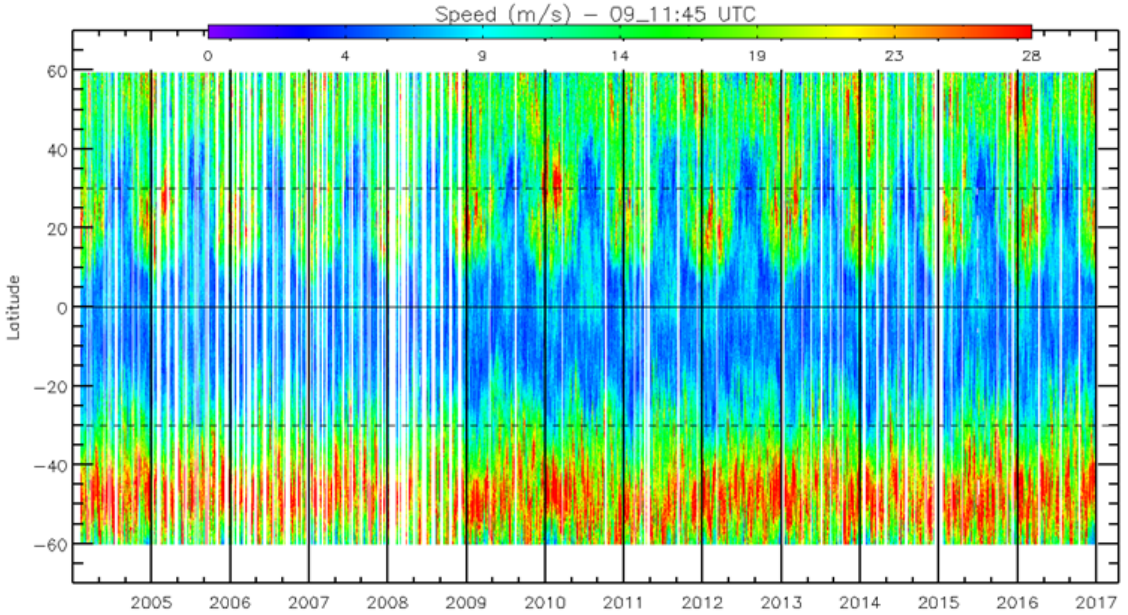
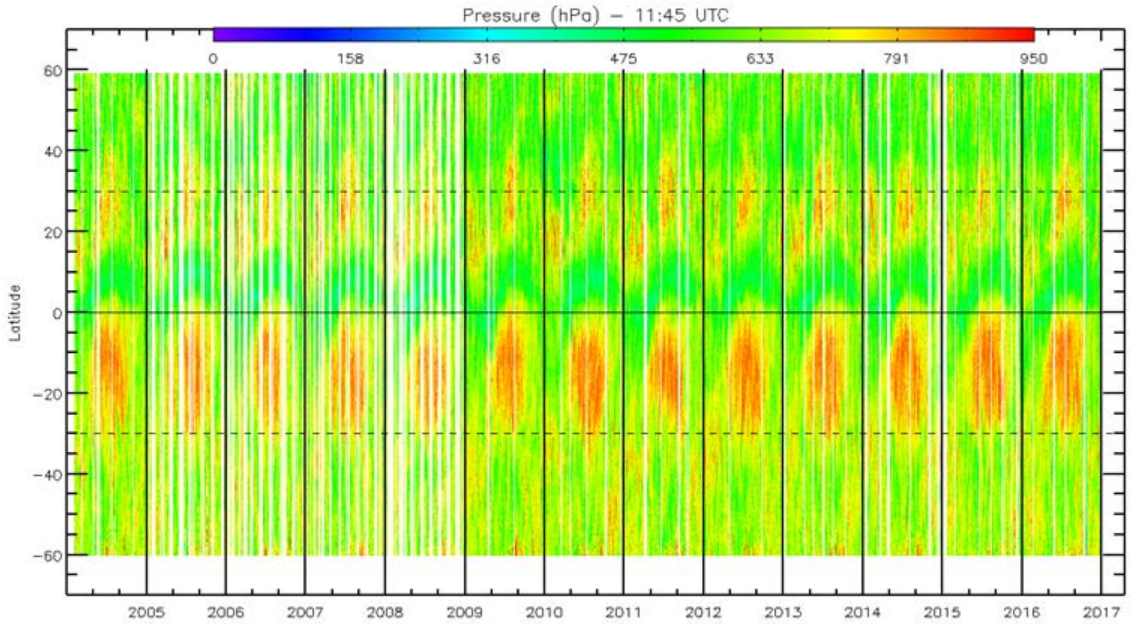
SEVIRI/MSG IR AMVs at 11:45UTC



AMV speed

AMV height in pressure units



1st EUMETSAT complete GEO wind (MVIRI+SEVIRI): conclusion

- 35 years of MFG (MVIRI) and MSG (SEVIRI) level 2 products have been reprocessed at EUMETSAT with an unique adapted version of the latest EUMETSAT algorithm (1982-2017).

- As a first release, the dataset is rather a stable and homogeneous dataset.

- **Current limitation**: CTP algorithm used is very crude (only uses the IR channel). That impacts the quality of the AMVs. The next release will improve it.

- This reprocessing will be repeated in the future with an improved cloud top pressure and will be useful for reanalyses and climate studies.

AMV CDR from imager onboard low earth orbit satellite

In the framework of the ERA-CLIM2 project, polar AMVs were reprocessed using GAC data from AVHRR instrument on board all available polar satellites for the period from 1982 to 2016 using EUMETSAT algorithm (v2.4).

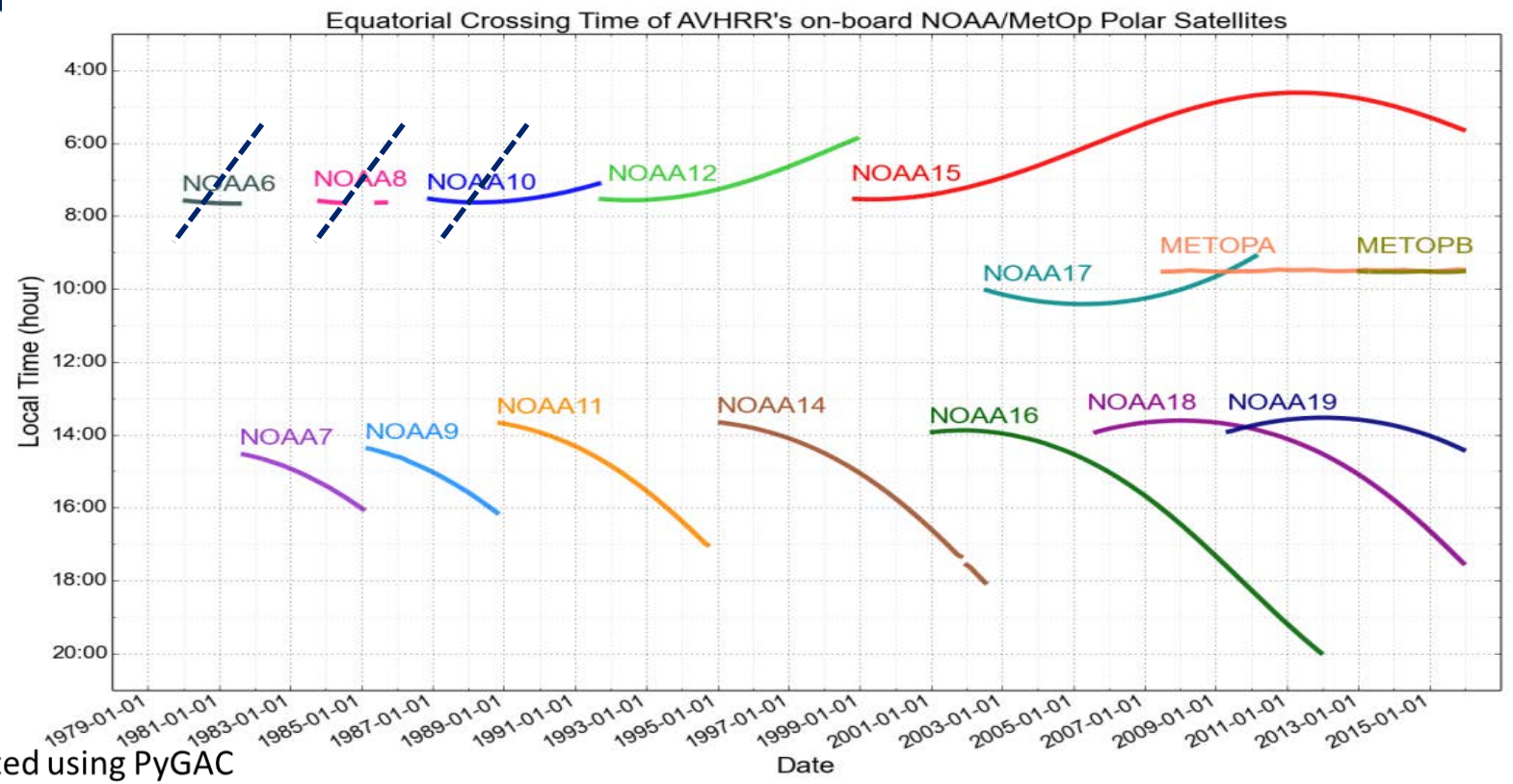
Polar winds AMVs dataset aims to be used in reanalysis dataset. It could also be used with regional reanalysis if AMVs are assimilated. It may be used for climate studies in conjunction with AMVs derived from geostationary satellite data, e.g., for long term statistics of the polar front position.

AVHRR input data also on board Metop and NOAA satellites

AVHRR FCDR PyGAC dataset [1978-2015] is used as an input data

Developed jointly by CM SAF & Cloud_cci

Reading and calibrating GAC L1b data



AVHRR FCDR data created using PyGAC

Original AVHRR level 1b GAC data

AVHRR PyGAC dataset (reflectances, angle, quality)

AVHRR orbits EUMETSAT format (radiances)

AVHRR PDUs data (orbits splitted in several 3 min. chuncks)

AVHRR input data formatting done at EUMETSAT

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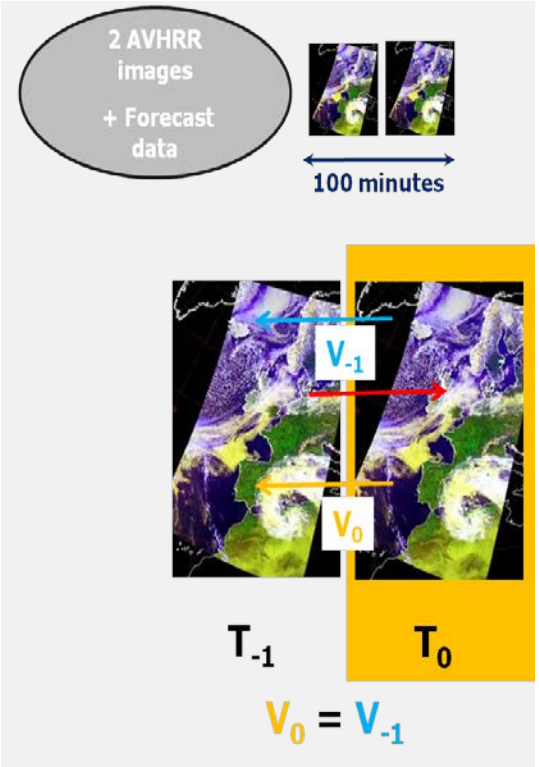
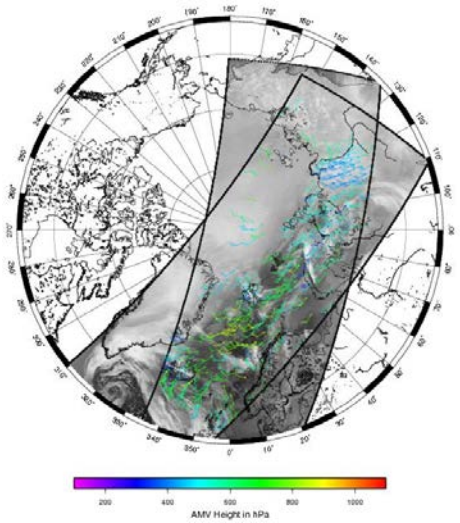
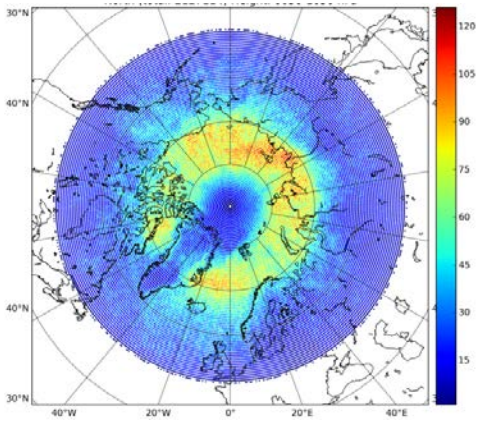
LEO AMVs reprocessing with the EUMETSAT algorithms



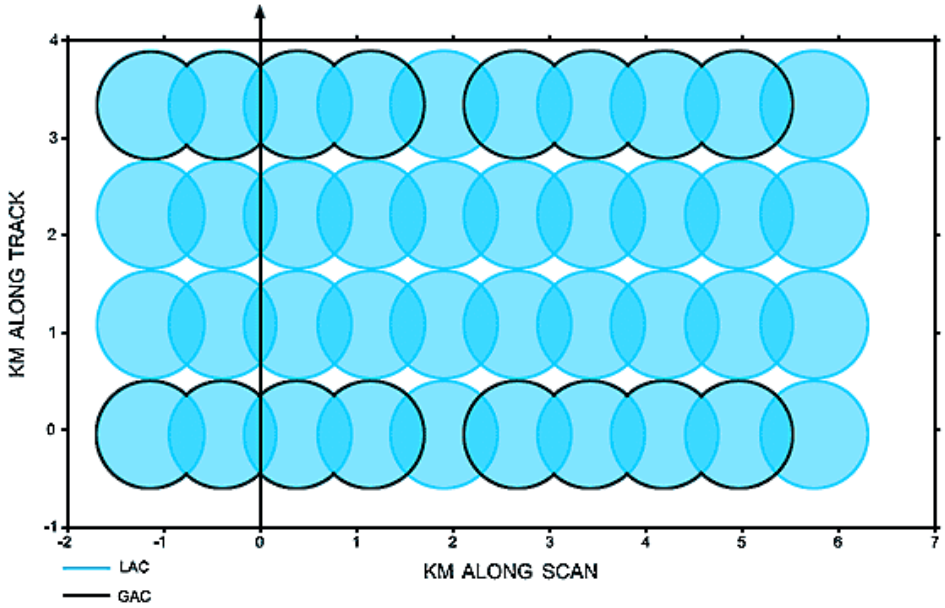




Entire AVHRR series (1982-present)

GAC versus LAC format:

Sub satellite point data resolution: 1.1x4.4 km^2 with a 2.2 km gap between pixels across the scan line



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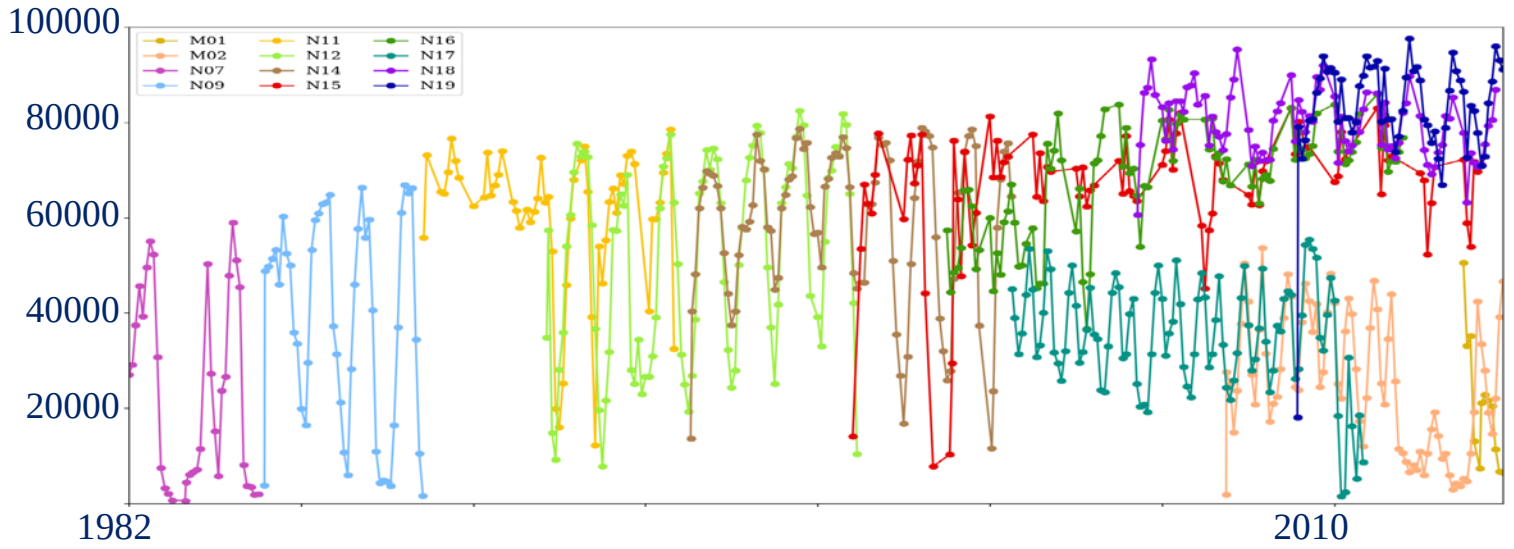
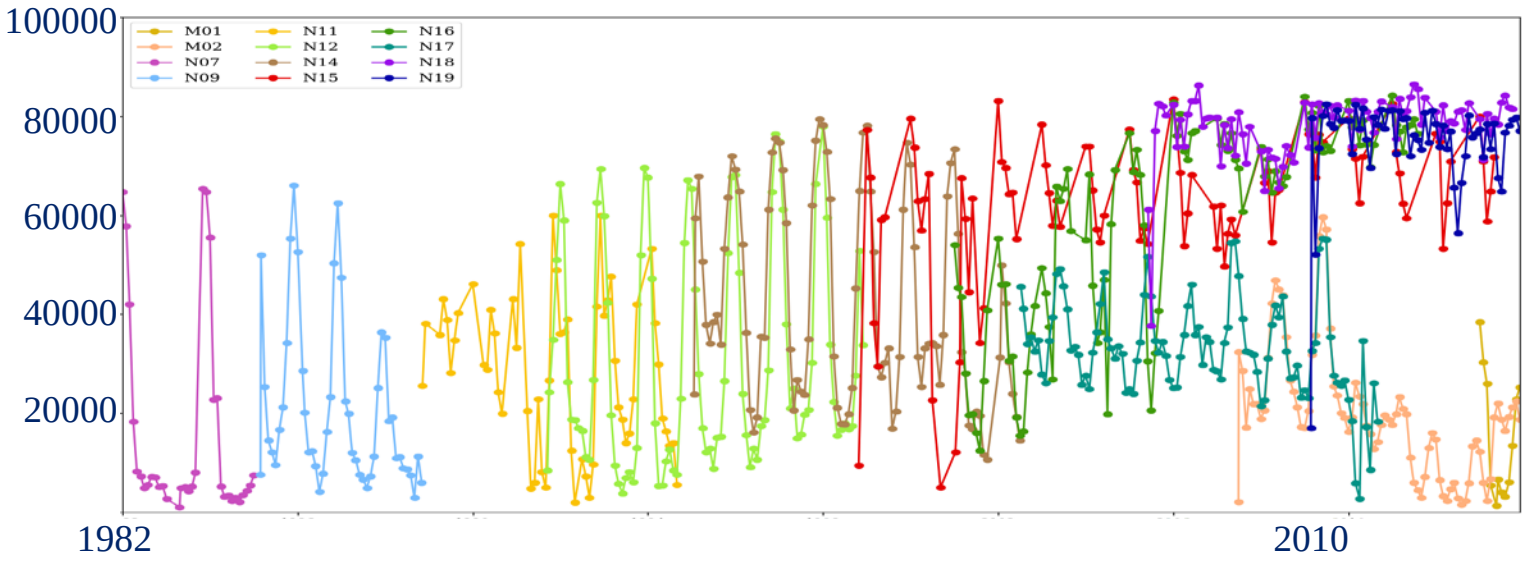
Number of AMVs over the period 1982 - 2015



Northern pole



Southern pole

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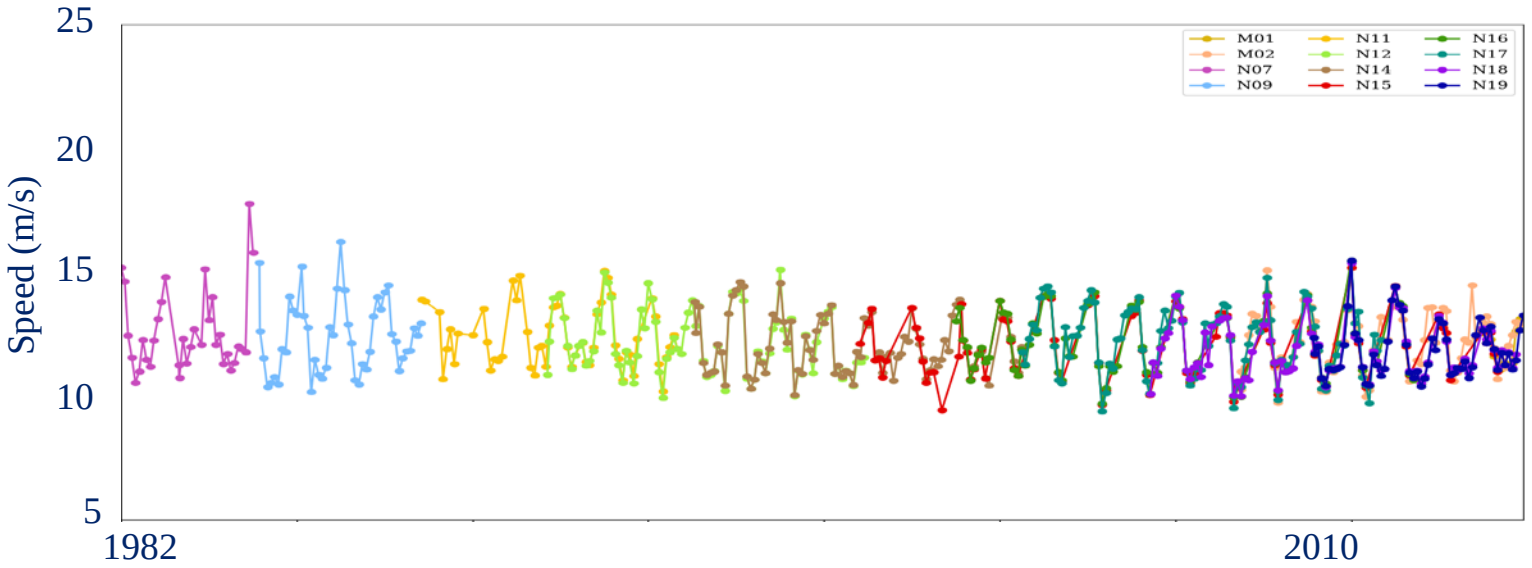
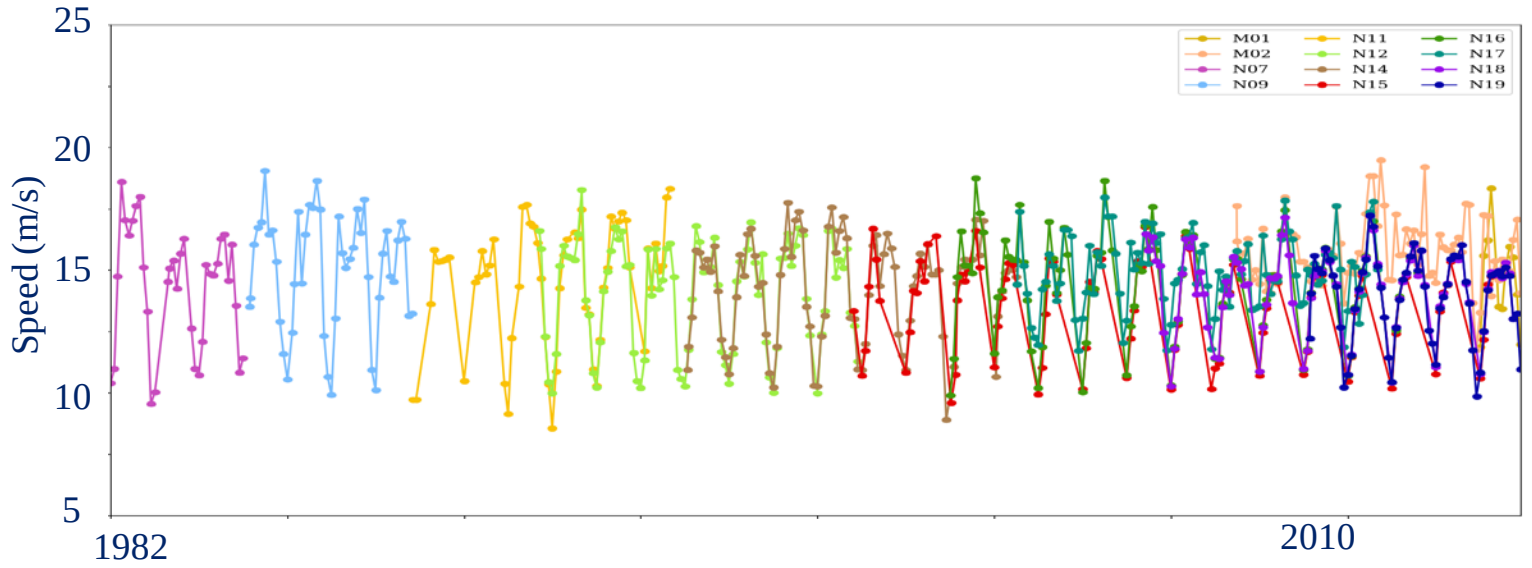
Monthly mean of AMVs speed over the period 1982 - 2015



Northern pole

(qi>50 and speed > 2m/s)



Southern pole

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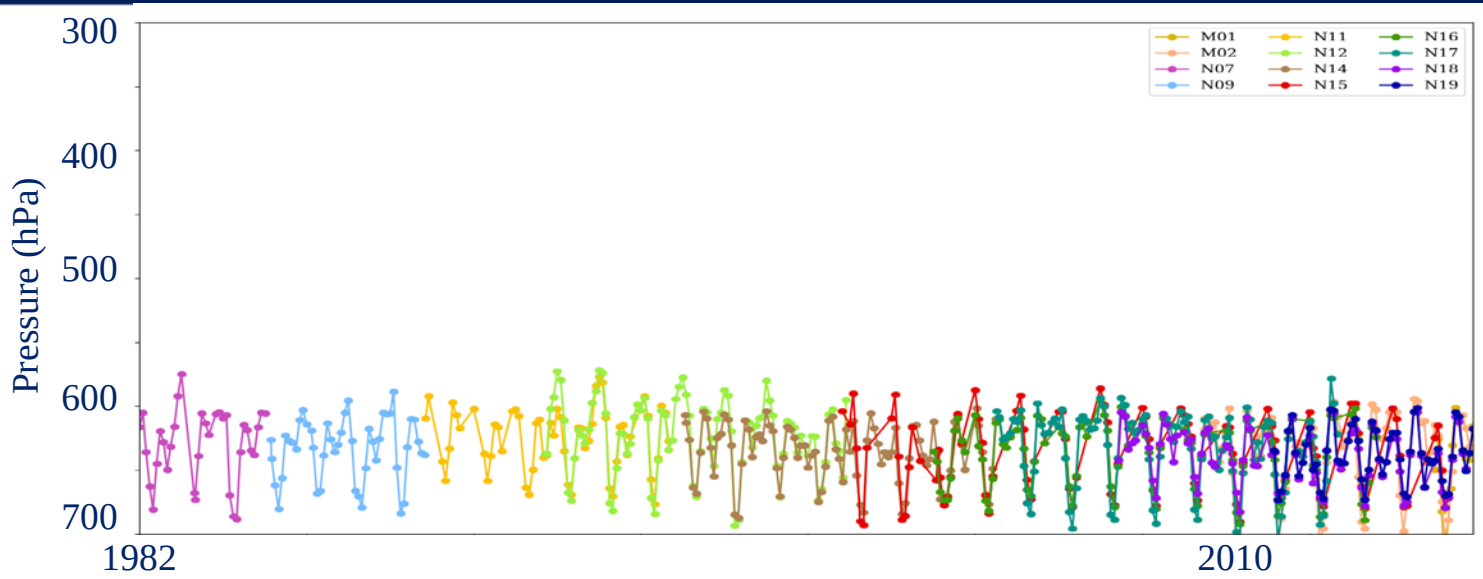
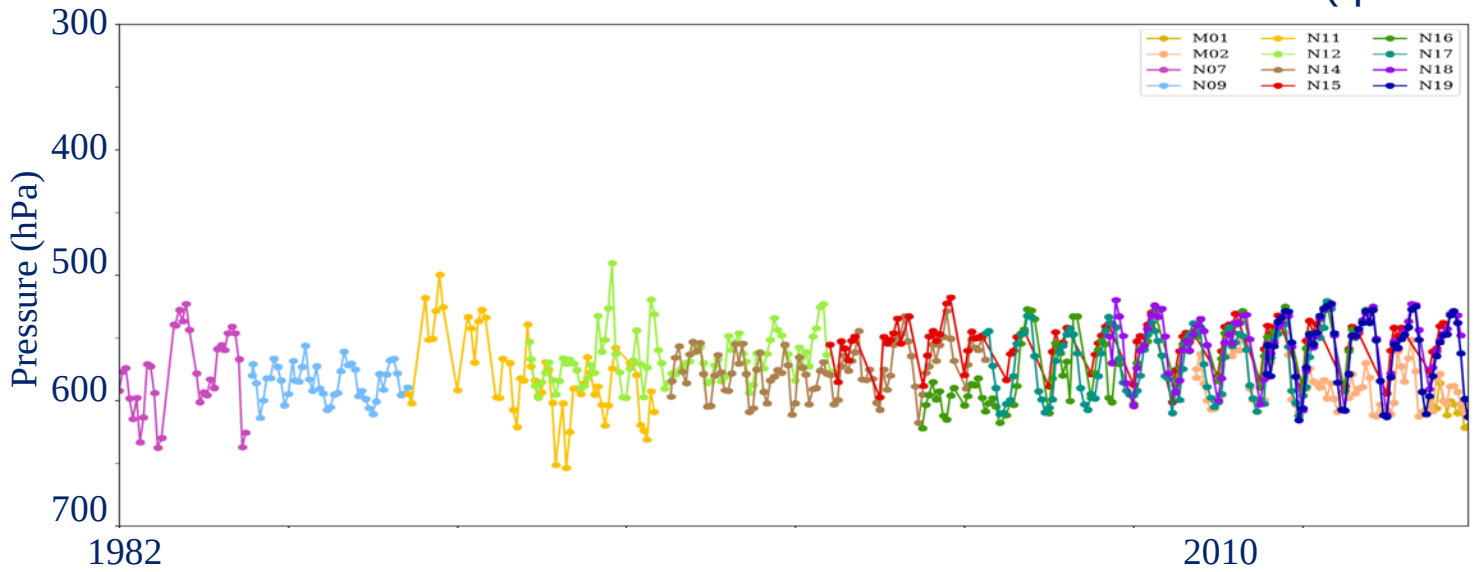
Monthly mean of AMVs height over the period 1982 - 2015



Northern pole

(qi>50 and speed > 2m/s)



Southern pole

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Polar AMVs: conclusion

The first release of polar AMVs from AVHRR data from 1982 dataset is rather stable and exhibit the main expected features:

- 200 to 600000 AMVs per month, with more winds in the summer hemisphere
- Average wind speeds of 13 m/s over the northern hemisphere and 15 m/s over the southern hemisphere.
- The time series shows a distinct seasonal cycle with maximum wind speeds over the winter hemisphere and minimum wind speeds over the summer hemisphere.
- The average height of the AMVs is between 700 and 500 hPa for the northern hemisphere and 650 to 500 hPa over the southern hemisphere which is driven by the topography of Antarctica

A second release is expected at the end of 2019 will improve the product:

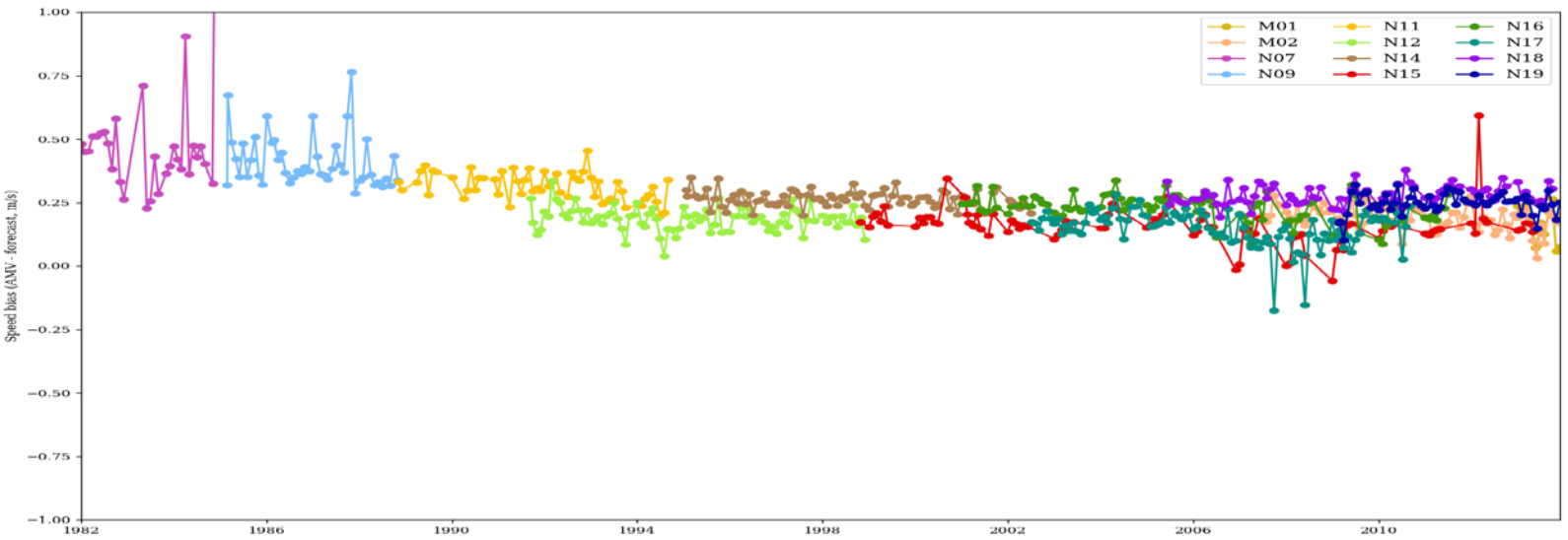
- Will include NOAA 6, 8, an 10
- Include cloudy information in the retrieval

Future EUMETSAT reprocessing plan

	Time coverage	Geographical coverage	Description	Date
GEO				
Meteosat-8, 9, and 10 SEVIRI AMV	2004 - 2018	Europe/Africa/India	Release 1 extension	Q4 2018
Meteosat-7	1982 - 2004	Europe/Africa/India	Release 1 extension	Q4 2018
LEO				
Metop AVHRR Polar AMV LAC	2007 - present	Polar region (up to 50°N and S)	Release 2	Q2 2019
Metop AVHRR Dual Wind AMV	2011 - present	Global	Release 1	Q2 2019
NOAA AVHRR Polar AMV GAC	1979 - present	Polar region (up to 50°N and S)	Release 1 extension	Q4 2020


Thank You

Speed bias



Northern pole

Southern pole

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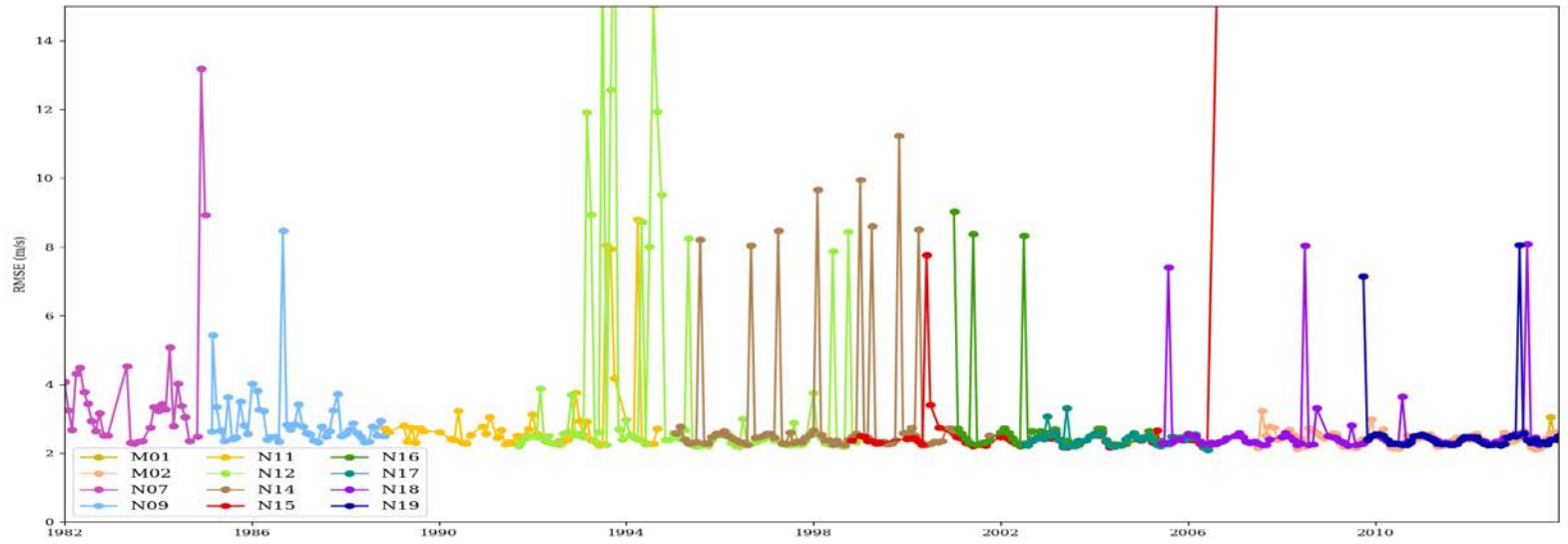
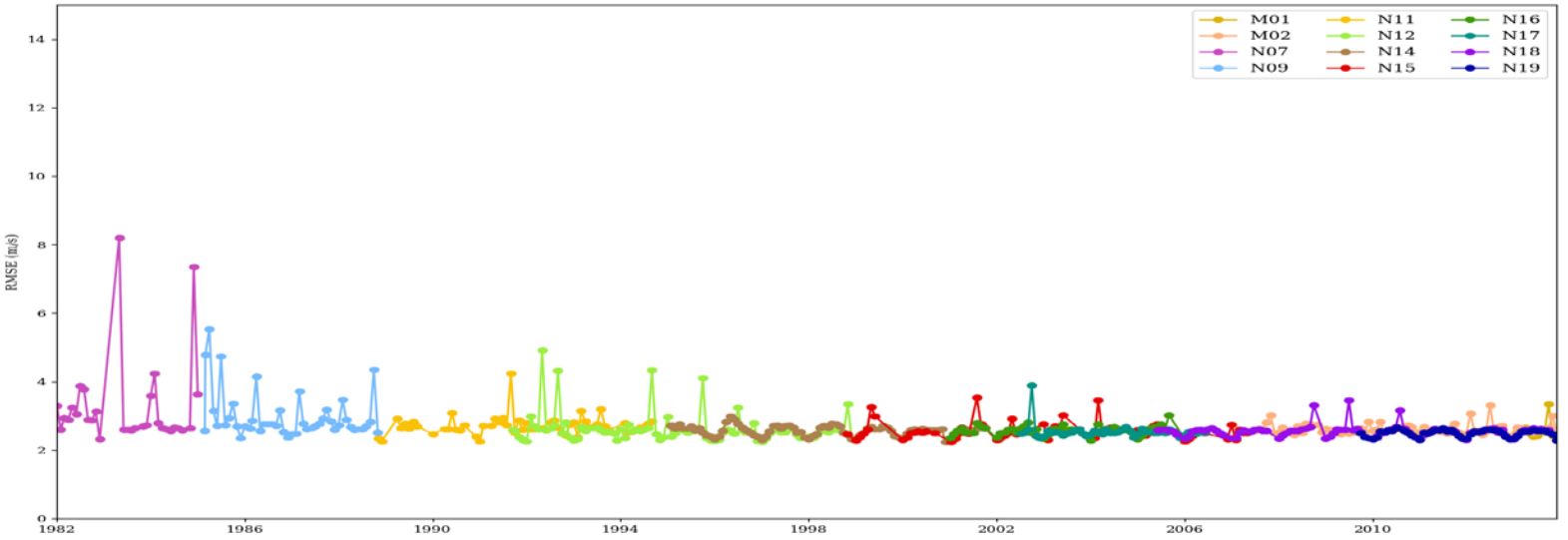
rmse



Northern pole



Southern pole

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