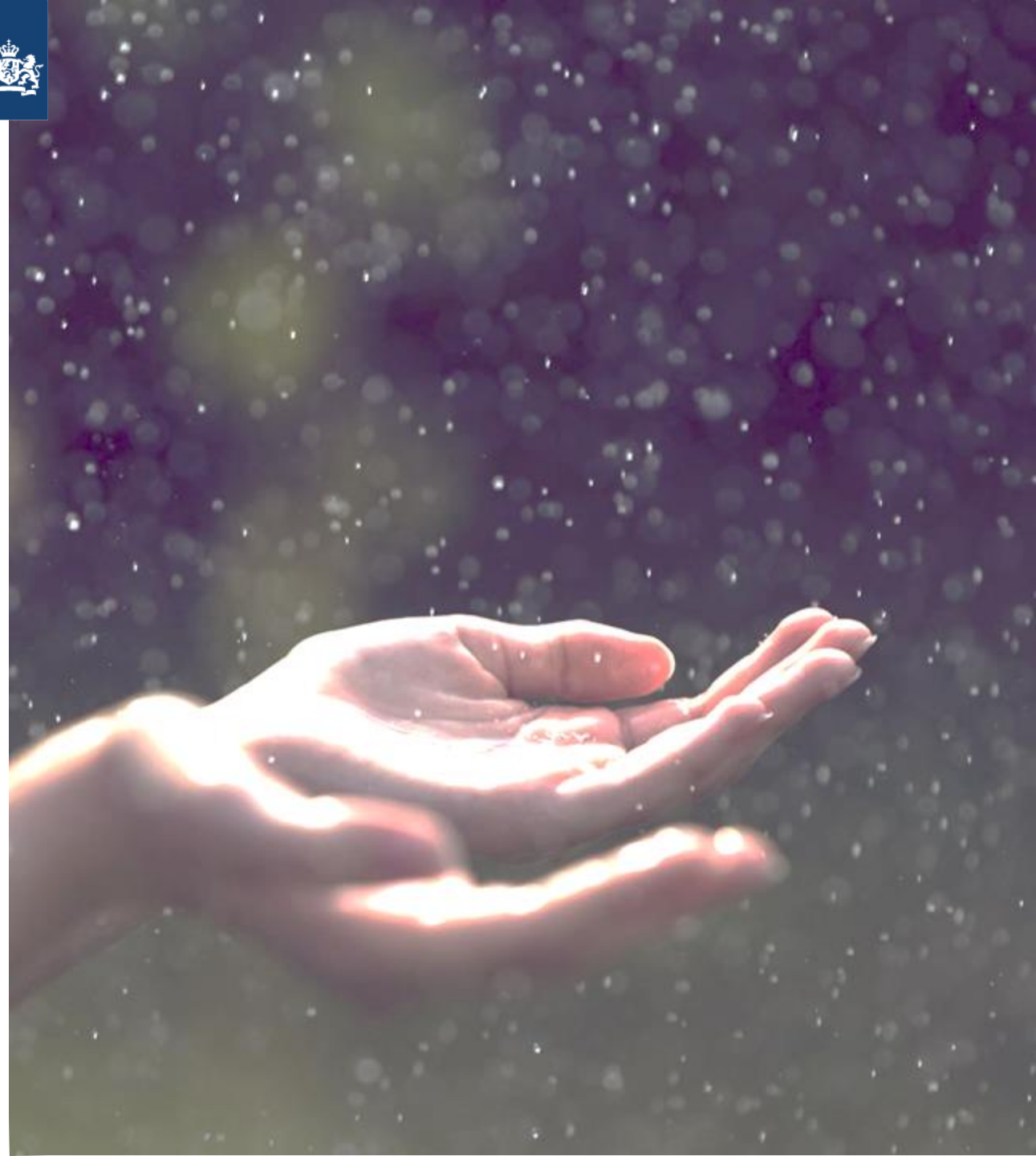
Koninklijk Nederlands
Meteorologisch Instituut
Ministerie van Infrastructuur en Waterstaat

International Radar Composite

KNMI Radar Team

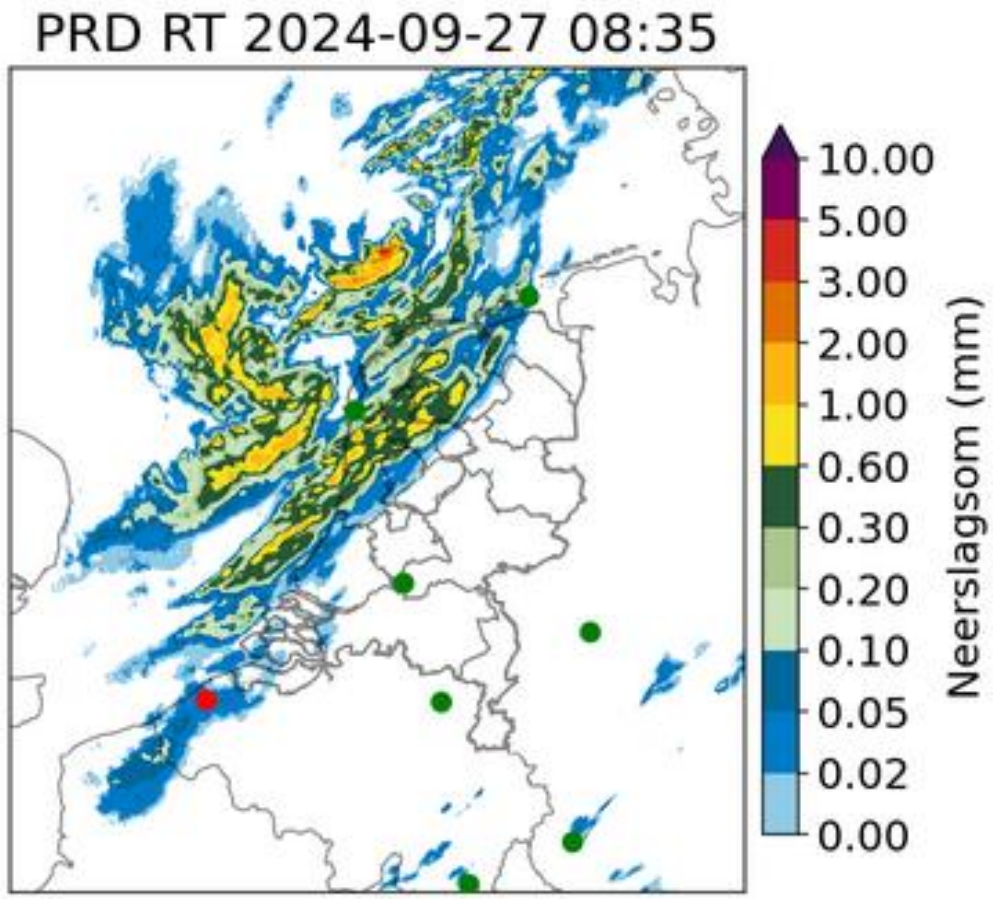
IRC
International Radar Composite

- Accurate, spatially coherent **quantitative precipitation estimates** with **high spatial and temporal resolution** *(1 km, 5 minutes)*
- Based on data from 8 radars and our automatic and manual rain gauge networks
- Key product used by water boards, KNMI weather room, Rijkswaterstaat and more



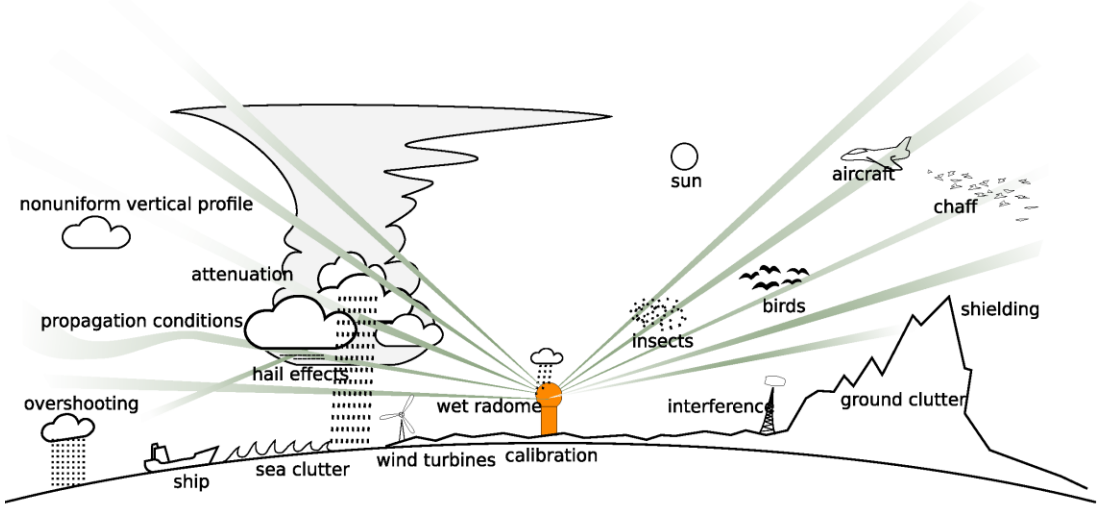
IRC radars

- 8 radars used in IRC
  - 2 Dutch radars
  - 3 Belgian radars
  - 3 German radars



IRC processing steps

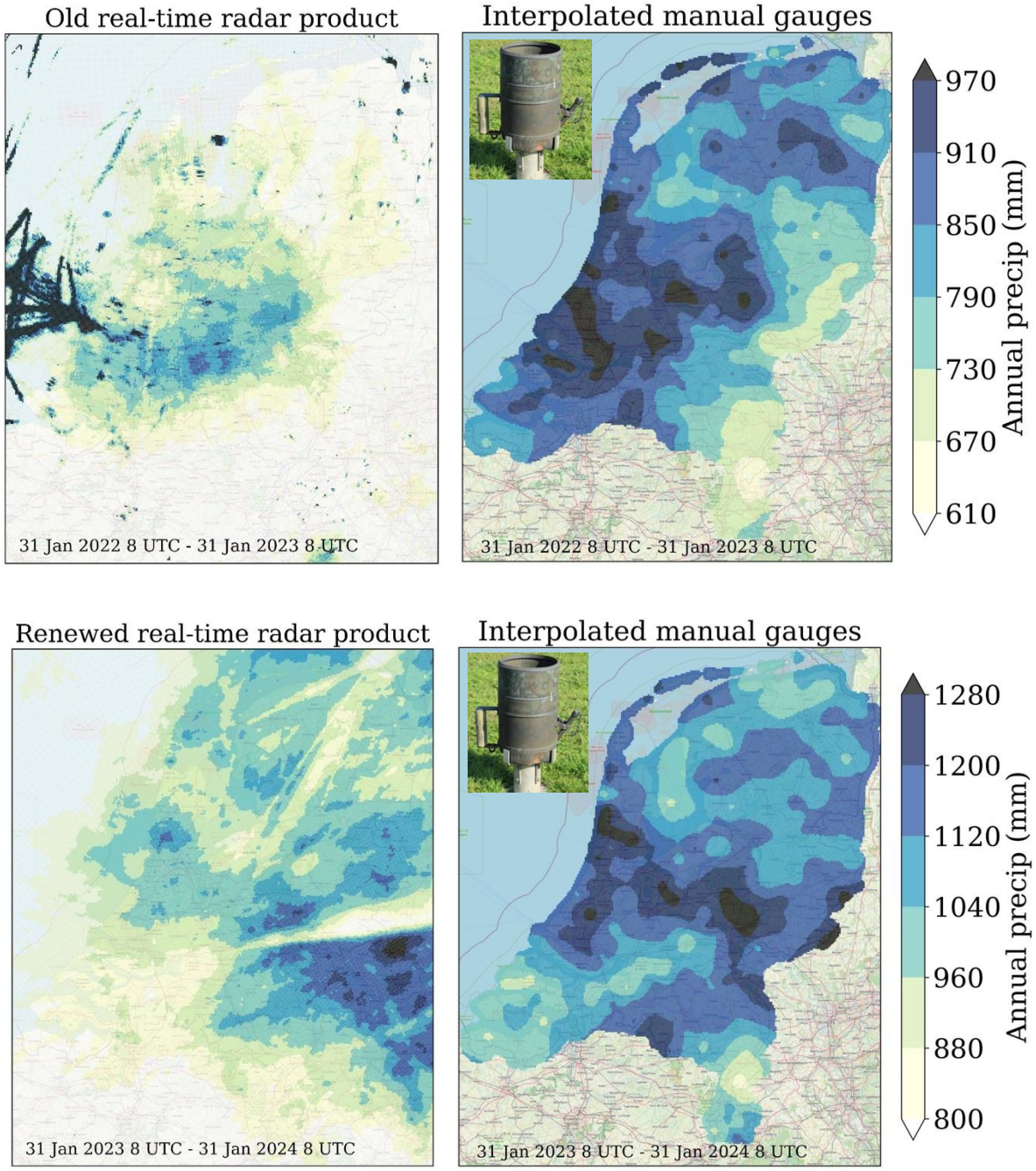
- Removal of non-meteorological echoes (fuzzy logic: https://doi.org/10.1175/JTECH-D-19-0149.1; Gabella clutter filter)
- Attenuation correction (via Kdp and Modified Kraemer: https://doi.org/10.1175/JTECH-D-20-0113.1)
- Vertical profile of reflectivity correction (https://doi.org/10.1002/jgrd.50726)
- Use of quality information for conversion to 2D data per radar, compositing of 2D data from radars & adjustment with rain gauge data
- Advection correction
- Spatial adjustment with rain gauge accumulations



(Markus Peura, Finnish Meteorological Institute)

IRC product validation

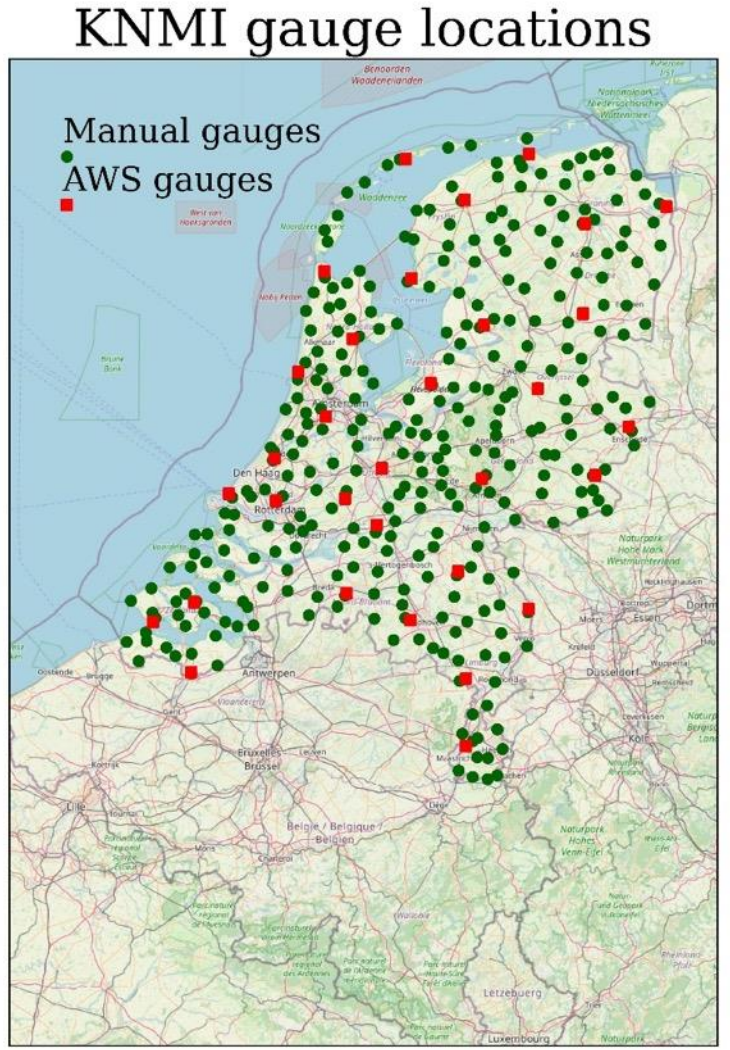
- Compared old QPE product (Feb 2022 – Jan 2023) to new QPE product (Feb 2023 – Jan 2024)
- Clutter removal (dual-pol) shows a huge quality increase
- Underestimates due to e.g. VPR and attenuation are much less severe
- Effects of severe beam blockage are apparent and require attention



IRC rain gauge adjustments

5-minute accumulations:

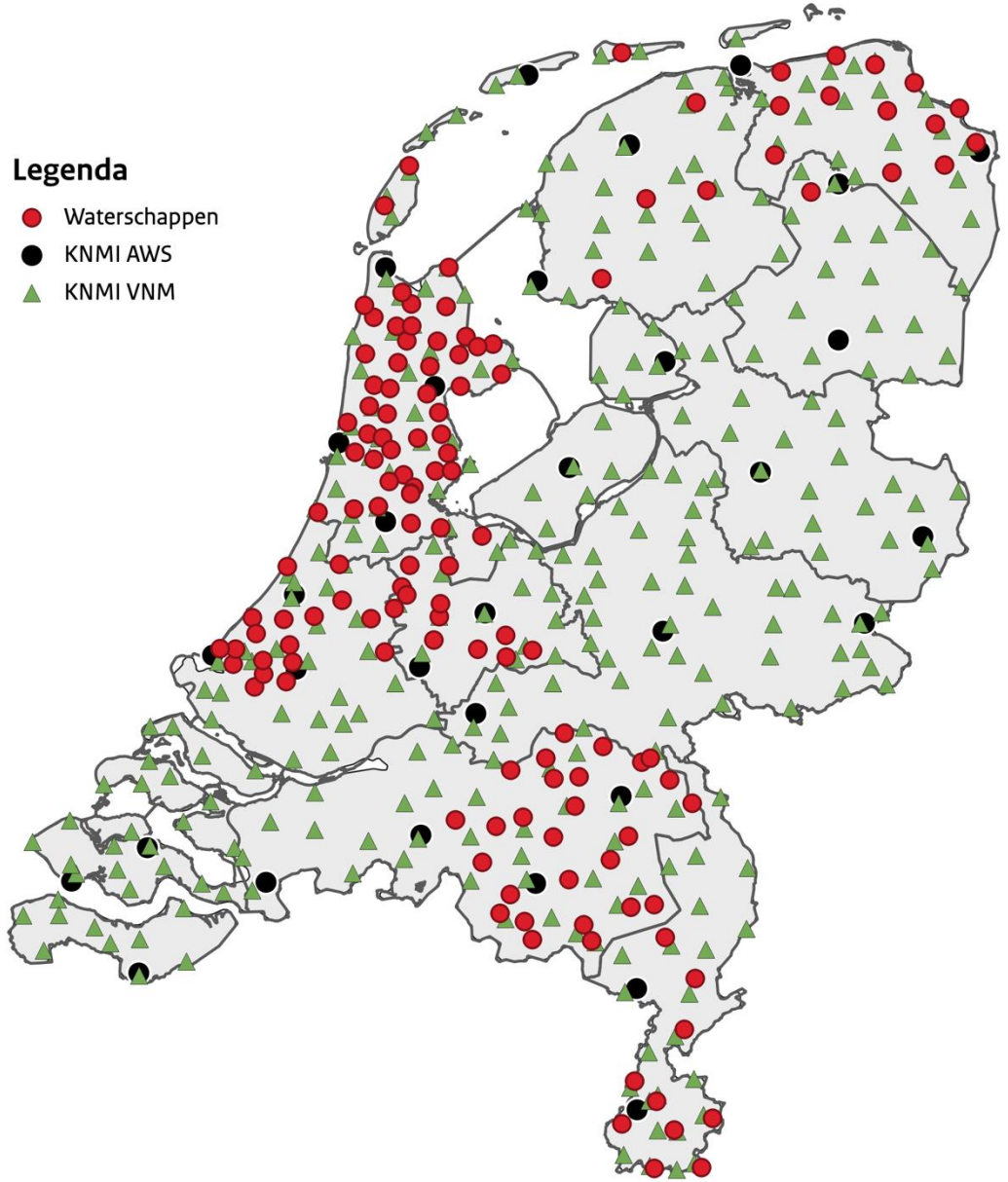
- **Real-time** (RTCOR; every 5 minutes). Adjusted with KNMI automatic 1-h rain gauge accumulations (32 locations) from a recent clock-hour.
- **Early reanalysis** (RECOR). ~14:30 UTC each day. RTCOR adjusted with daily accumulations from KNMI manual gauges (~200 locations) from that 8-8 UTC period.
- **Final reanalysis** (RFCOR). After a few weeks adjustment of RTCOR with daily accumulations from validated & complete KNMI manual gauges (~319 locations) from that 8-8 UTC period.



Rain gauges from Dutch waterboards

Only 32 KNMI rain gauges in real time

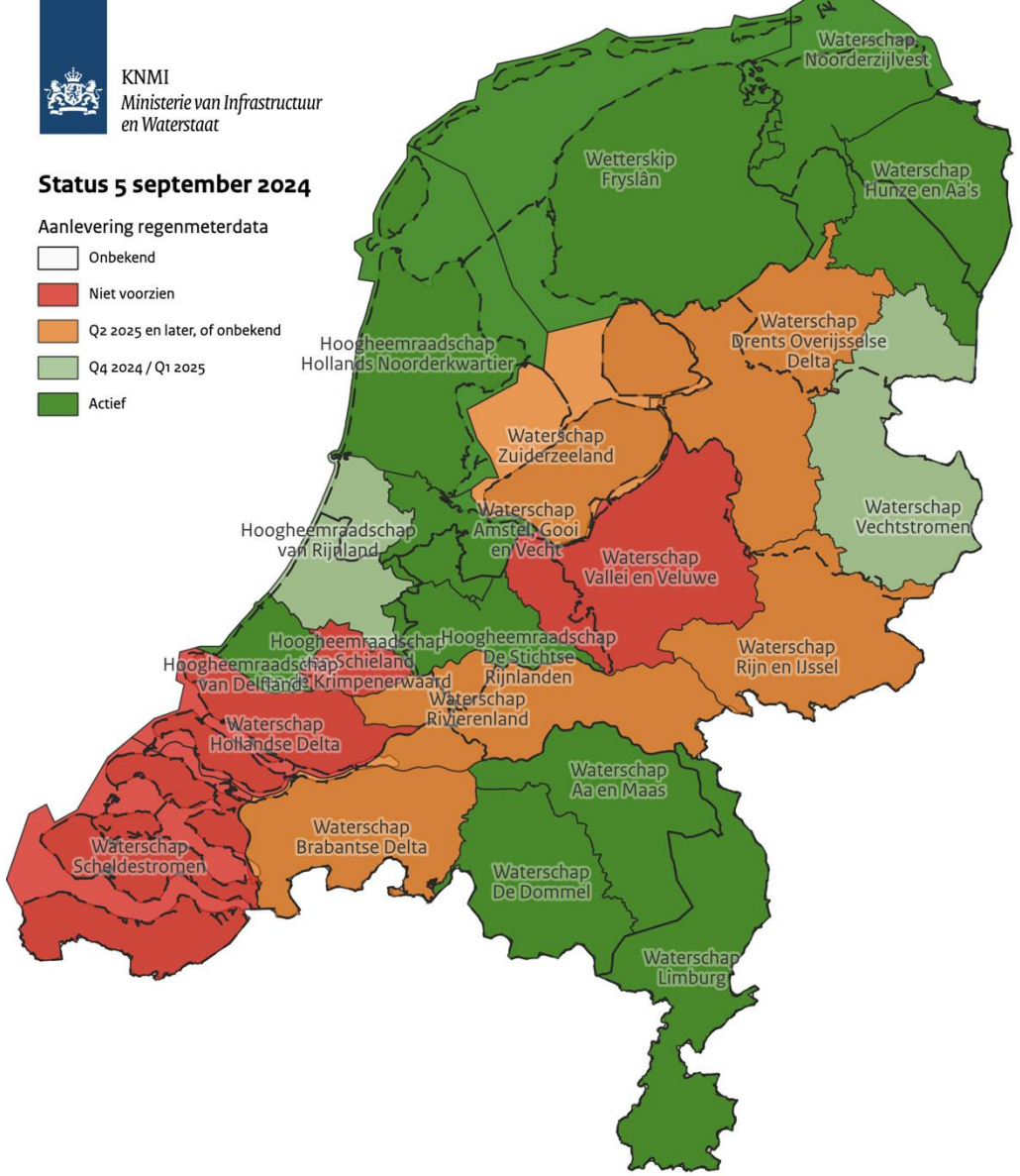
- But **~140 rain gauges of water boards**
- KNMI performs quality control
  - Flag improbable values
  - 2 basic algorithms currently applied
  - 3rd algorithm planned to be implemented this year



Rain gauges from Dutch waterboards

Use this data in IRC

- Use all data that is
  - Not flagged
  - In time
- Start testing in coming weeks



Timeliness: (KNMI gauges within 10 min)	10 min	15 min	30 min	45 min
	55%	96%	99%	100%

What's next?

Combined research and development effort

- Research
  - Other radar data to precipitation algorithms
  - Better beam blockage correction
  - Improve rain gauge correction
- Development
  - Support research!
  - Setup continuous real time evaluation
  - Collect rain gauge data from BE/DE