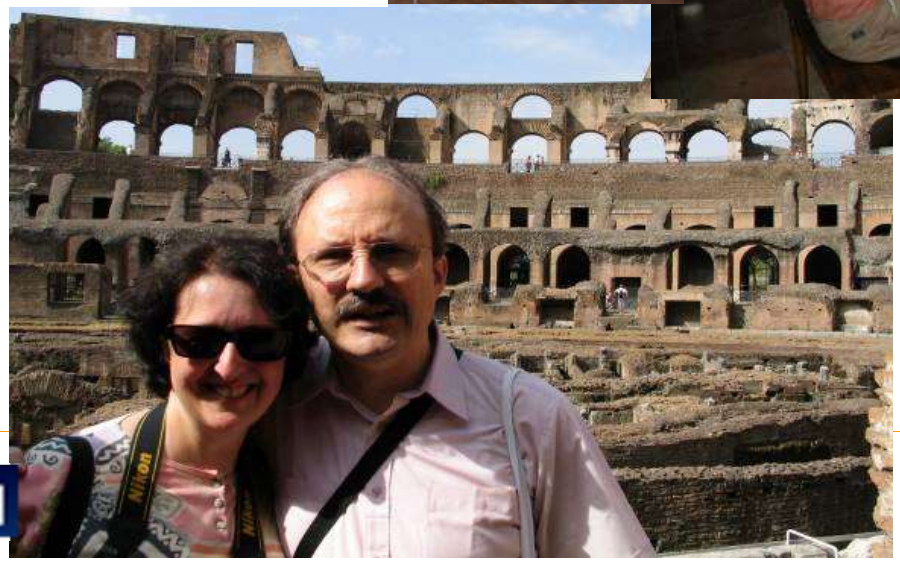
Wilfried Jacobs (DWD):
Basics of Water vapour channels in satellite products

Opening (Dean), Source: K. Dahnelt (DWD)



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Basics of water vapour channels in satellite products

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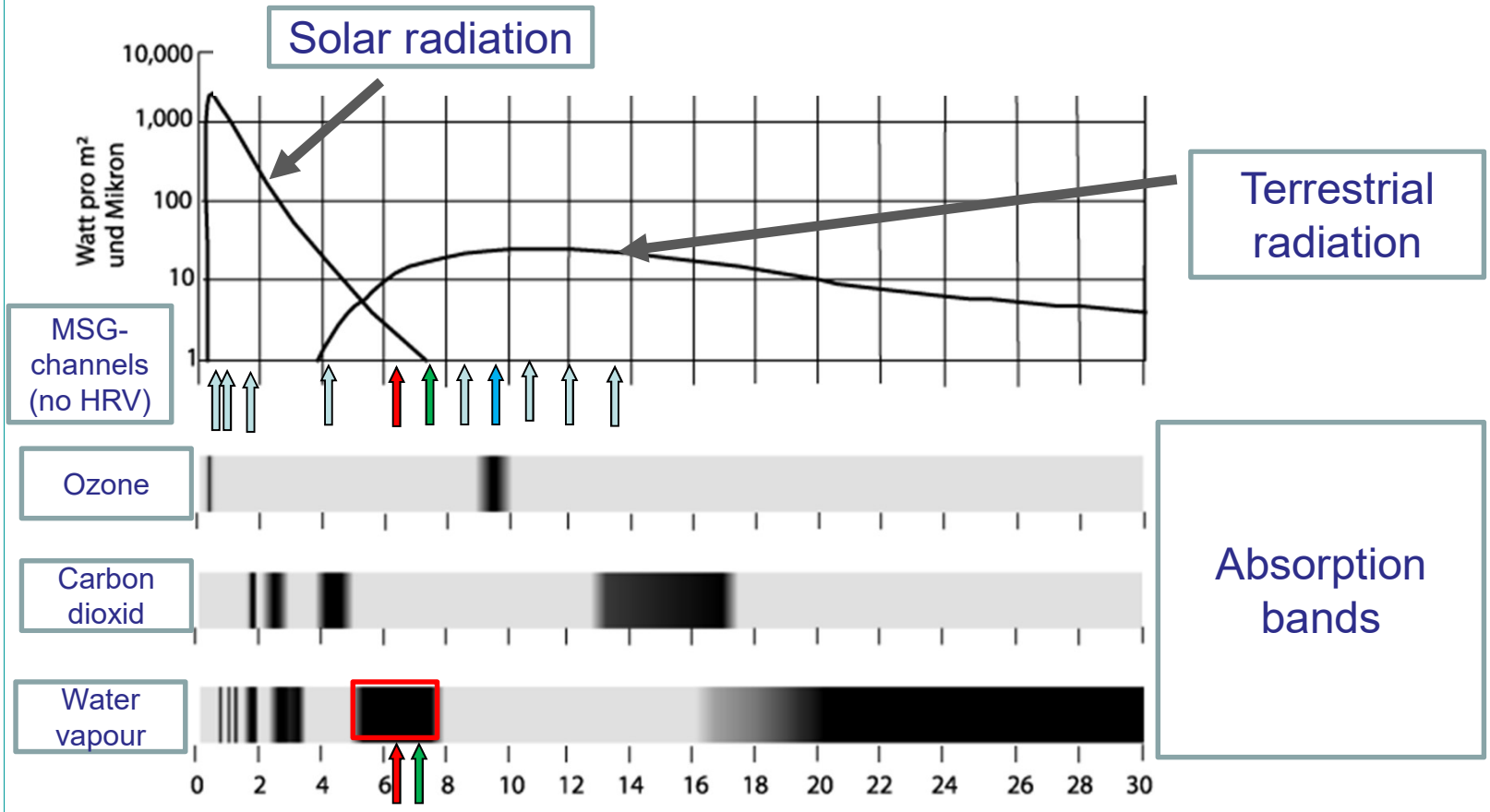
1. Briefly physical background
2. WV-products (images WV 6.2, 7.3 µm, Air mass RGB)
   - Examples
   - Diagnostic
     - Jets
     - Potential vorticity
3. Q&A

Absorption bands – MSG-channels



WV 6.2 near absorption band's center → contribution from higher parts of atmosphere
WV 7.3 near the absorption band's edge → contribution from lower parts of atmosphere

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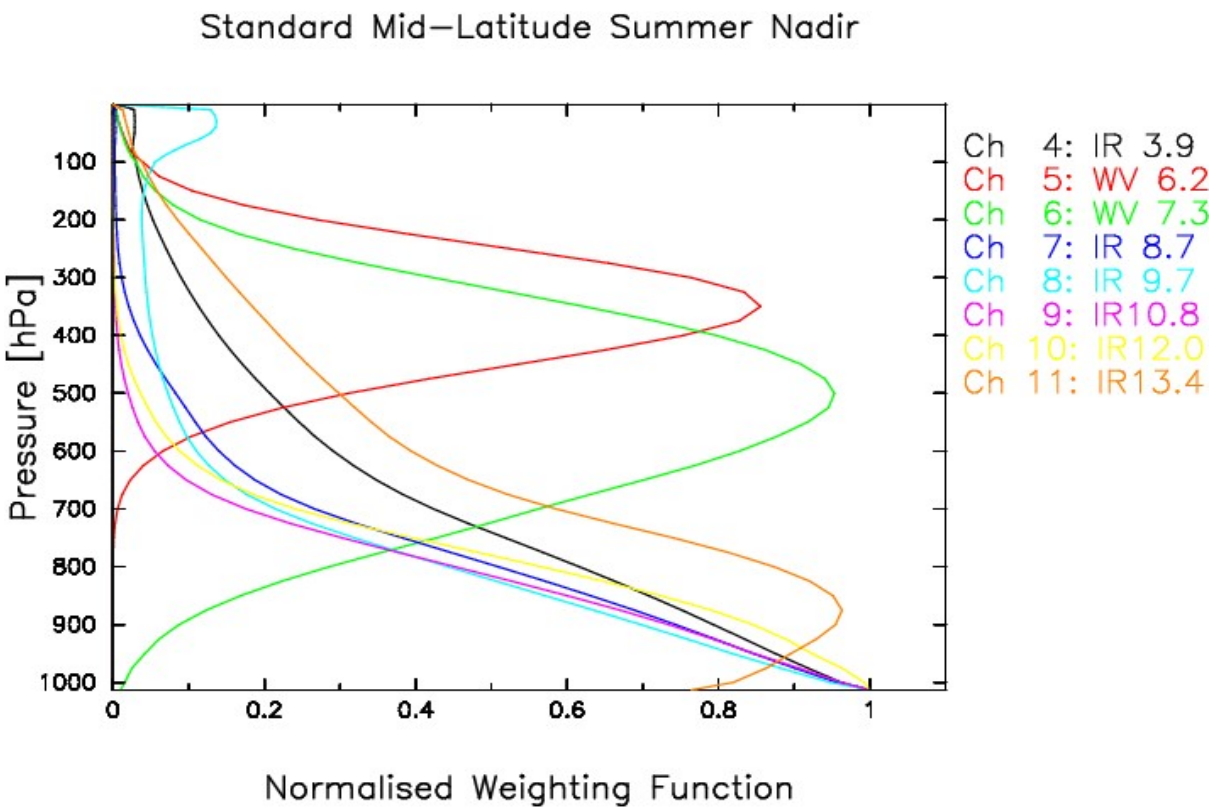
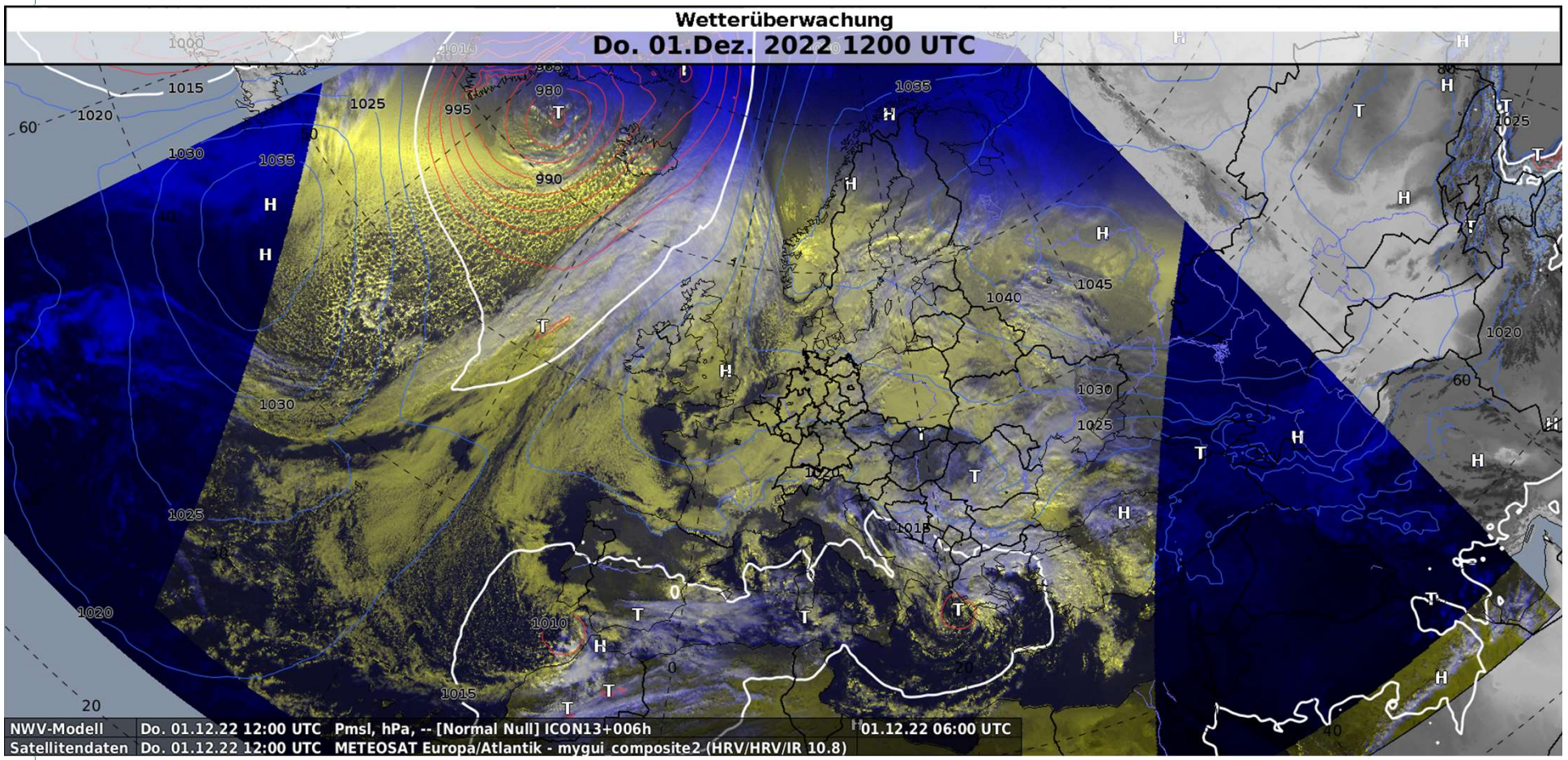
MSG-imager: Weighting functions



Examples

HRV-HRV-IR10.8 µm



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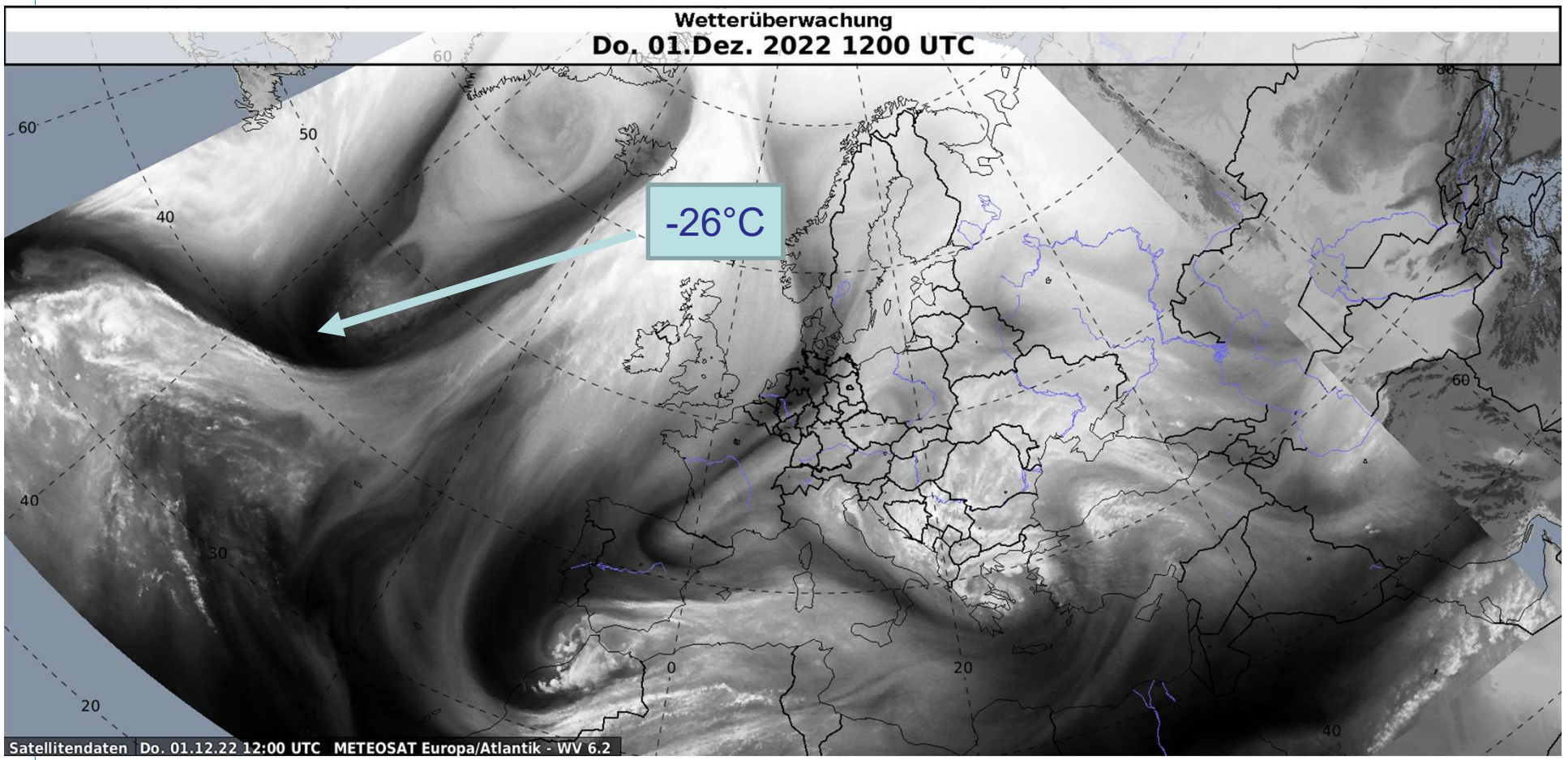
Water vapour (6.2 µm, enhanced)



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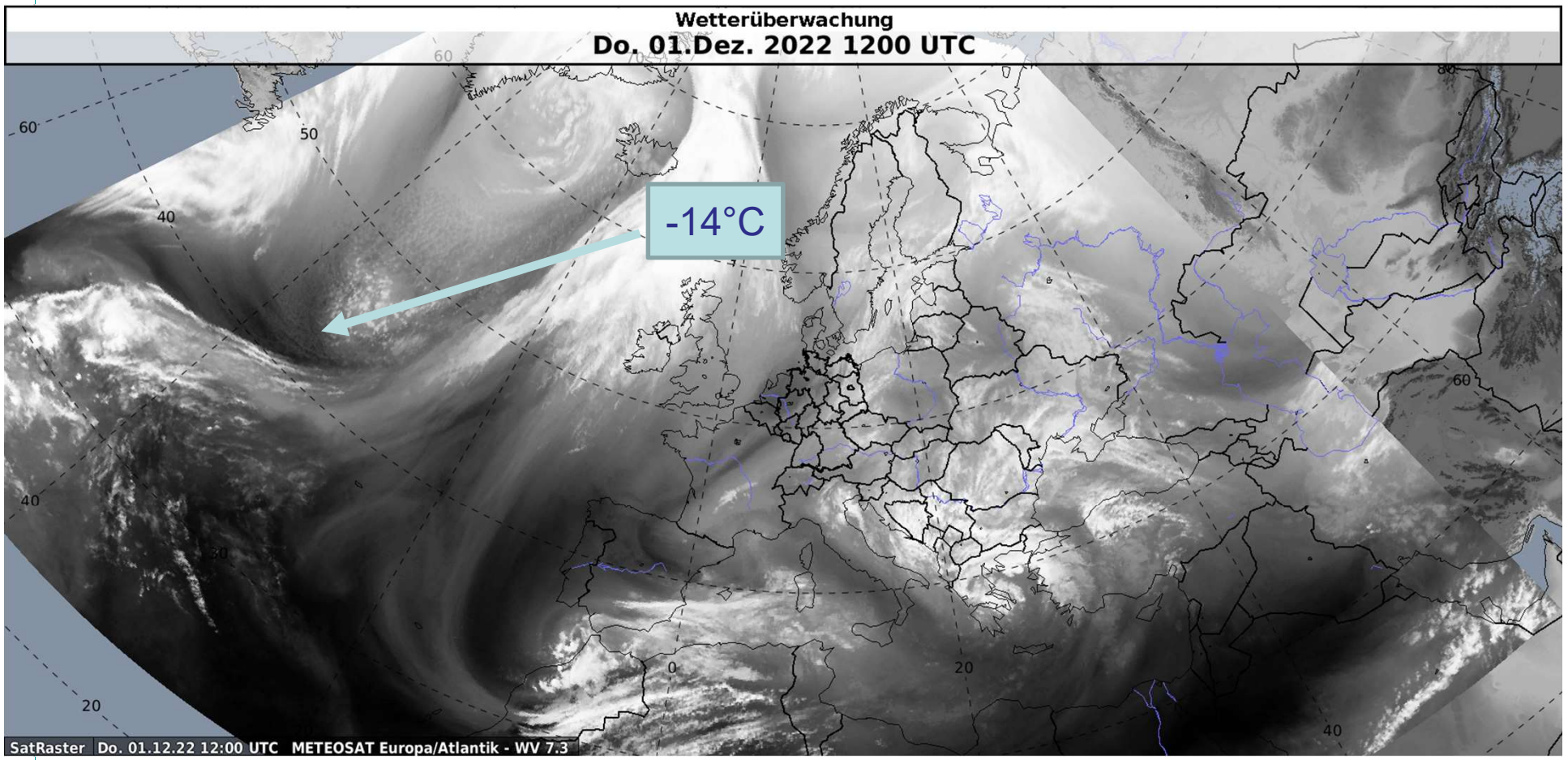
Water vapour (7.3 µm, enhanced)



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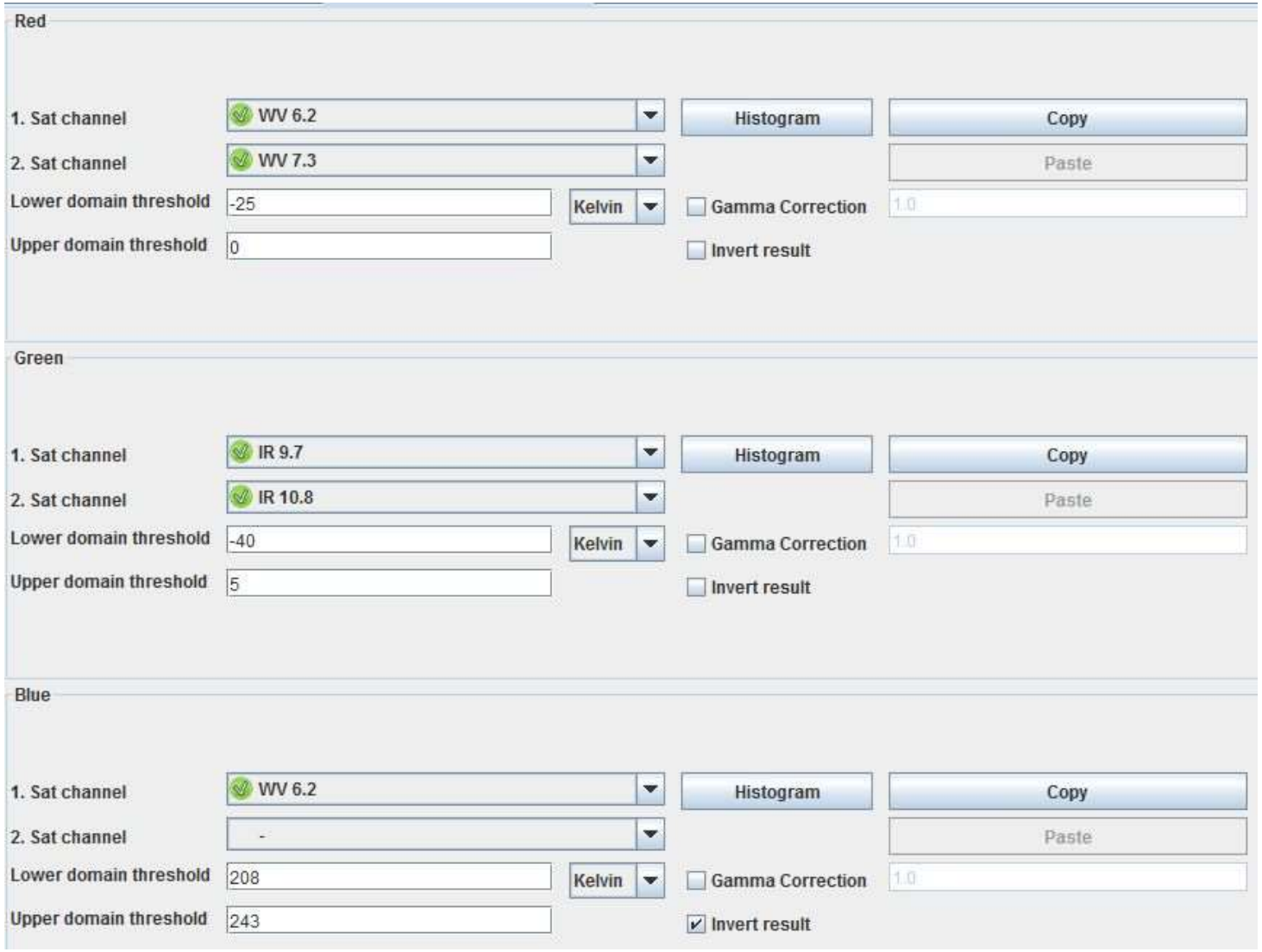
Air mass RGB: Definition



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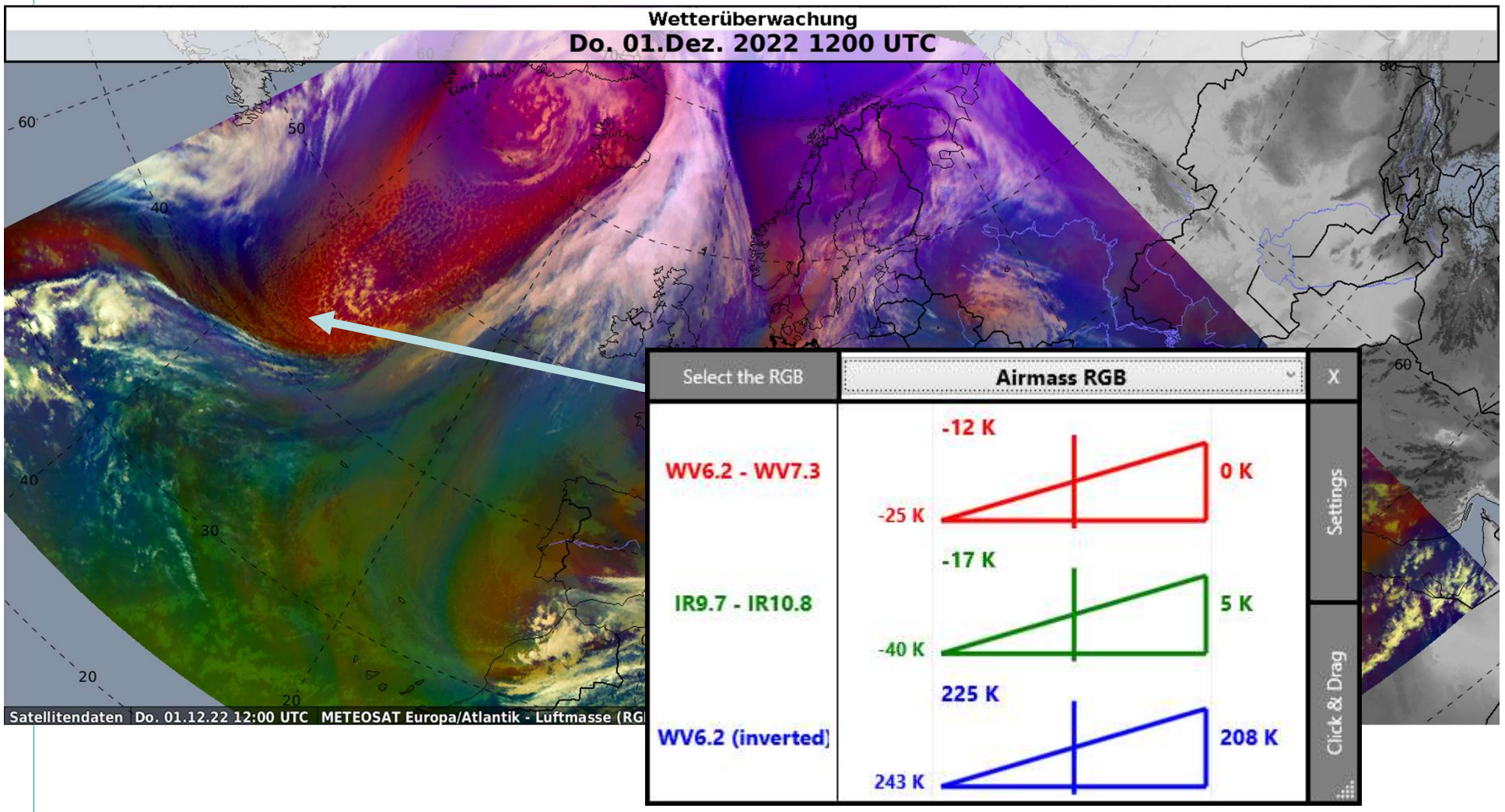
Water vapour (Air mass -RGB)



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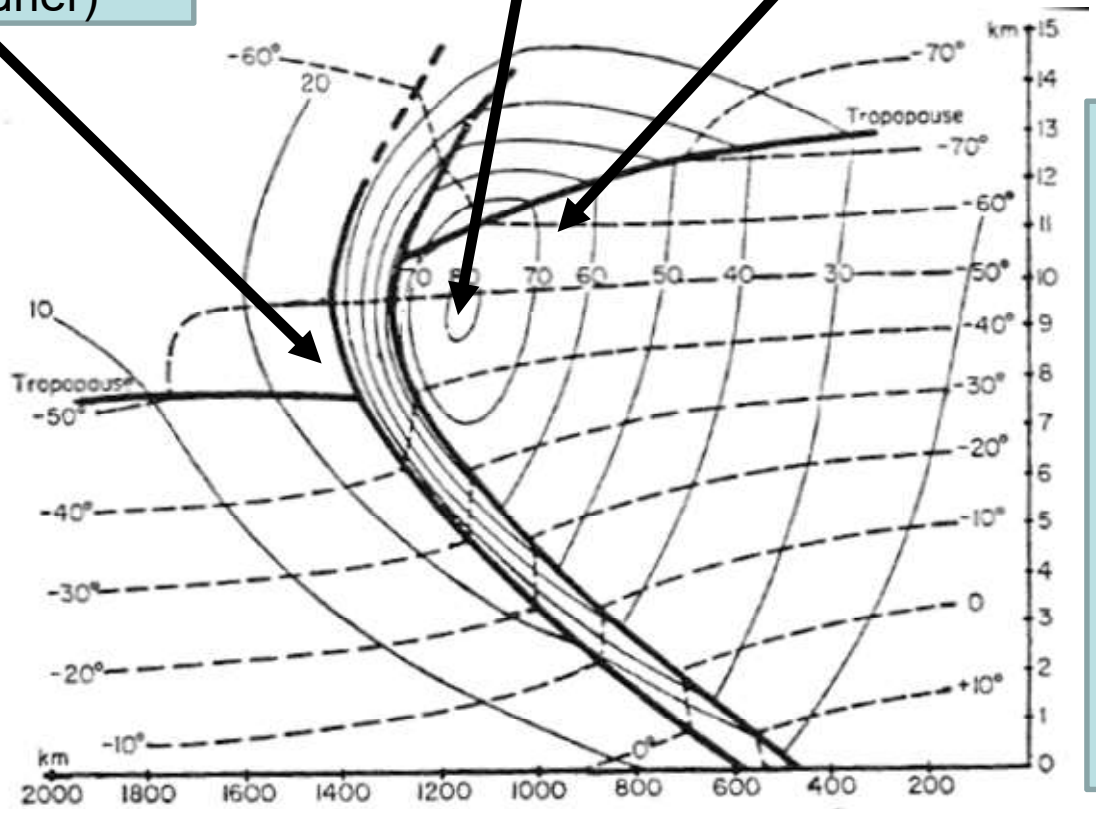
Model of polarfront (jet stream)

Jet stream‘s core

Thermal indirect circulation (no clouds, drier)

Thermal direct circulation (more clouds, humid)



Isotachs [m/s]
Isothermes [°C]

Source: Berggren, R.: The distribution of temperature and wind connected with active tropical air in the higher troposphere, and some remarks concerning clear air turbulence at high altitude. Tellus 4 (1952), S. 43-53

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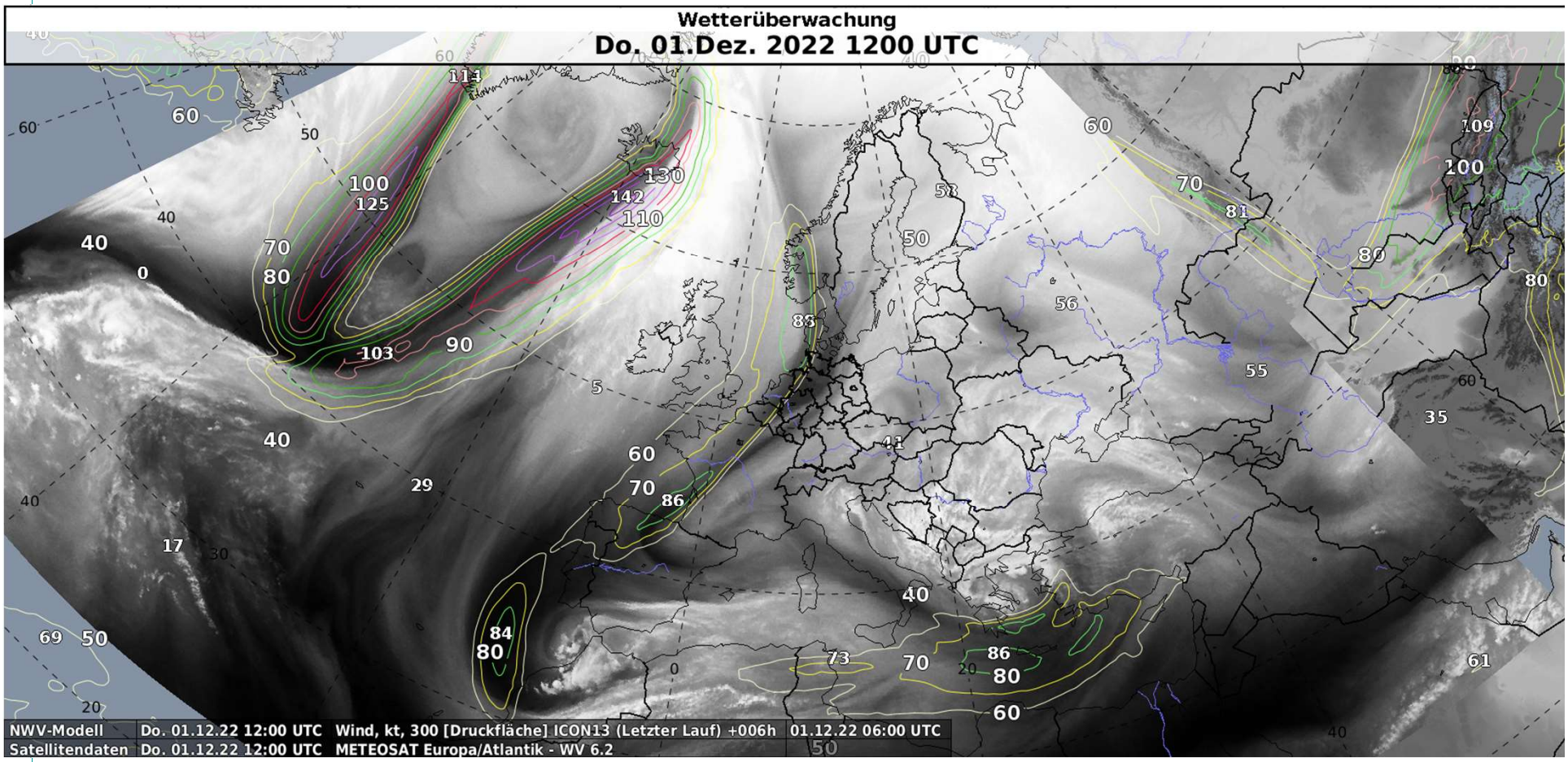
WV 6.2 µm – wind 300 hPa (ICON+6h)



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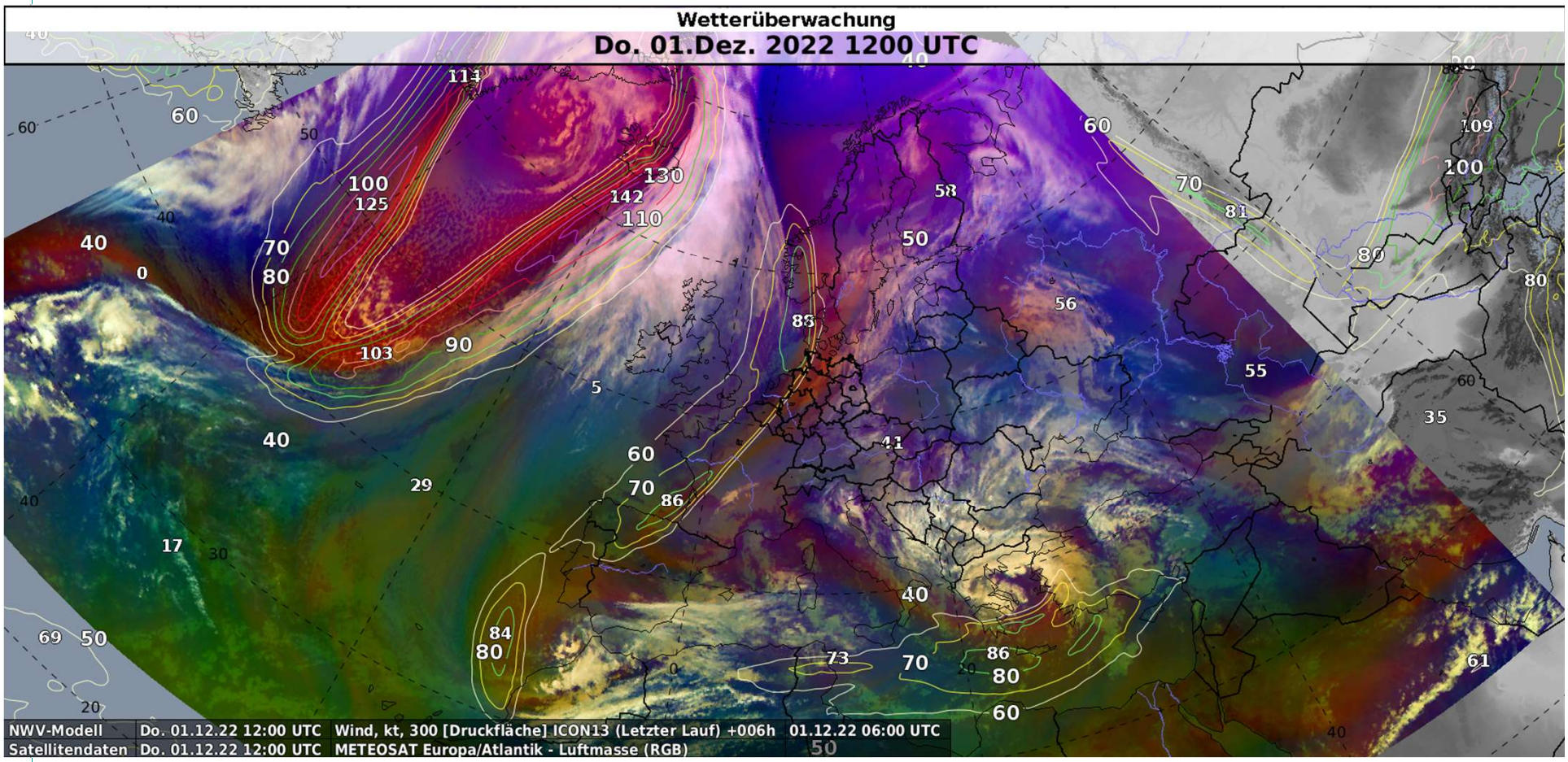
Airmass RGB – wind 300 hPa (ICON+6h)



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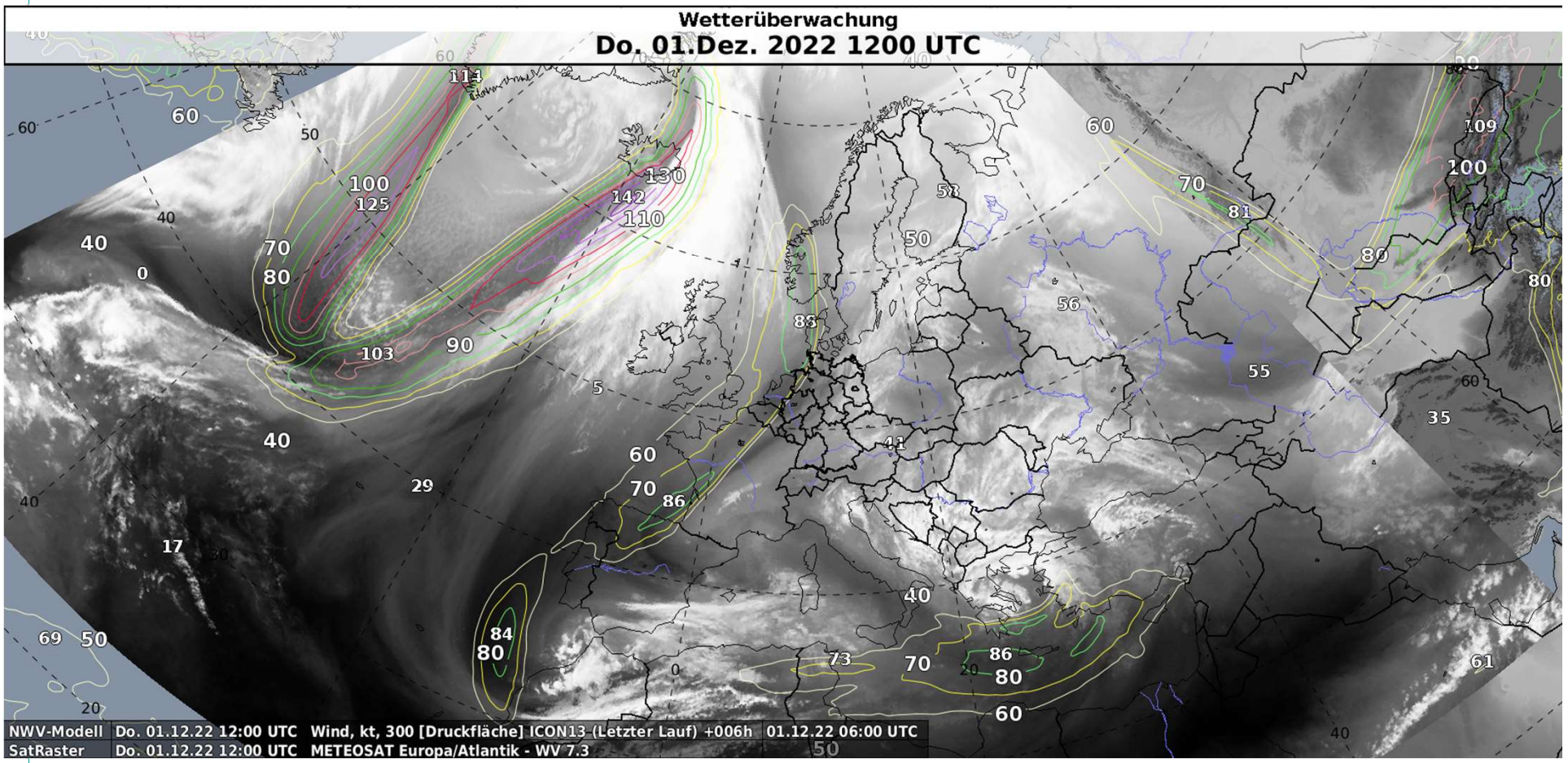
WV 7.3 µm – wind 300 hPa (ICON+6h)



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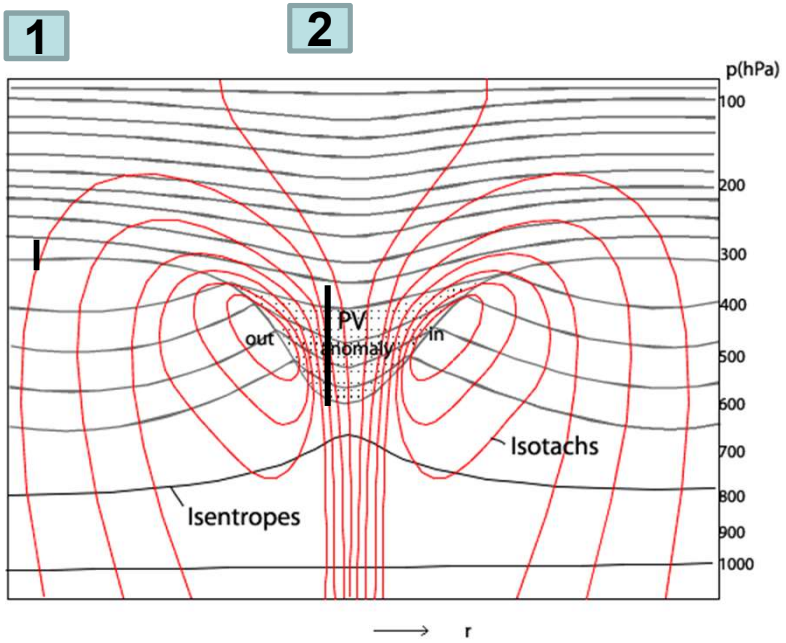
Diagnosis of potential vorticity (PV) DWD: PV along isentrope 310 K



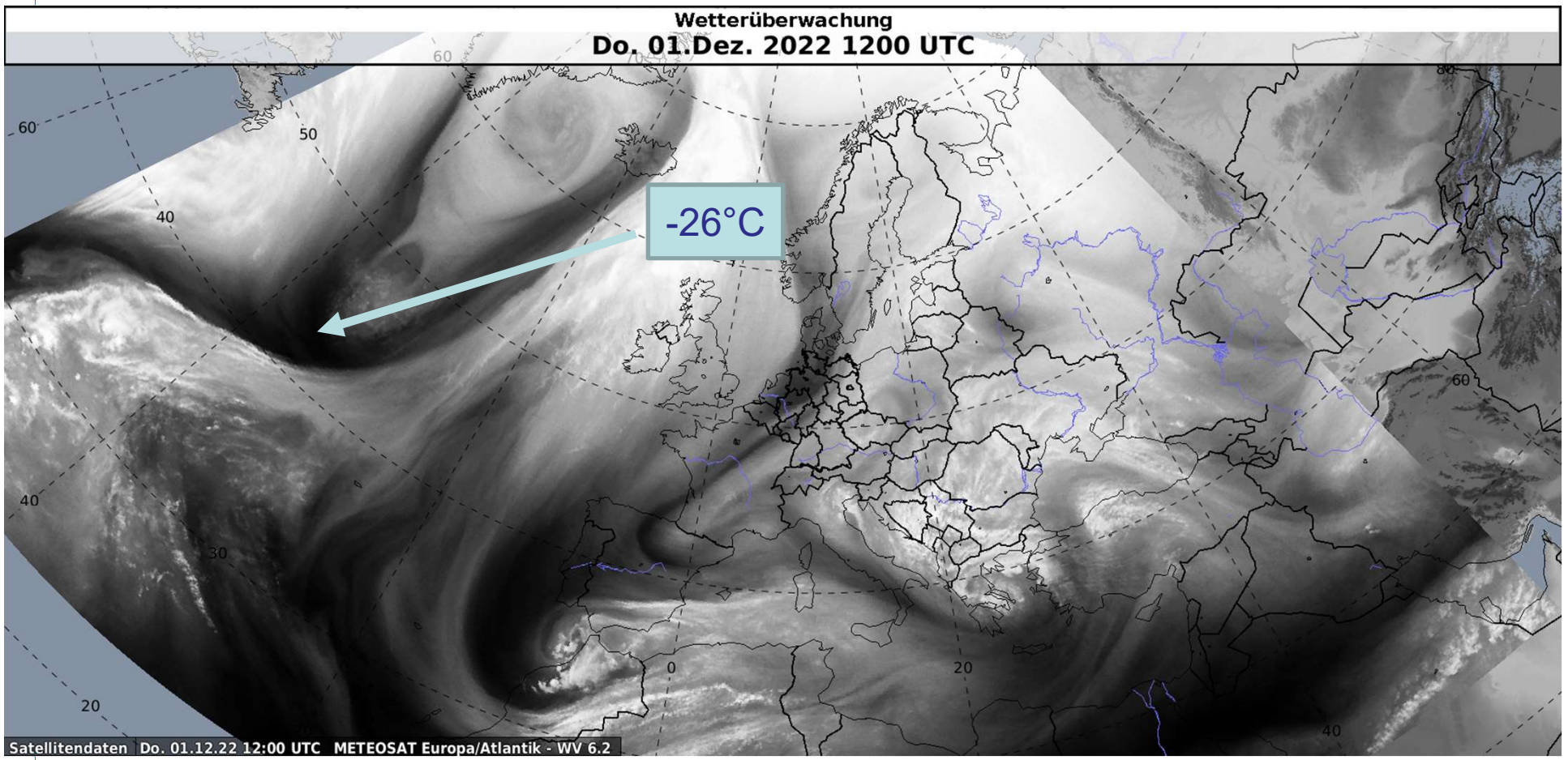
Streaming of air package in a PV anomaly:

1: low vertical extension and rather high humidity (cold in WV 6.2)

2: Aiabatic conditions can be assumed. Because air flows along isentropes the air package is stretched, mainly to lower heights yielding drier conditions and higher temperatures. The WV 6.2 image reveals higher temperatures and darker structures (air mass RGB violet to purple).

Stretching causes positiv vorticity with counter clockwise rotation (red curves) around the PV-maximum

Water vapour (6.2 µm, enhanced)



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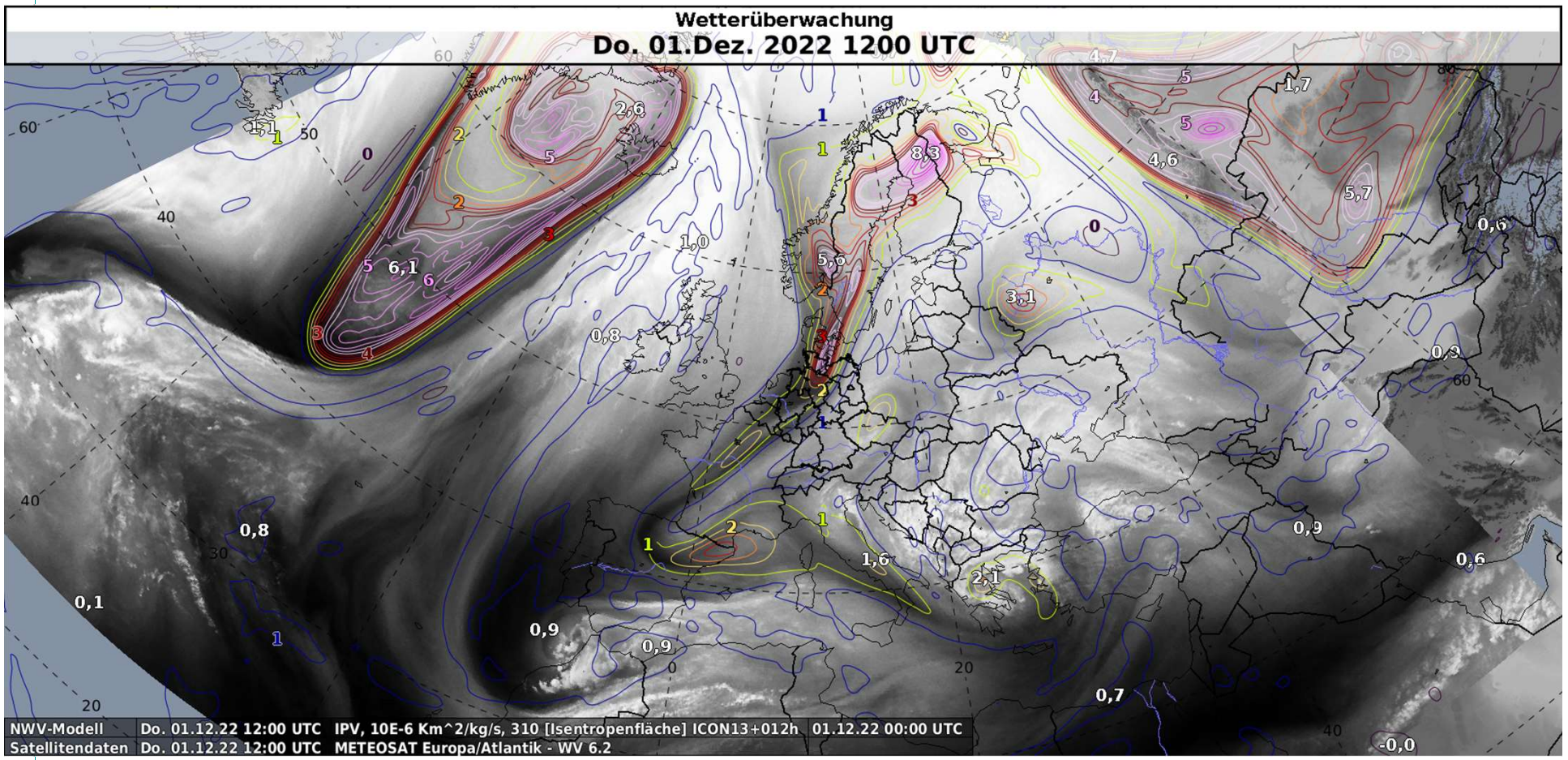
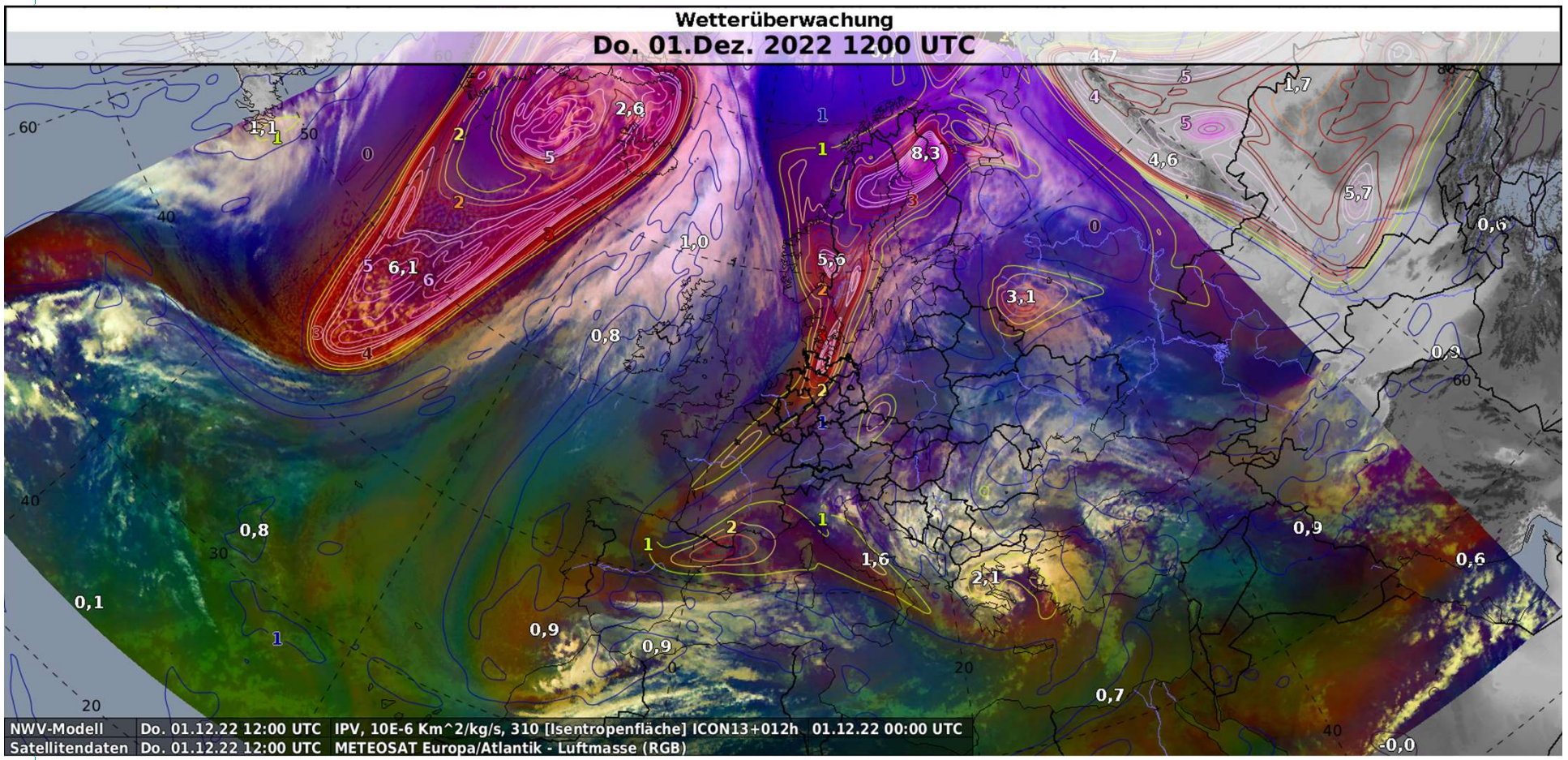
WV 6.2 µm – IPV 310 K (ICON)



Air mass RGB – IPV 310 K (ICON)



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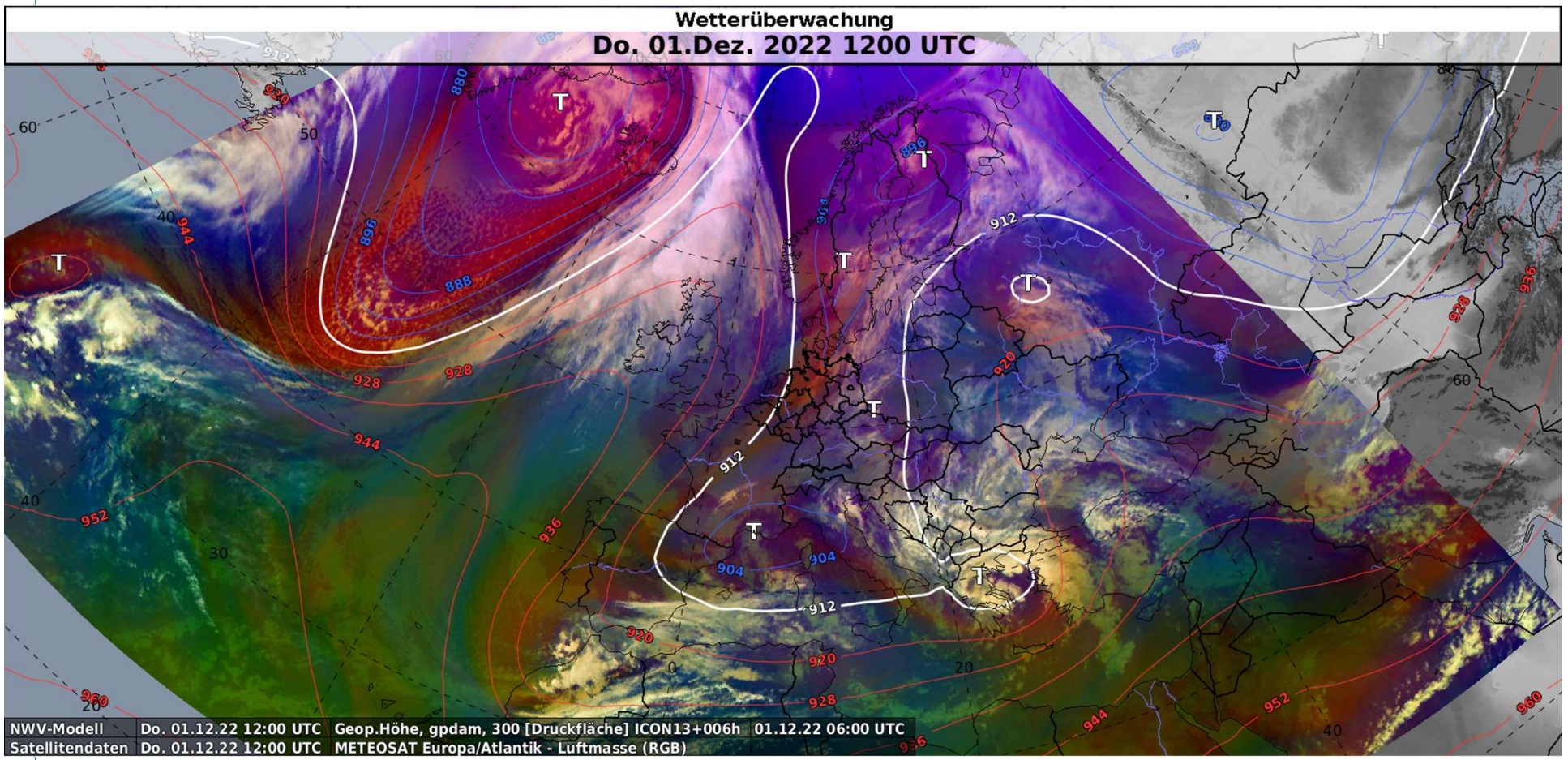
Air mass RGB – Geop 300 hPa (ICON)



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