

NWC/GEO-HRW provides “Atmospheric Motion Vectors (AMVs)” & “Trajectories” for Geostationary satellites all around the world:

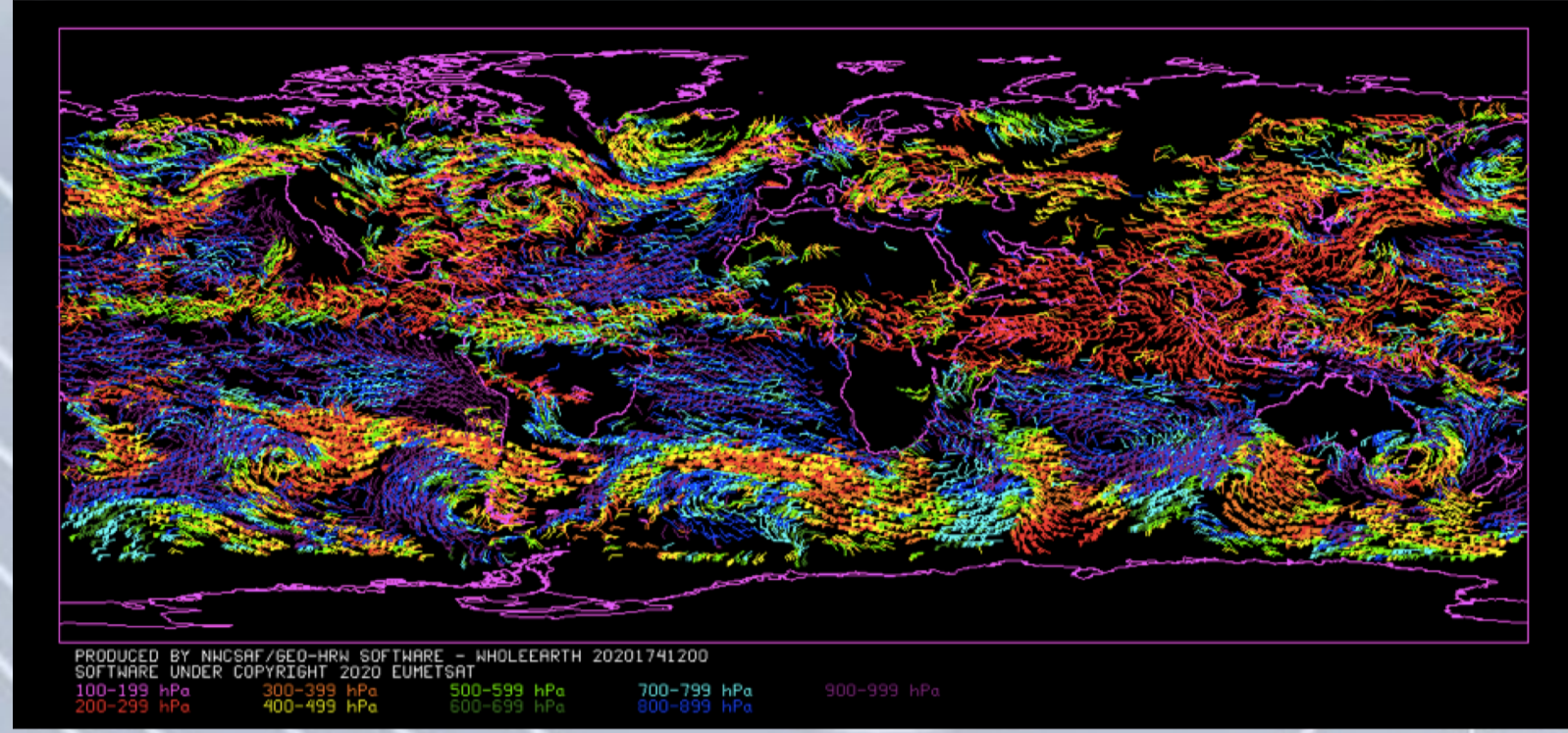
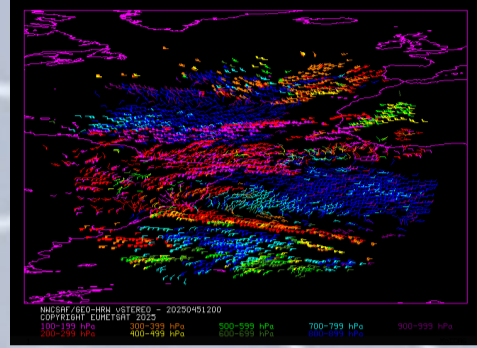
- MTG-I/MSG in Europe, Africa & Indian Ocean
- Himawari-8/9 in Asia & Western Pacific
- GOES-R in the Americas & Eastern Pacific

Updates for v2025/vMTG day-1 (available since July 2025):

- Extension to MTG-I satellite series
- netCDF outputs now “CF compliant” for easier processing
- Writing of BUFR outputs with ECCODES lib (instead of BUFRDC lib)

Current development for release in 2027:

- “GOES-East & MTG-I stereo AMVs” for purely geometric stereo height, which calculates the AMV height with the parallax displacement using both satellites (with Carr Astronautics & Univ. Maryland)



Comparing validation of MSG and MTG-I satellites:

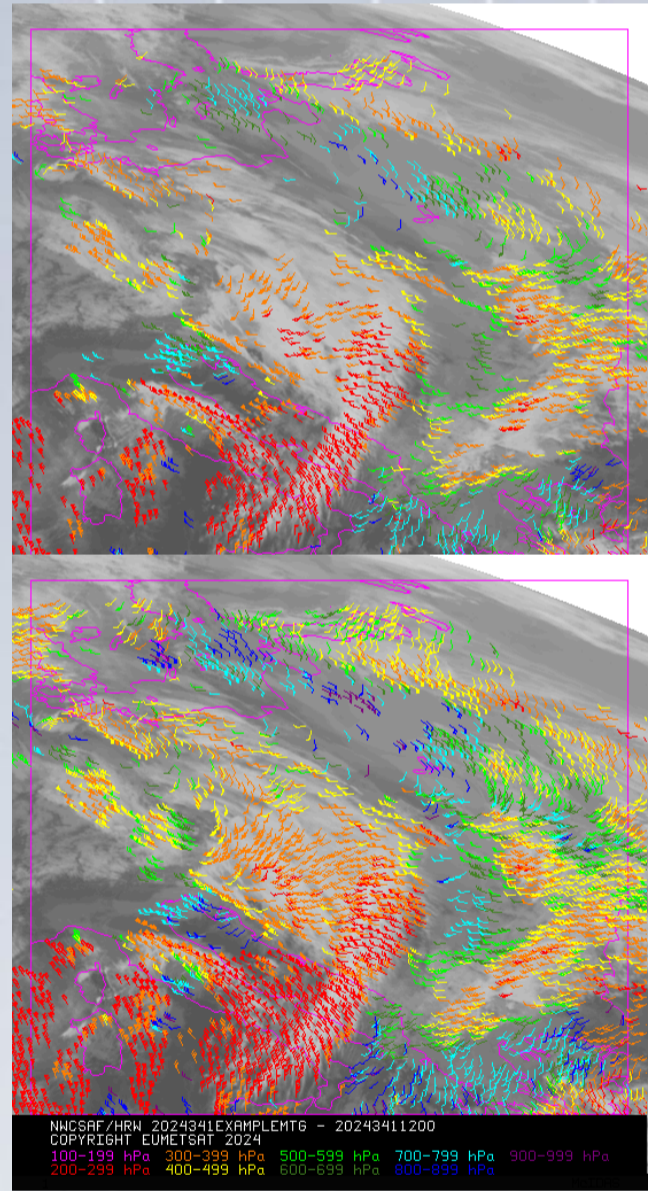
- Number of AMVs x 2.5 times with MTG-I (more significant at higher levels)
- Normalized Root Mean Square Vector Difference (NRMSVD) similar or slightly better
- Normalized Bias especially less negative

Validation for all satellites and layers inside defined “target accuracies”

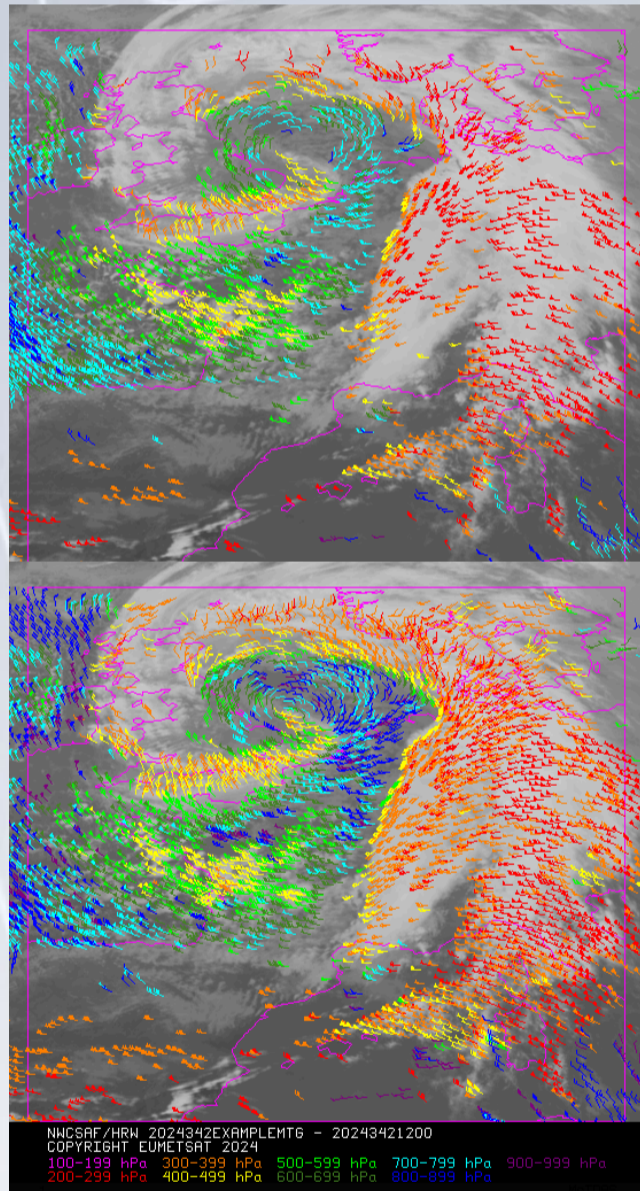
NWC/GEO-HRW v7.0 AMVs Validation in the European region against Radiosounding winds at 12:00Z (09 October 2024 – 08 February 2025)		MSG-3 satellite	MTG-I1 satellite
Number of comparisons (NC)	ALL LAYERS (100-1000 hPa)	414774	1089246
Radiosounding wind speed (SPD, m/s)		17.24	20.09
Normalized Bias (NBIAS)		-0.05	-0.01
Normalized Root Mean Square Vector Difference (NRMSVD)		0.40	0.37
Number of comparisons (NC)	HIGH LAYER (100-400 hPa)	164645	597916
Radiosounding wind speed (SPD, m/s)		24.65	25.42
Normalized Bias (NBIAS)		-0.05	-0.02
Normalized Root Mean Square Vector Difference (NRMSVD)		0.33	0.33
Number of comparisons (NC)	MEDIUM LAYER (400-700 hPa)	106835	262297
Radiosounding wind speed (SPD, m/s)		15.87	16.96
Normalized Bias (NBIAS)		-0.01	+0.02
Normalized Root Mean Square Vector Difference (NRMSVD)		0.42	0.40
Number of comparisons (NC)	LOW LAYER (700-1000 hPa)	143294	229033
Radiosounding wind speed (SPD, m/s)		9.73	9.80
Normalized Bias (NBIAS)		-0.09	-0.02
Normalized Root Mean Square Vector Difference (NRMSVD)		0.52	0.52

Summary of Validation statistics for NWC/GEO-HRW v7.0, related to the Operative thresholds defined in the NWCSAF Product Requirement Table (against Radiosounding winds)	High Layer NRMSVD	Medium Layer NRMSVD	Low Layer NRMSVD
NWC/GEO-HRW v7.0, Default configuration, MSG	0.33	0.42	0.52
NWC/GEO-HRW v7.0, Default configuration, MTG-I	0.33	0.40	0.52
NWC/GEO-HRW v7.0, Default configuration, Himawari-8/9	0.31	0.44	0.54
NWC/GEO-HRW v7.0, Default configuration, GOES-R	0.33	0.43	0.49
NWC/GEO-HRW Product Requirement Table Optimal Accuracy	0.30	0.40	0.45
NWC/GEO-HRW Product Requirement Table Target Accuracy	0.36	0.48	0.54
NWC/GEO-HRW Product Requirement Table Threshold Accuracy	0.42	0.56	0.63

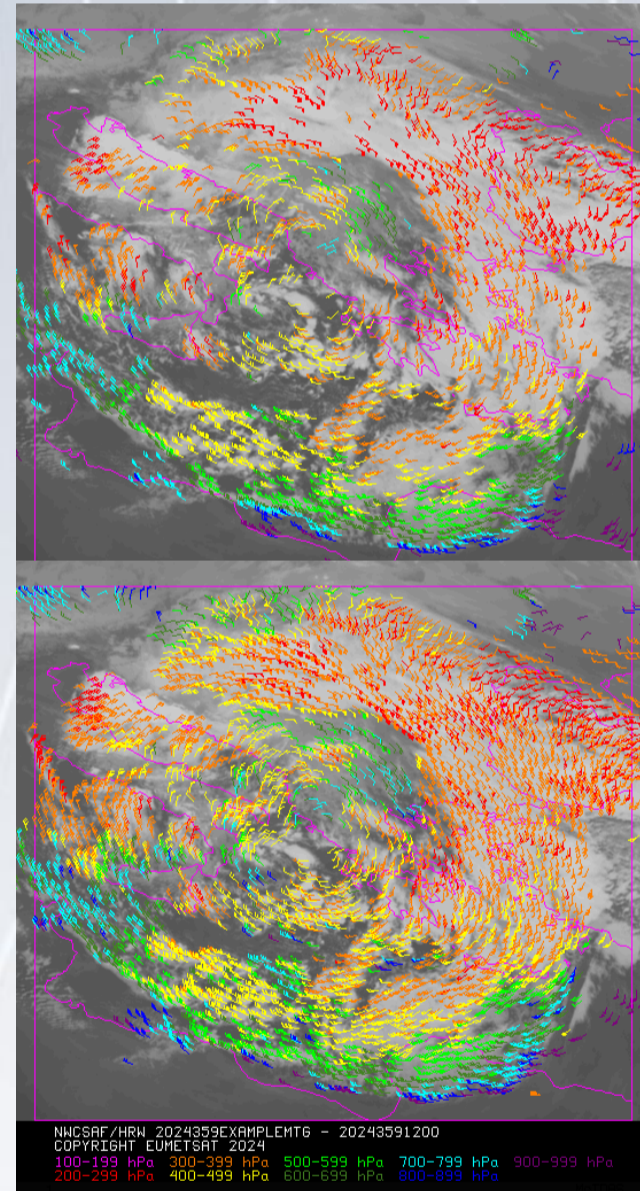
Some examples of MSG AMVs (up) vs MTG-I AMVs (down):



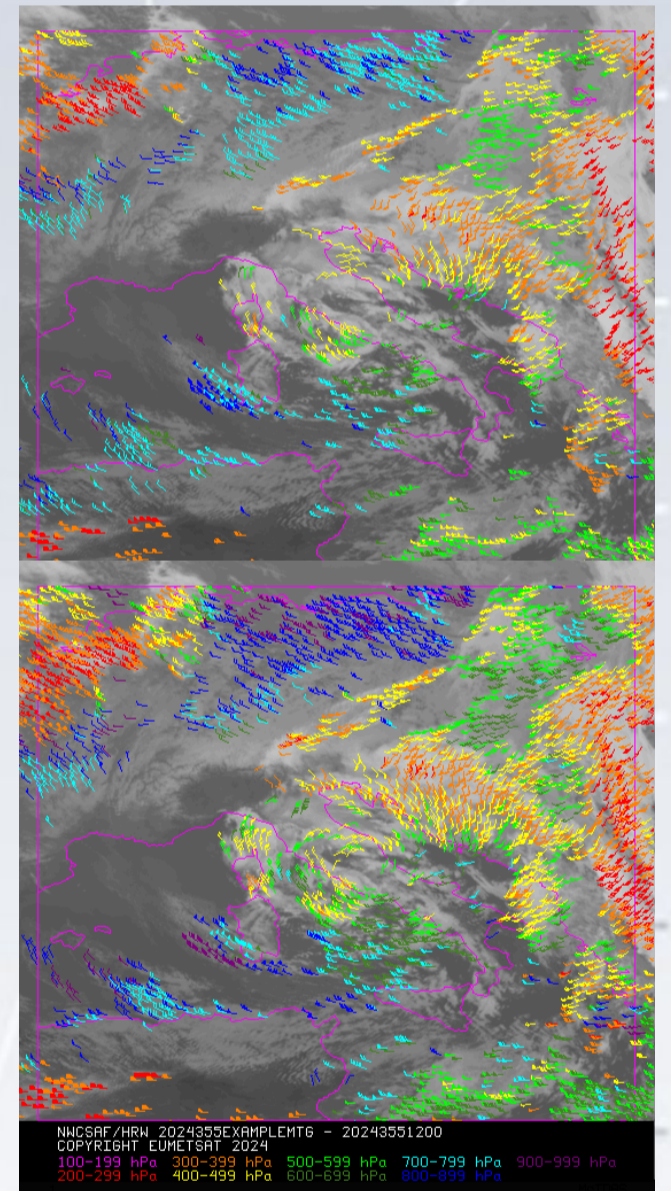
06 December 2024 1200Z
Eastern Europe



07 December 2024 1200Z
Western Europe



24 December 2024 1200Z
Southeastern Europe



20 December 2024 1200Z, Italy
(Main difference: low-level AMVs frequently at a lower level for MTG-I, related to better validation statistics)

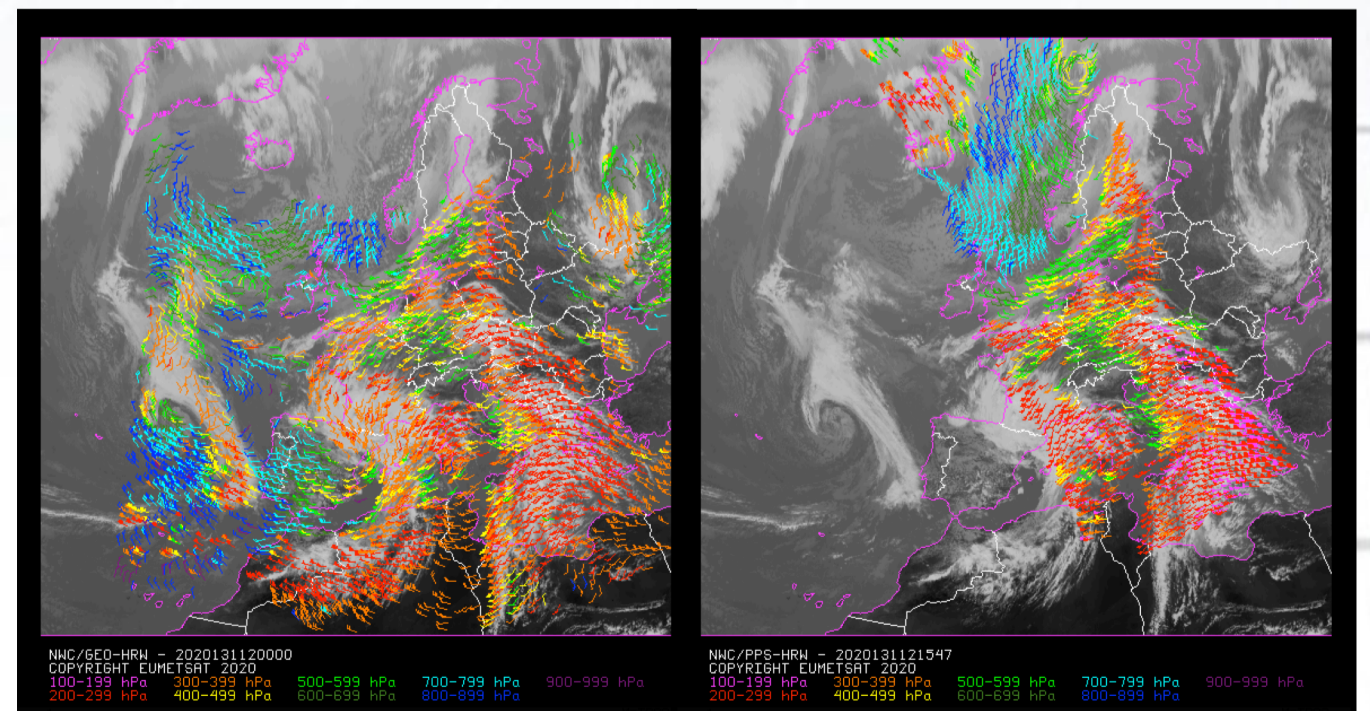
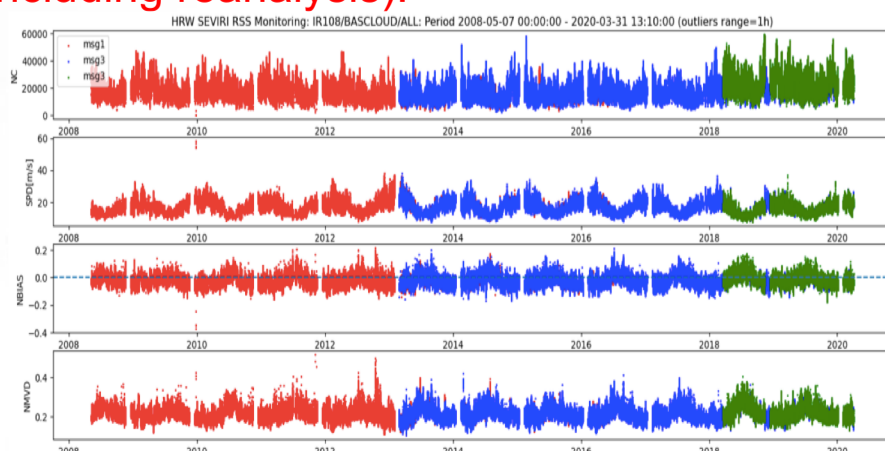
Additionally, NWC/PPS-HRW provides “Atmospheric Motion Vectors (AMVs)” for 16 polar satellites (projected to static regions of different resolutions) with the same algorithm: 90% code equivalent for both implementations

- Using AVHRR-3, VIIRS, MODIS, MERSI-2 and SLSTR radiometers
- Latest version available: [NWC/PPS-HRW v2021.3](#) since March 2023.

With both options (NWC-GEO/HRW & NWC/PPS-HRW), AMVs obtained in all corners of the world, very useful for:

- NWP assimilation in global models (including reanalysis).
- Climatic studies:

EUMETSAT has prepared for this for example a “Climatic Data Record (CDR)” of 2008-2020 NWC/GEO-HRW AMVs with MSG Rapid Scan data.



Comparison for the same moment (10 May 2020 1200Z) of NWC/GEO-HRW & NWC/PPS-HRW (polar satellite AMVs with similar densities & statistics: NRMSVD = 0.38 for high; 0.43 for medium; 0.40 for low level)