

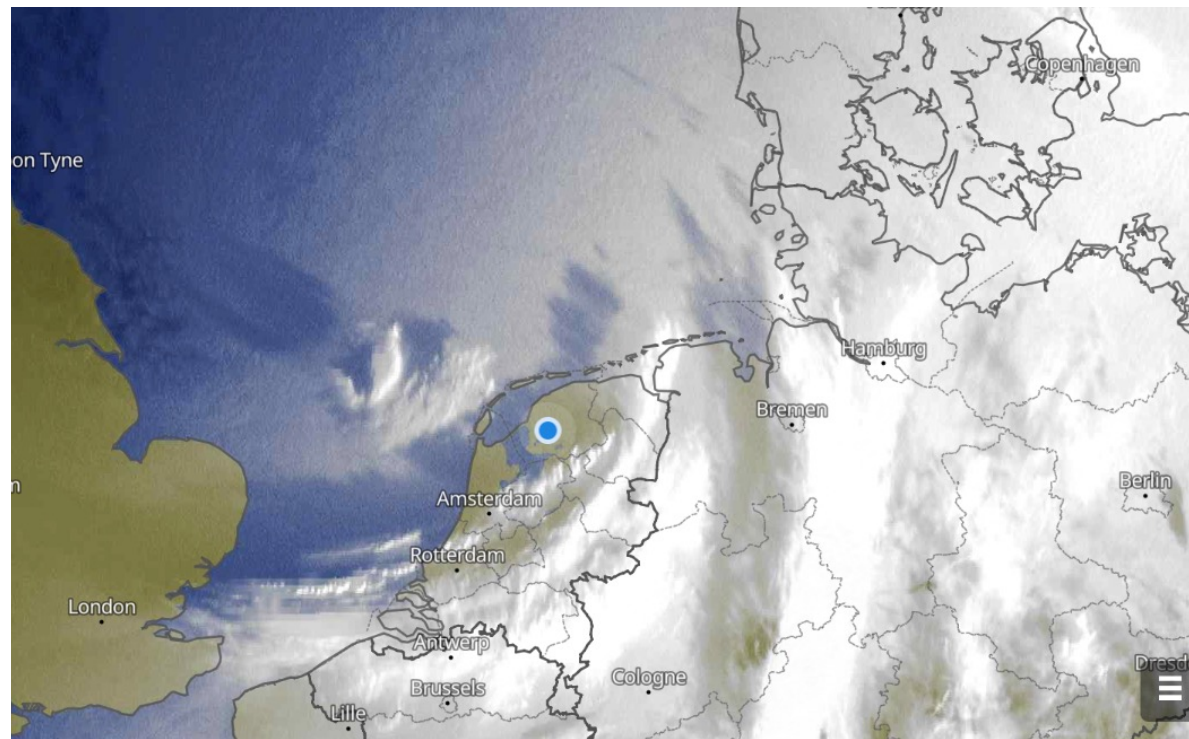
# Het weerbericht in je broekzak

---

Tamme van der Wal

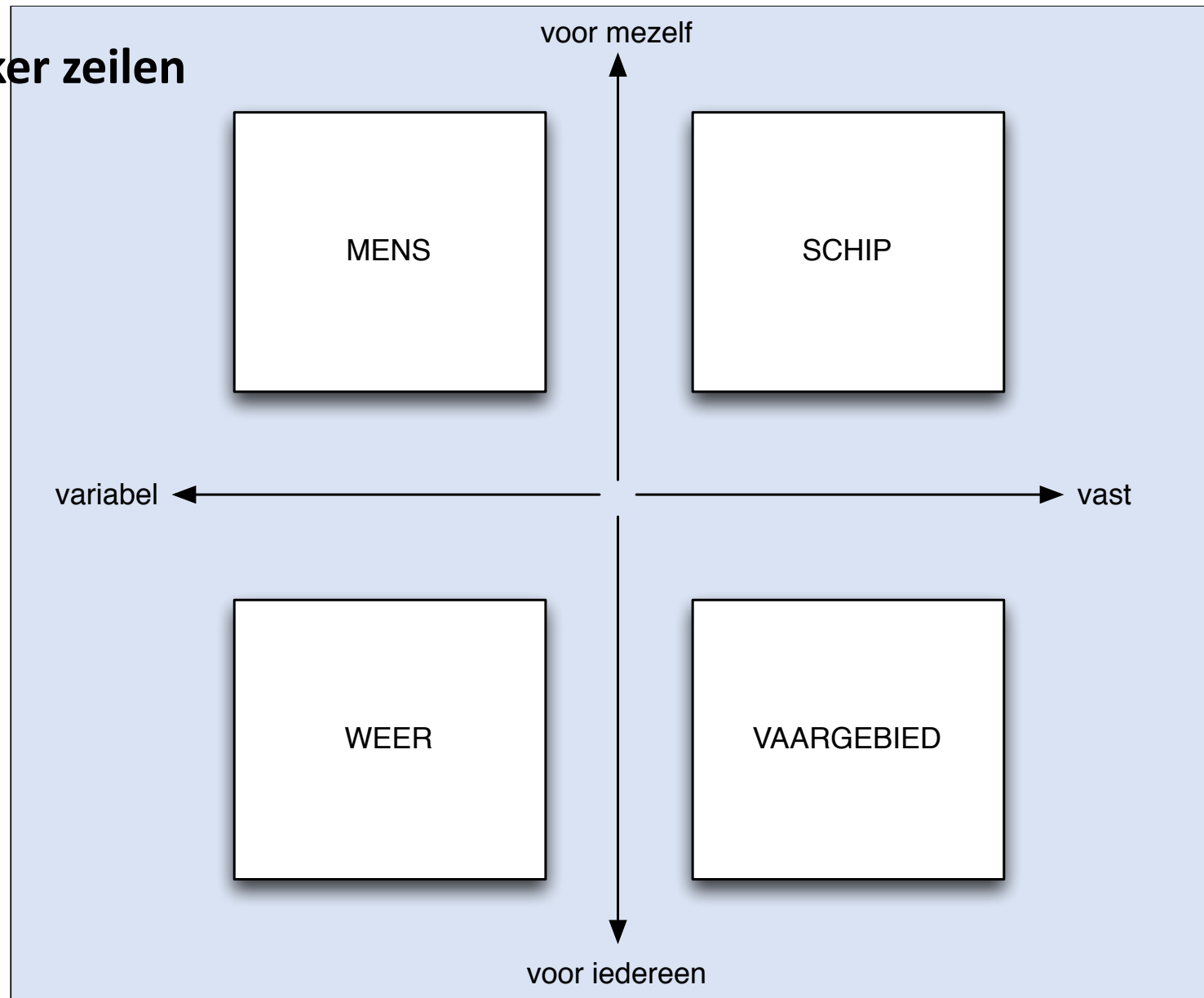
12 februari 2025

Flevomare

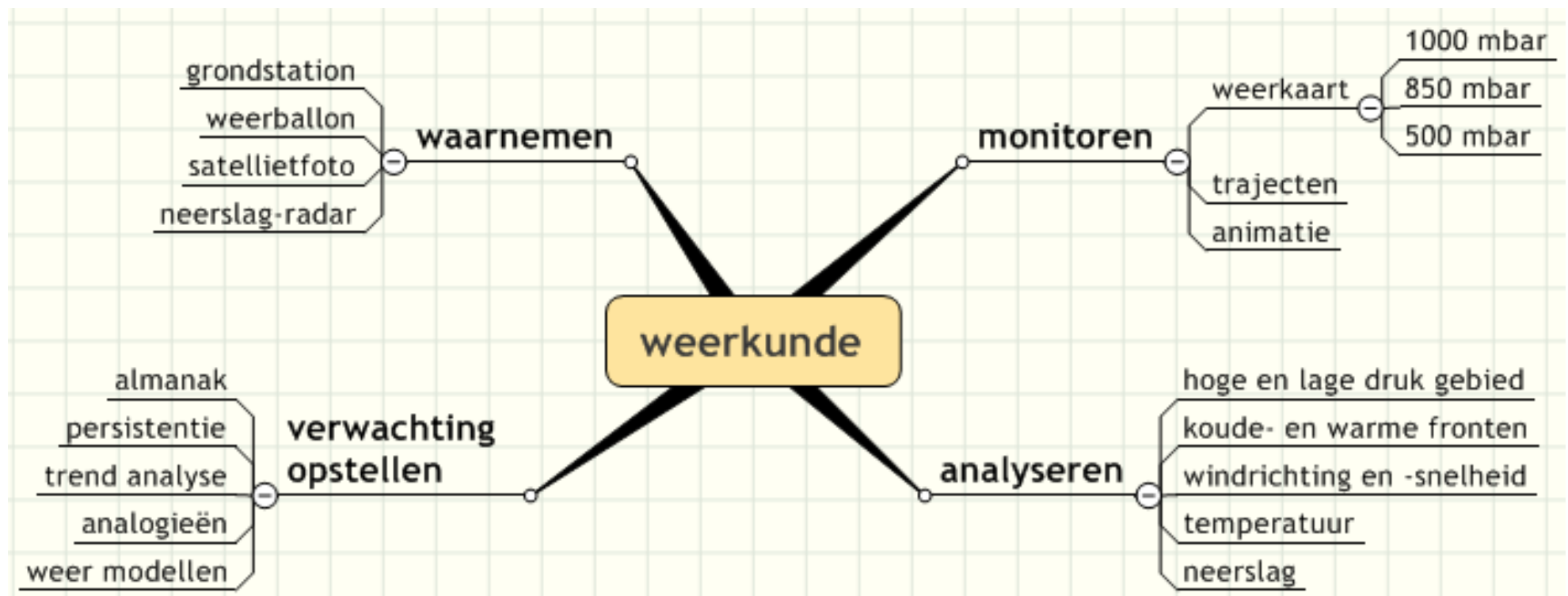


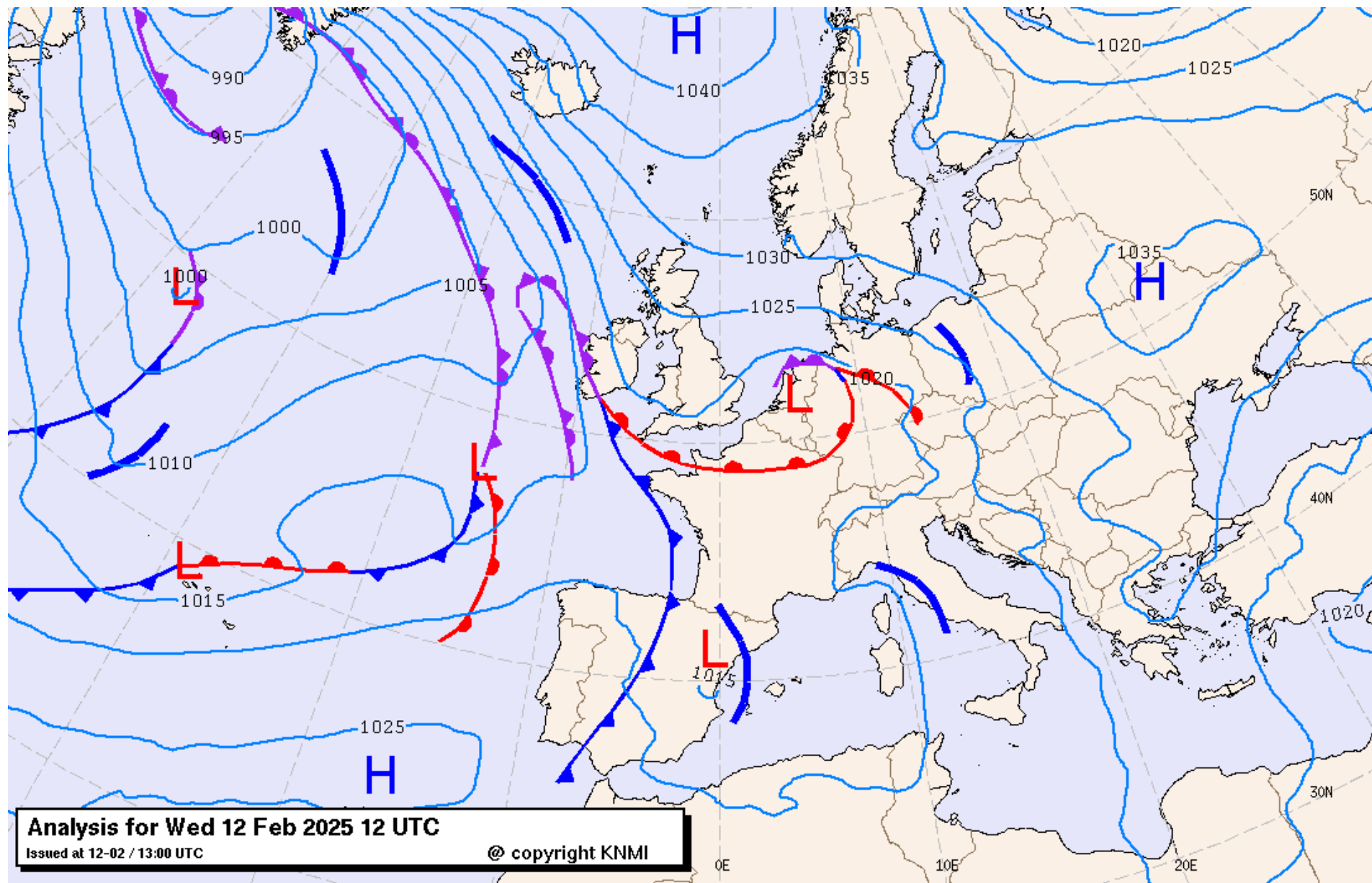
wsv Flevomare

# “Risico” factoren – lekker zeilen

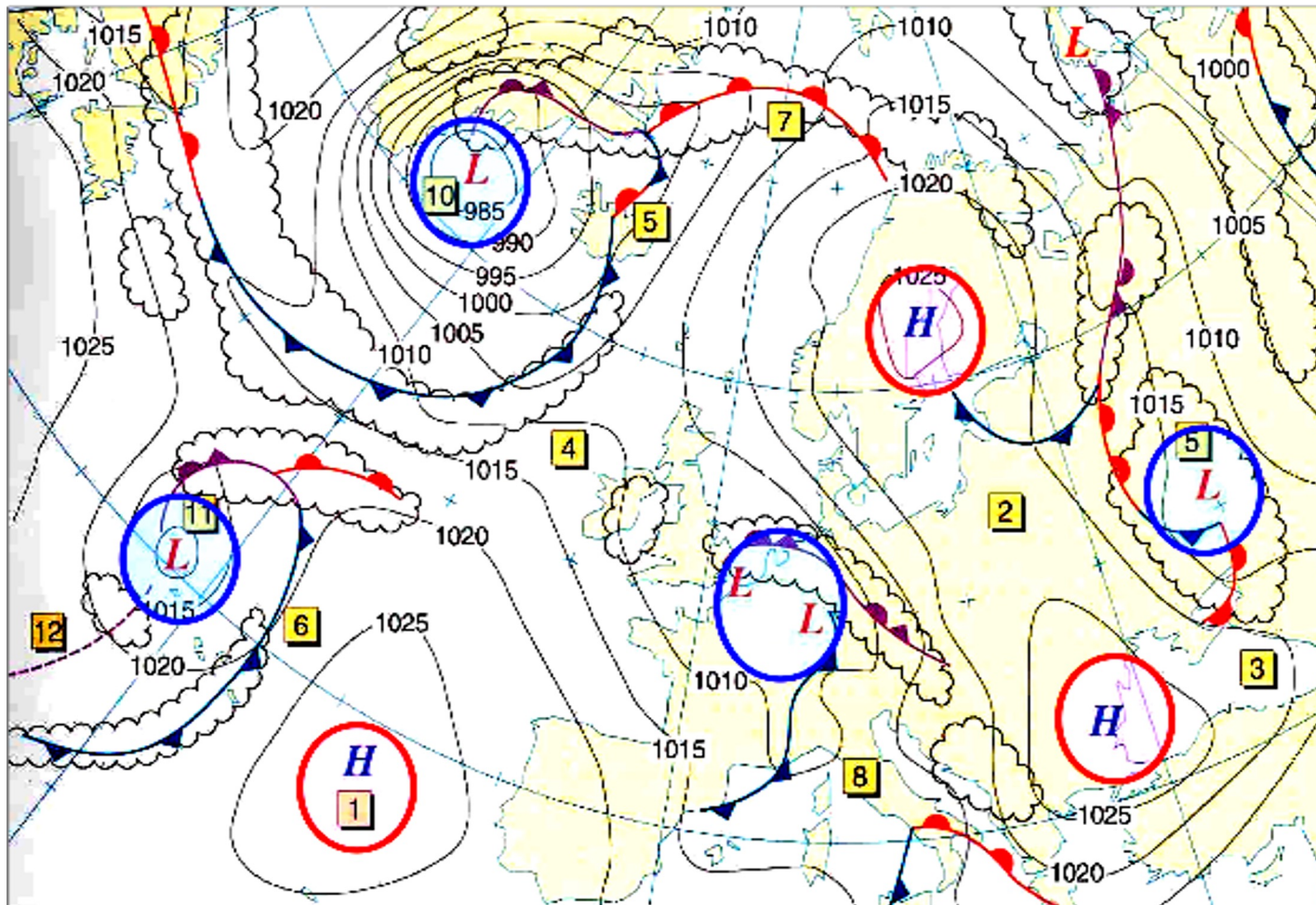


# Meteorologie / weerkunde





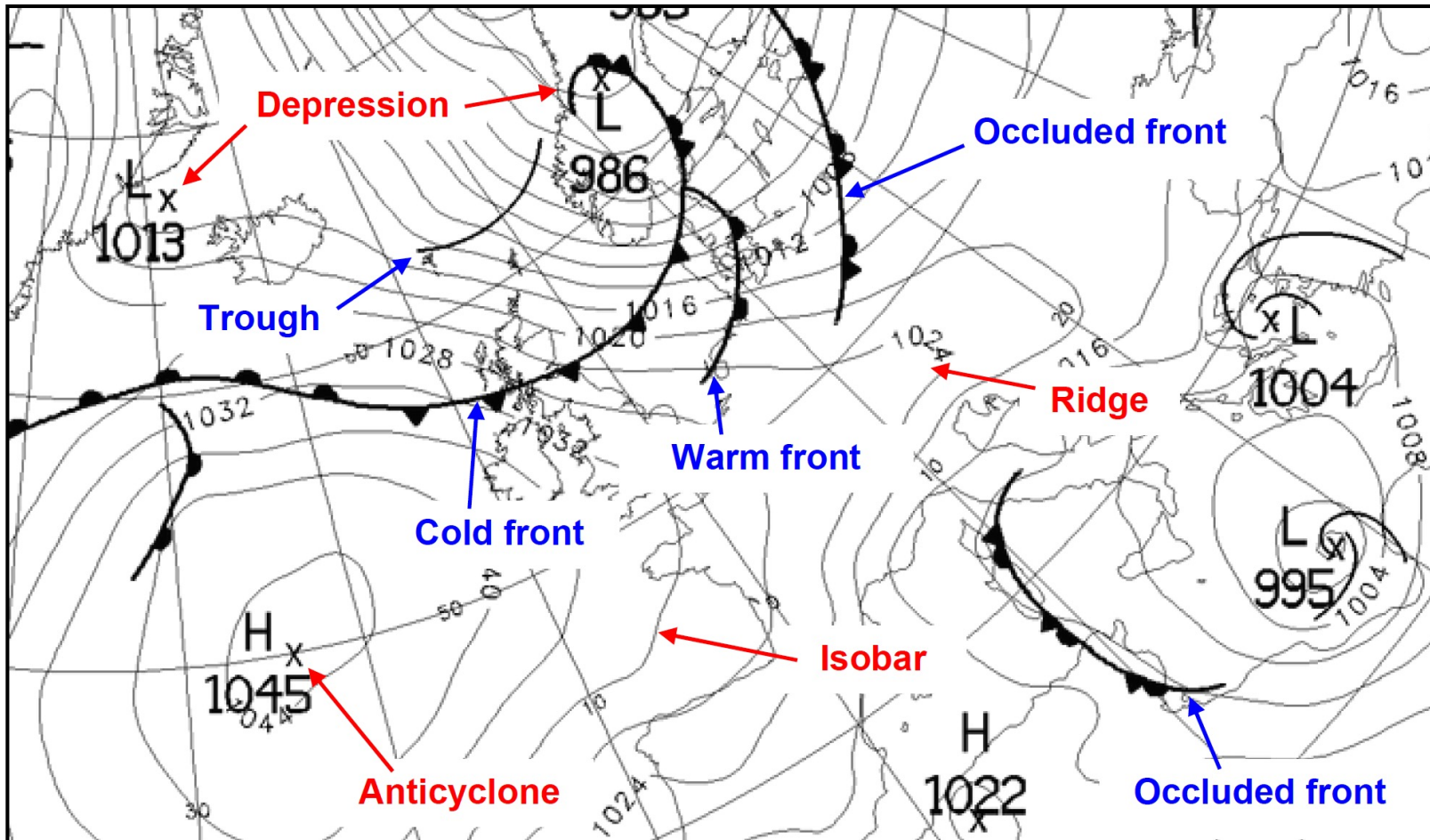
# Weerkaarten



5/2/2017

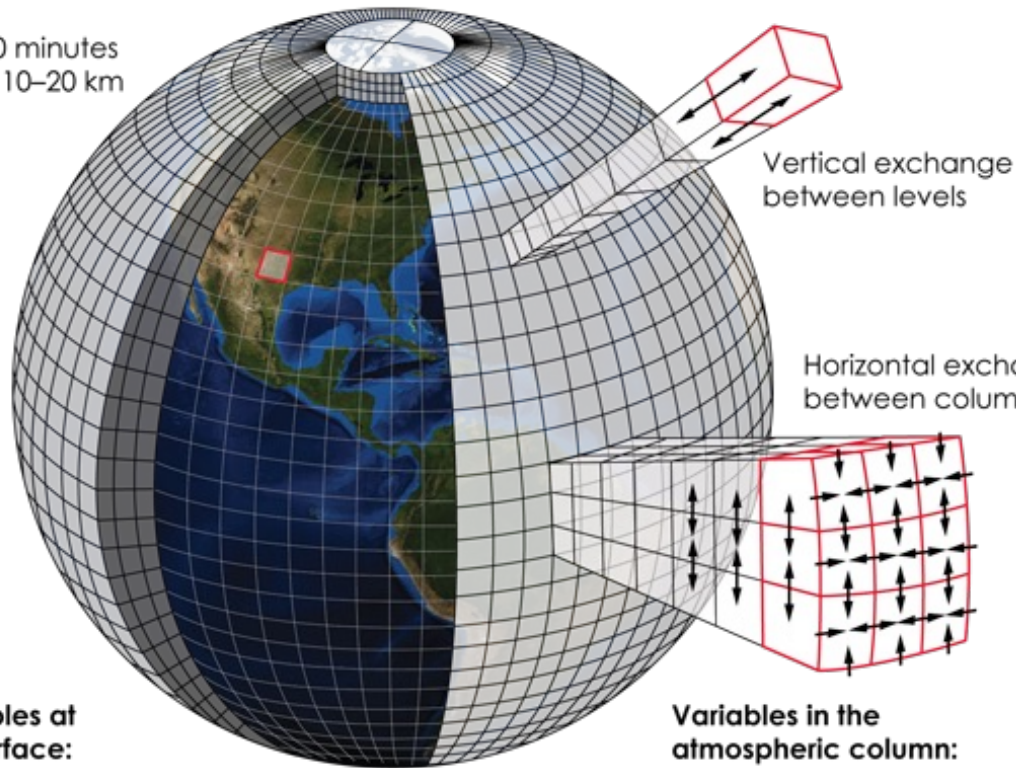
weer aan boord

14



# Weather forecast modeling

Timestep 5–10 minutes  
Grid spacing 10–20 km



## Variables at the surface:

- Temperature
- Humidity
- Pressure
- Moisture fluxes
- Heat fluxes
- Radiation fluxes

## Variables in the atmospheric column:

- Wind vectors
- Humidity
- Clouds
- Temperature
- Height
- Precipitation
- Aerosols



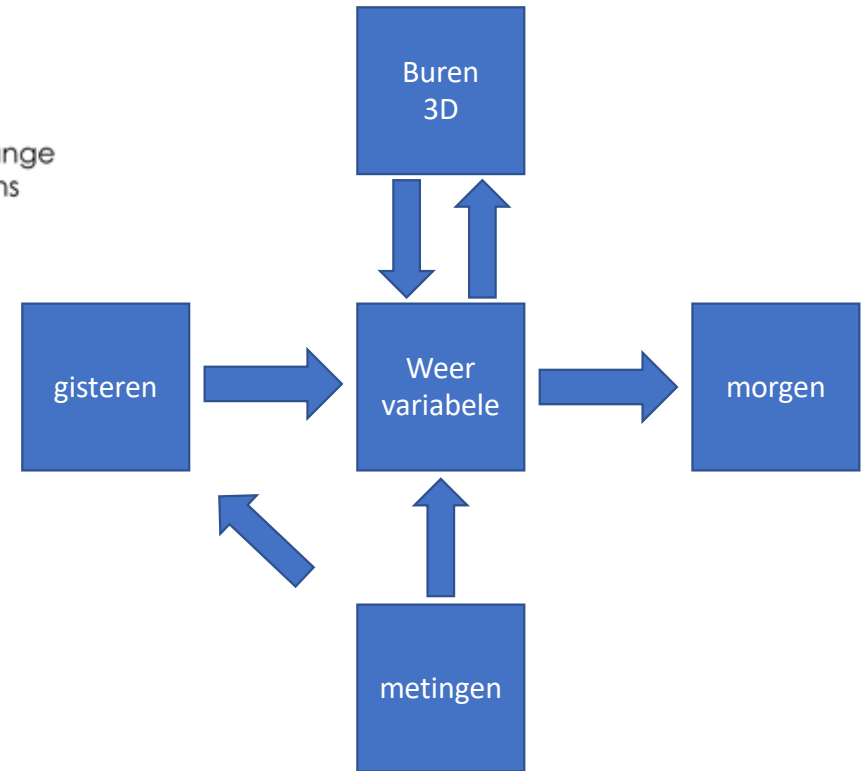
**Global**



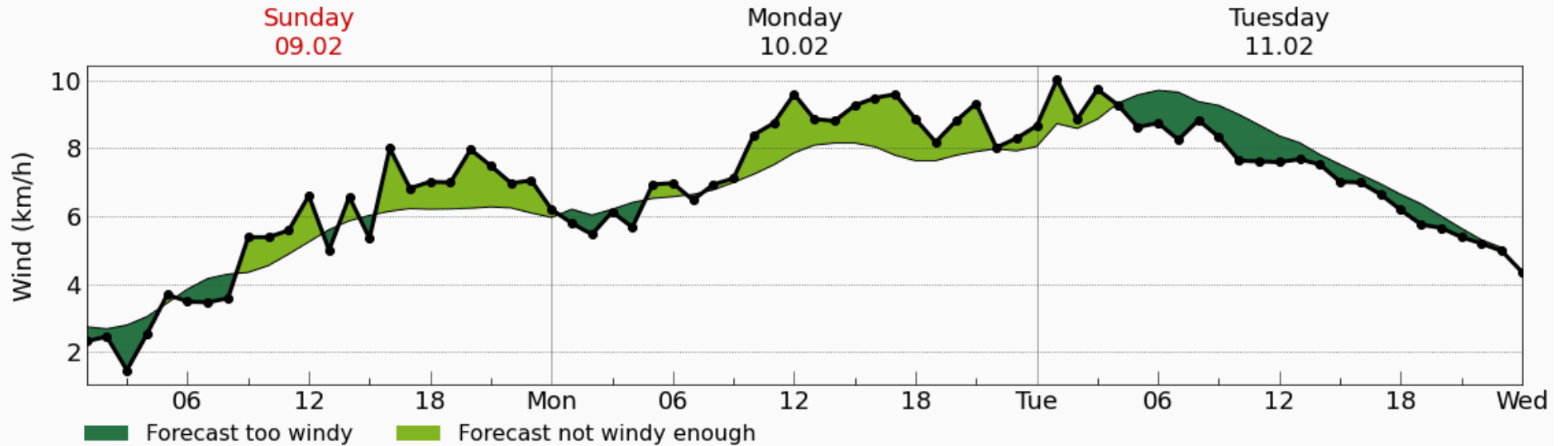
**Mesoscale**



**Microscale**



Verification for Wind (km/h) at 53.22°N, 5.75°E (-2 m asl)  
 Distance from verification site: 22.54 km. Time zone: CET.



**MLM error statistics for the last 3 days**

Mean error: -0.19 km/h  
 Absolute error: 0.73 km/h  
 RMS error: 0.86 km/h

Percentage of forecasts with errors smaller than:

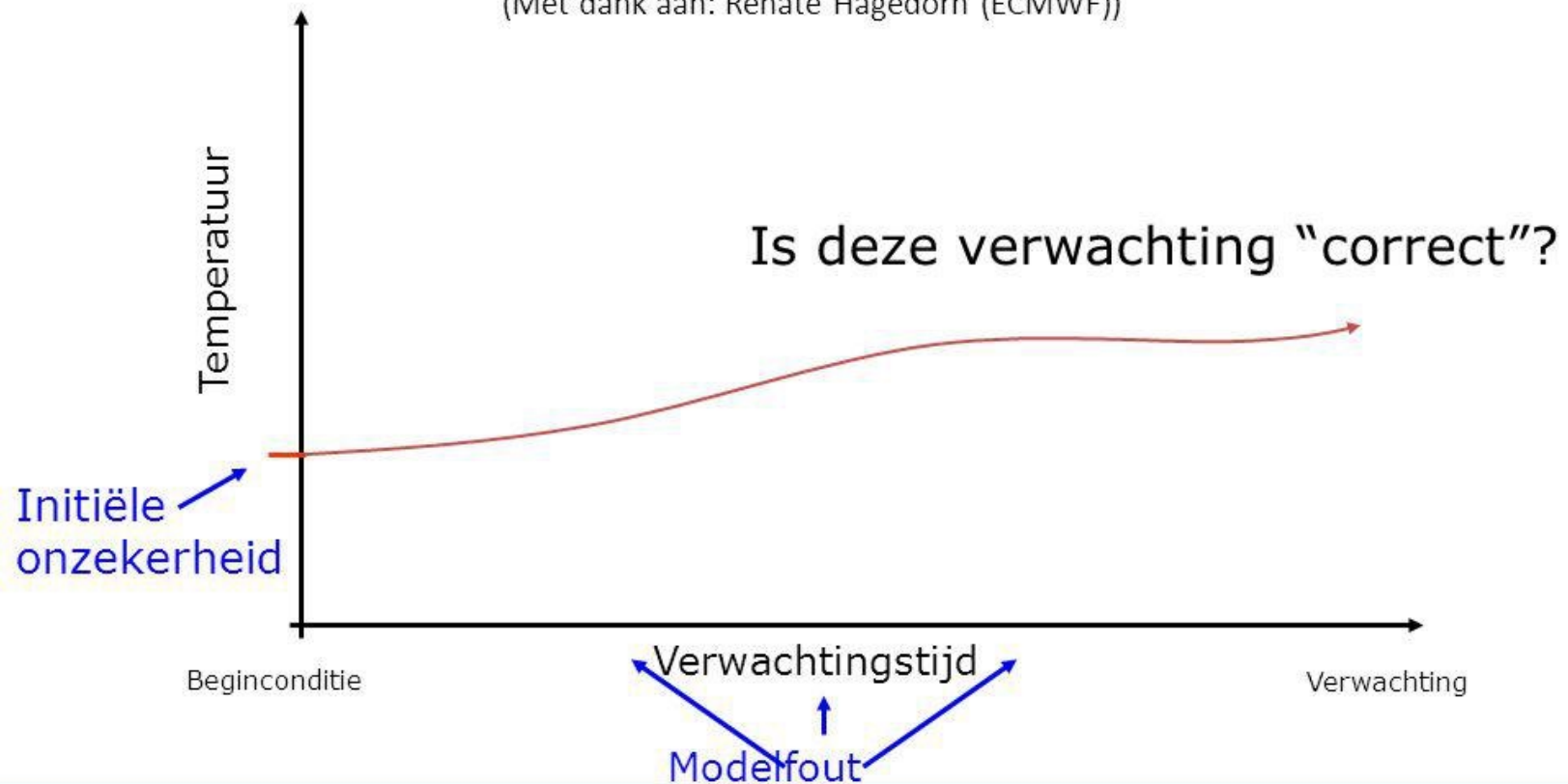
10 km/h: 100 %  
 5 km/h: 100 %  
 2 km/h: 100 %





## Deterministische weersverwachting

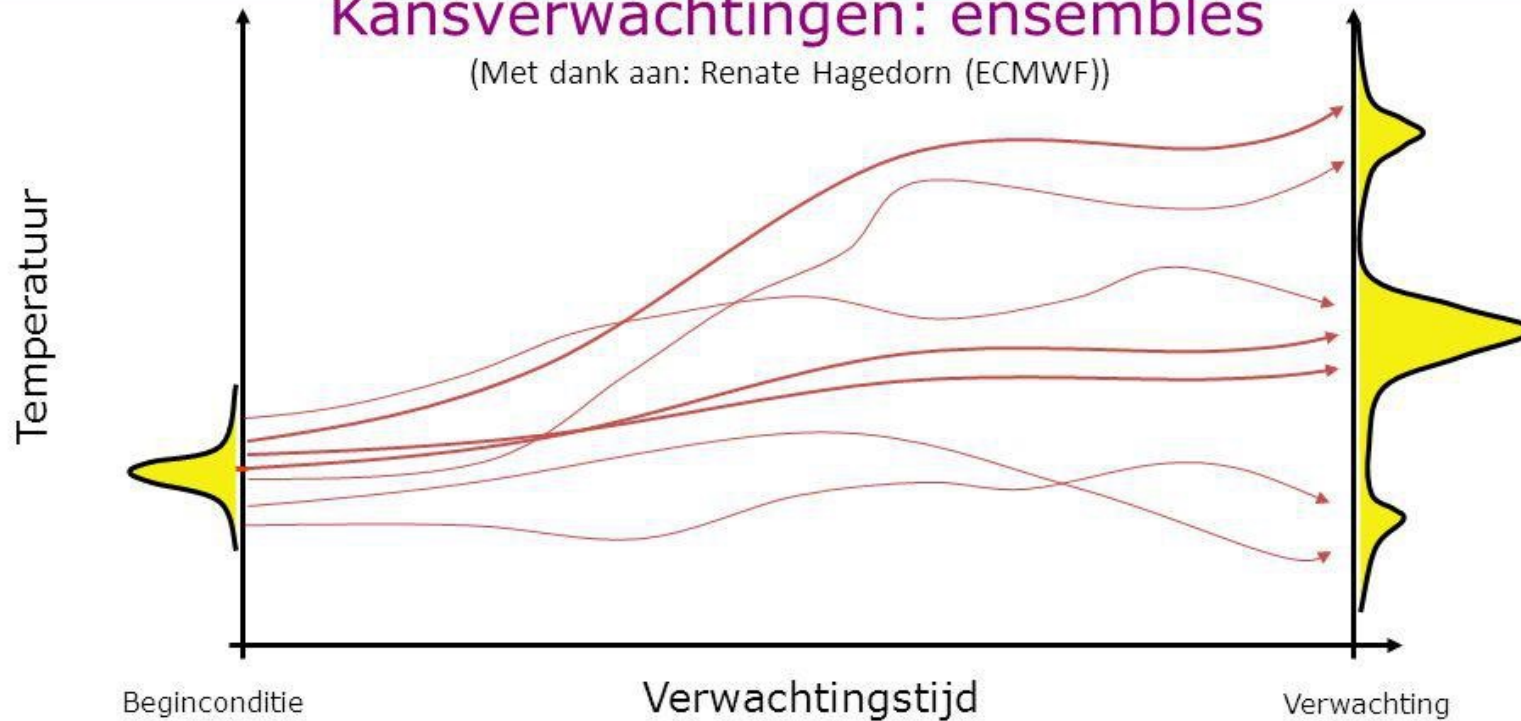
(Met dank aan: Renate Hagedorn (ECMWF))



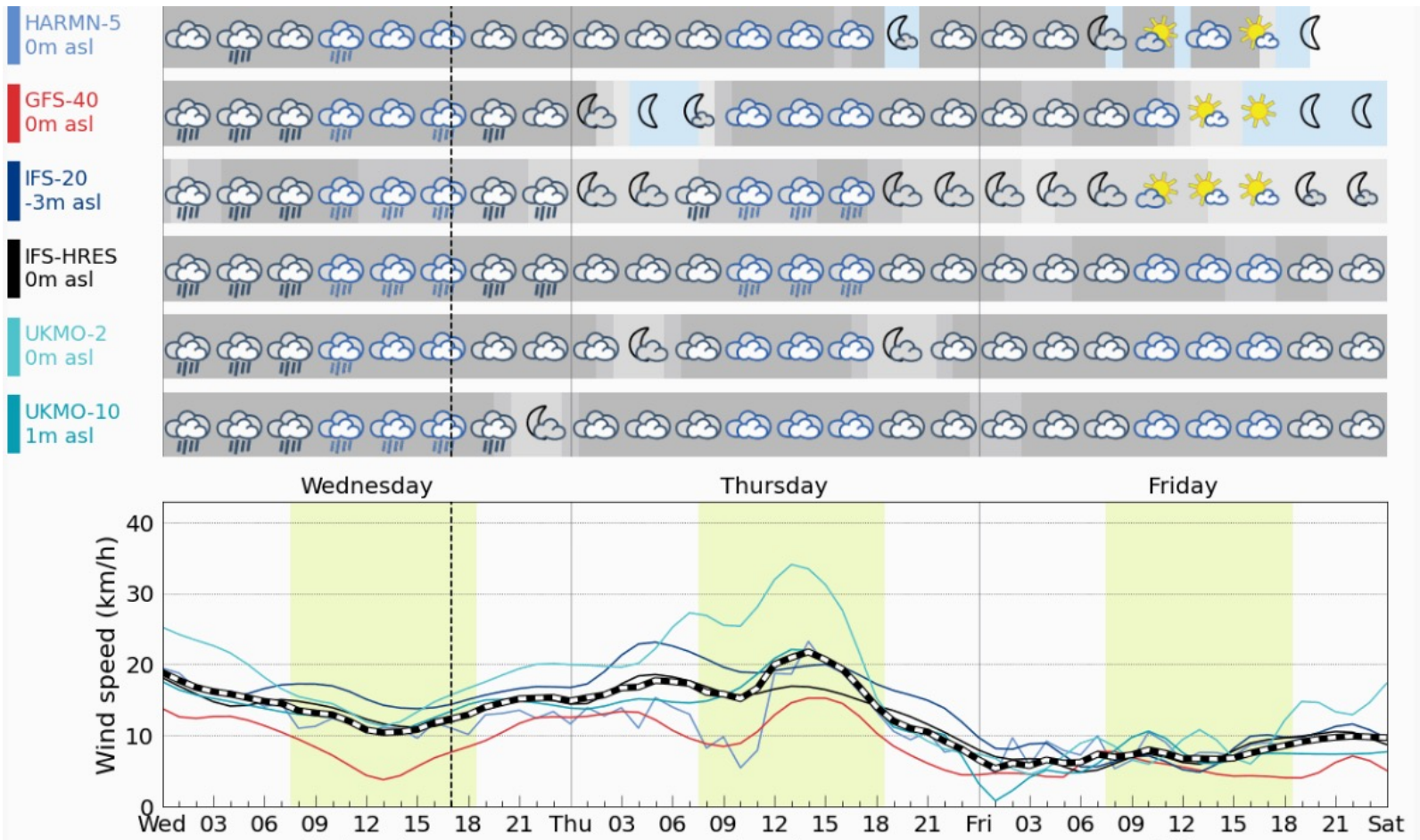


## Kansverwachtingen: ensembles

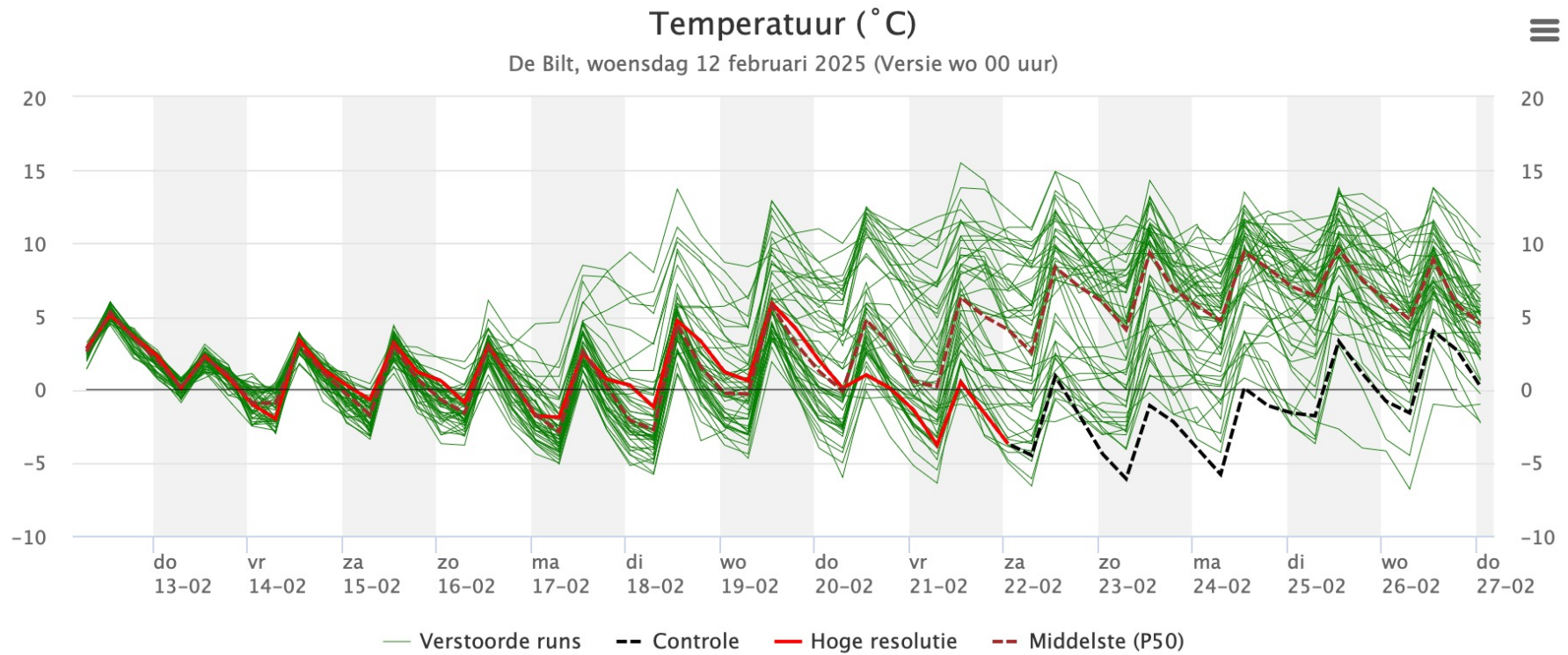
(Met dank aan: Renate Hagedorn (ECMWF))



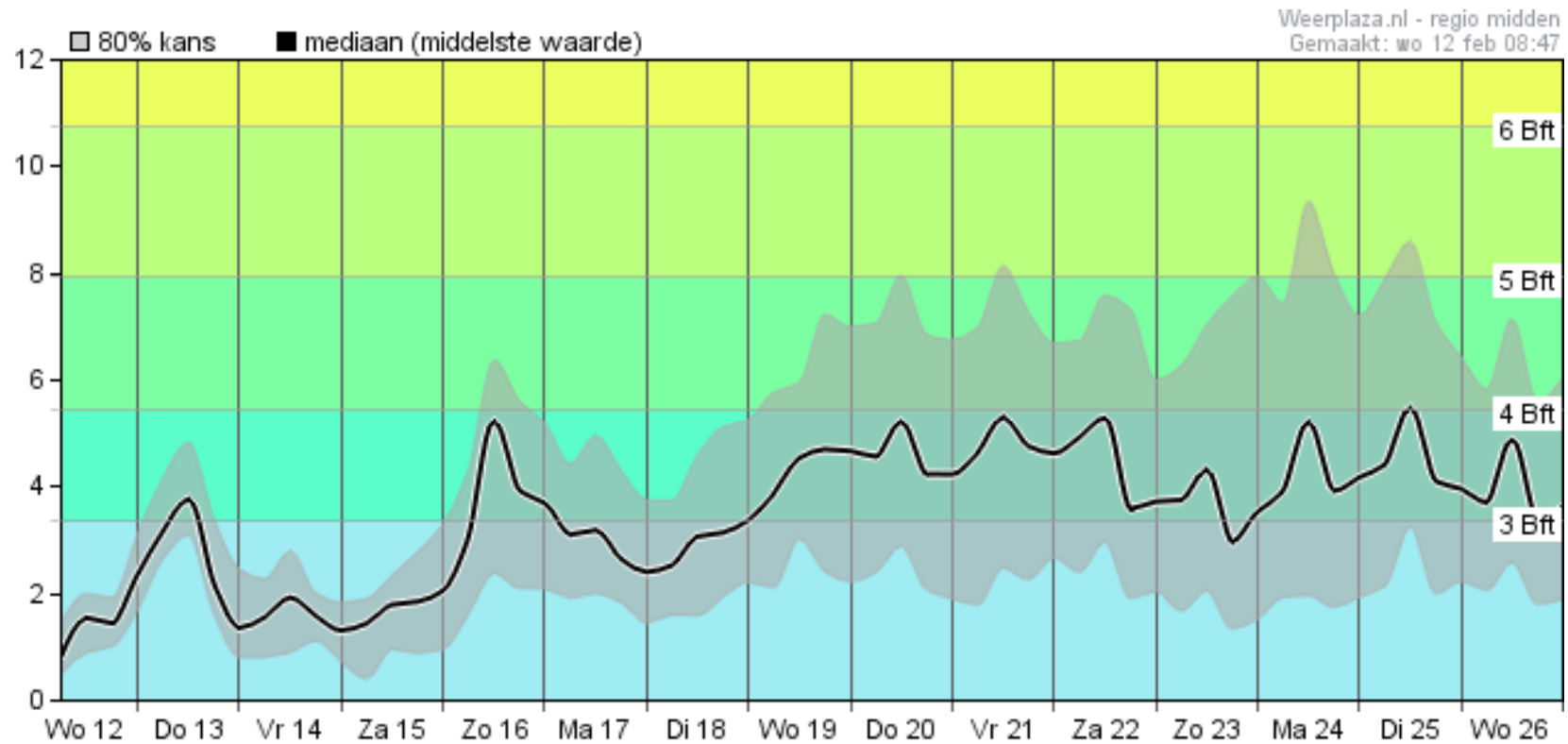
Complete beschrijving van de weersverwachting in termen van een Probability Density Function (PDF)



# De 'expert' pluim - Temperatuur



# ECMWF windsnelheid



Wind Barbs 10m

AURORA 0.25° PRETRAINED  
18z 31 Jan

07:00

Sa 1 Feb  
+012

Aurora is created by and copyrighted by Microsoft / Bodnar et al. (2024), weight licensed under CC BY-NC-SA 4.0 license HuggingFace



Experimental

Aurora 0.25° pretrained

Global • 25 km • 4 runs per day

Microsoft atmosphere AI

Aurora is an AI foundation weather model created by Microsoft. This version of Aurora produces data at 0.25 degrees resolution.

Aurora is created by and copyrighted by Microsoft / Bodnar et al. (2024), weights licensed under CC BY-NC-SA 4.0 license as per HuggingFace.

ECMWF-AIFS

Global • 25 km • 4 runs per day

ECMWF atmosphere AI

AIFS is an attention-based graph neural network based AI weather model trained on ERA5 reanalysis data.

ECMWF-AIFS is created by and copyrighted by ECMWF which is licensed under the CC BY 4.0 license

FengWu

Global • 25 km • 4 runs per day

Shanghai AI Laboratory atmosphere AI

FengWu is a Transformer based AI weather model trained on 39 years of ERA5 reanalysis data.

FengWu is created by and copyrighted by Shanghai AI Laboratory / Chen et al. (2023), weights licensed under CC BY-NC-SA 4.0 license

FourCastNet v2

Global • 25 km • 4 runs per day

NVIDIA atmosphere AI

FourCastNet v2 is a Spherical Fourier Neural Operators based AI weather model that is trained on 37 years of ERA 5 reanalysis data.

FourCastNet v2 is created by and copyrighted by Nvidia / Bonev et al. (2023), weights licensed under Apache 2.0 license

FuXi

Global • 25 km • 4 runs per day

Fudan University atmosphere AI

FuXi combines 3 AI weather models to forecast for the short, medium and long term. It is trained on 39 years of ERA5 reanalysis data.

FuXi is created by and copyrighted by Fudan University / Chen et al. (2023), weights licensed under CC BY-NC-SA 4.0 license

Pangu-Weather

Global • 25 km • 4 runs per day

Huawei Cloud atmosphere AI

Pangu-Weather is a Swin transformer based AI weather model trained on 39 years of global ERA5 reanalysis data.

Pangu-Weather is created by and copyrighted by Huawei Cloud / Bi et al. (2023), weights licensed under CC BY-NC-SA 4.0 license



Nowcast

Climate

Aurora 0.25° pretrained

18z 31 Jan

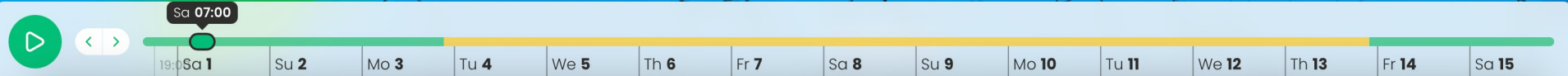
Frankfurt

10m

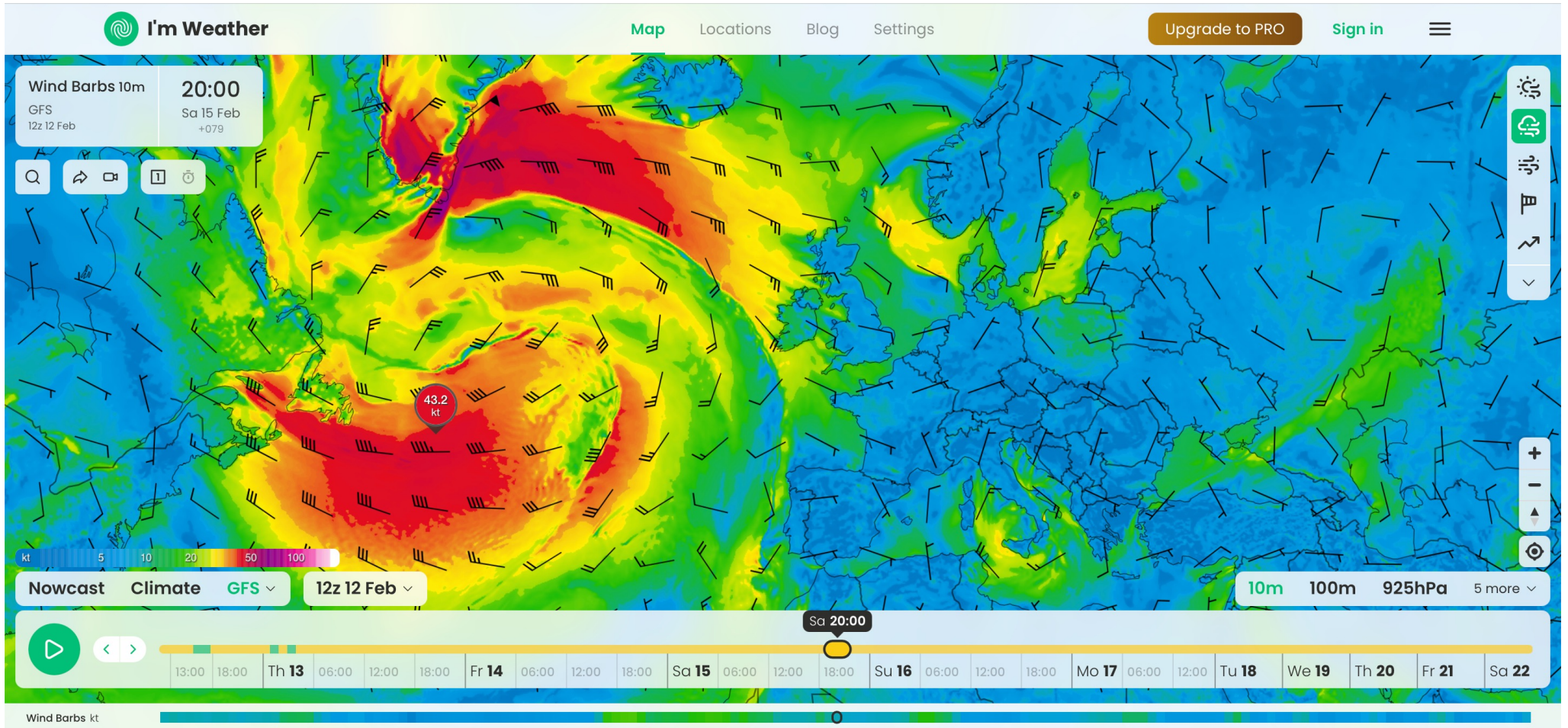
925hPa

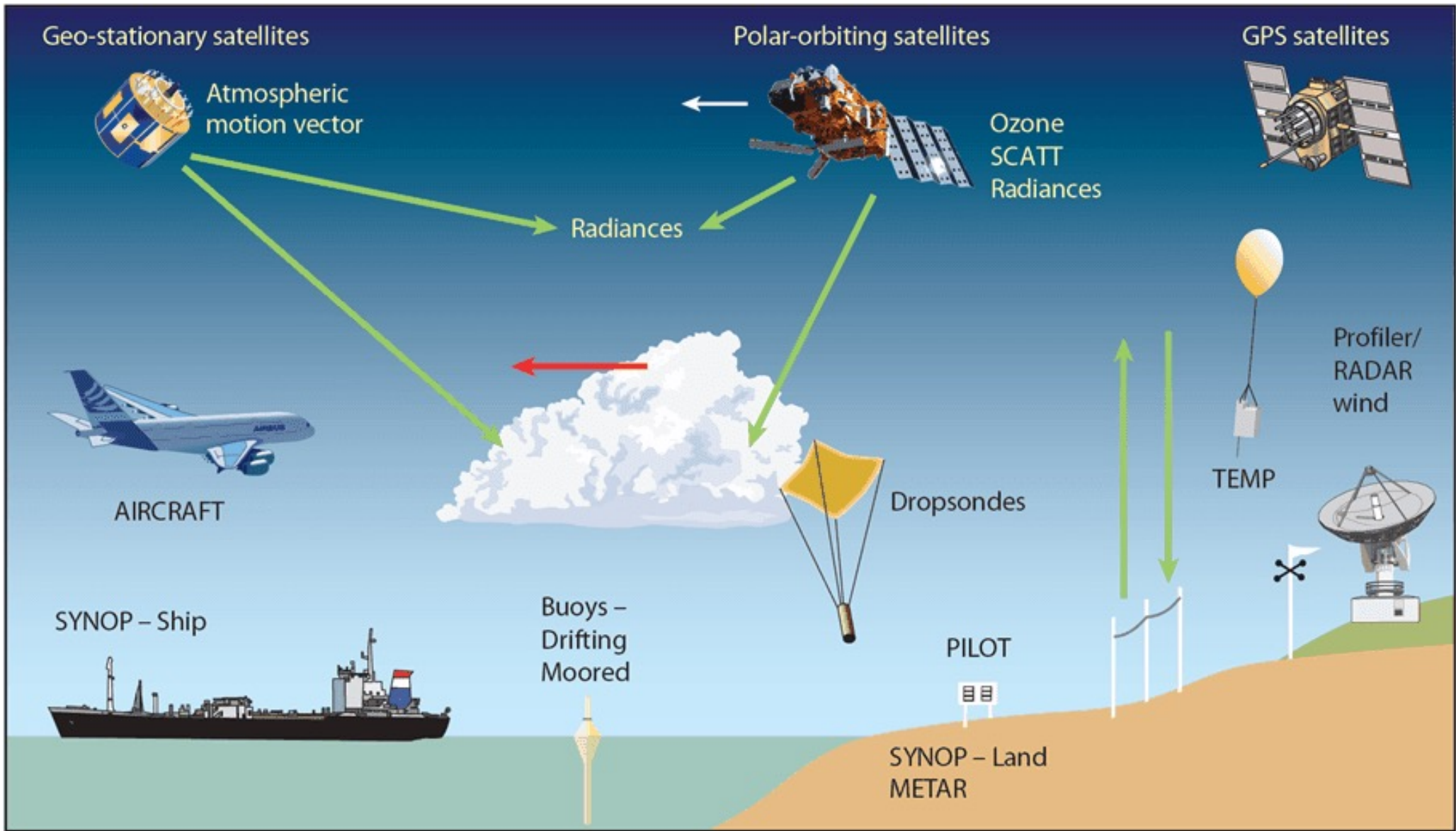
850hPa

4 more



https://imweather.com/?model=gfs&run=1739361600&member=&element=wind\_barbs&level=10m&lat=48.8000&lng=-9.5187&z=2.70







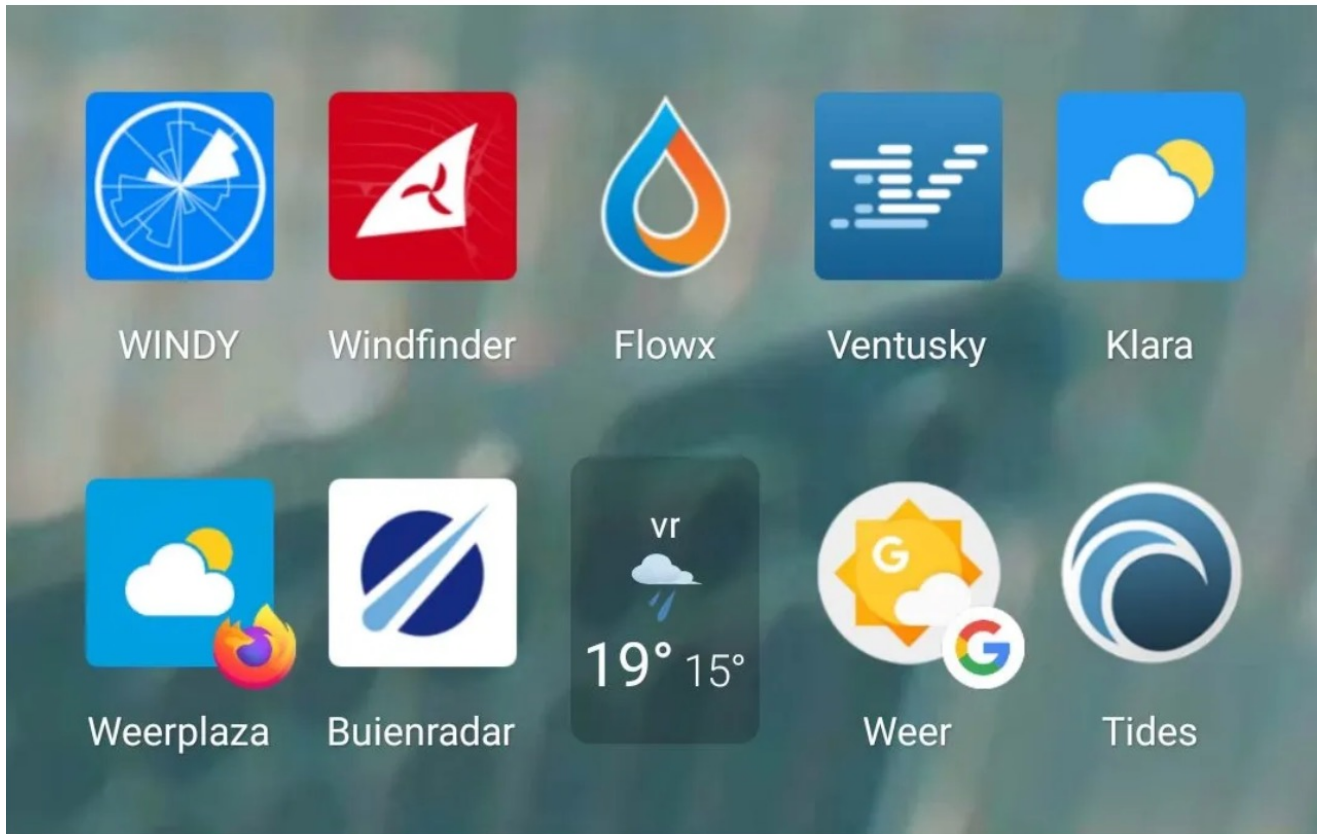
# Samenvatting tot nu toe

- Weersverwachting gebaseerd op weermodellen
- Waarnemen – analyseren – ‘voorspellen’ – waarnemen – etc.
- Modellen werken met een ‘grid’ (3D)
- Elke run (tijdstip) op verse data
- ‘Verstoorde’ runs → ensemble verwachting
- Verschillende modellen → multi model verwachting

# De beste gratis weer-apps op Android en iPhone

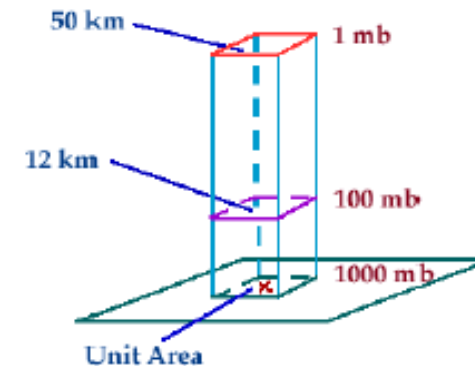
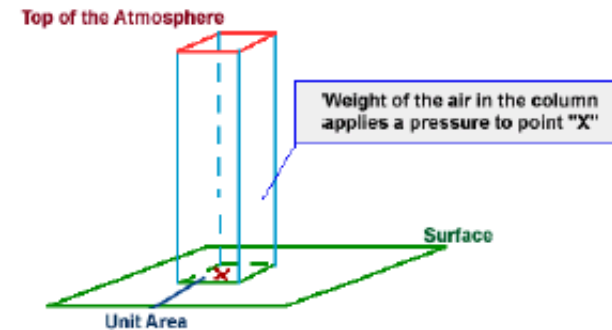
37 FIJNE REACTIES

UITGELICHT

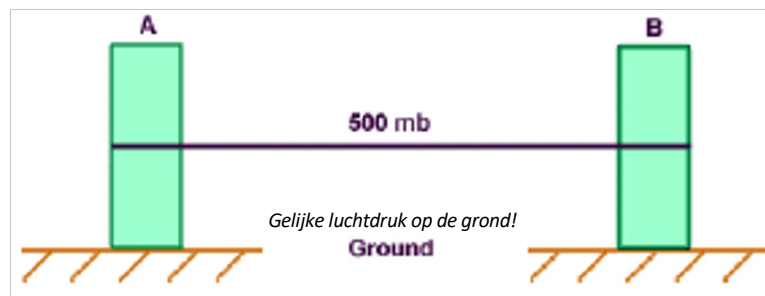


# Wat is luchtdruk?

- Lucht heeft een gewicht;
  - Veroorzaakt een 'luchtdruk';
  - uitgedrukt in mbar of hPa;  
(1 mbar = 1 hPa)
  - gemeten met barometer;
- 
- Gemiddelde luchtdruk is ongeveer 1013 mbar;
  - [890 mbar – 1040 mbar];
  - Luchtdruk neemt af met de hoogte!

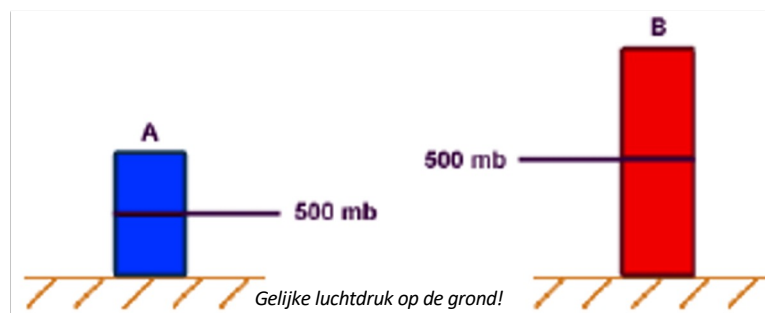


# luchtdruk en temperatuur



Als de lucht kouder wordt, krimpt de kolom  
waardoor de luchtdrukverdeling over de hoogte  
anders wordt.

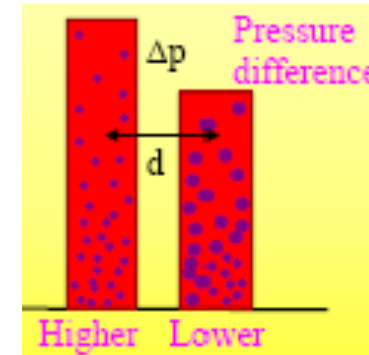
Als lucht warmer wordt, rekt de kolom uit.



# Druk verschillen

- Drukgradient: Het verschil in druk per afstand:

$$\text{Drukgradient} = \Delta P/d$$



- Druk gradient = drijvende kracht
- Isobaren dichtbij elkaar:  
grote drukgradient  $\rightarrow$  veel kracht
- Isobaren ver uit elkaar:  
kleine drukgradient  $\rightarrow$  weinig kracht

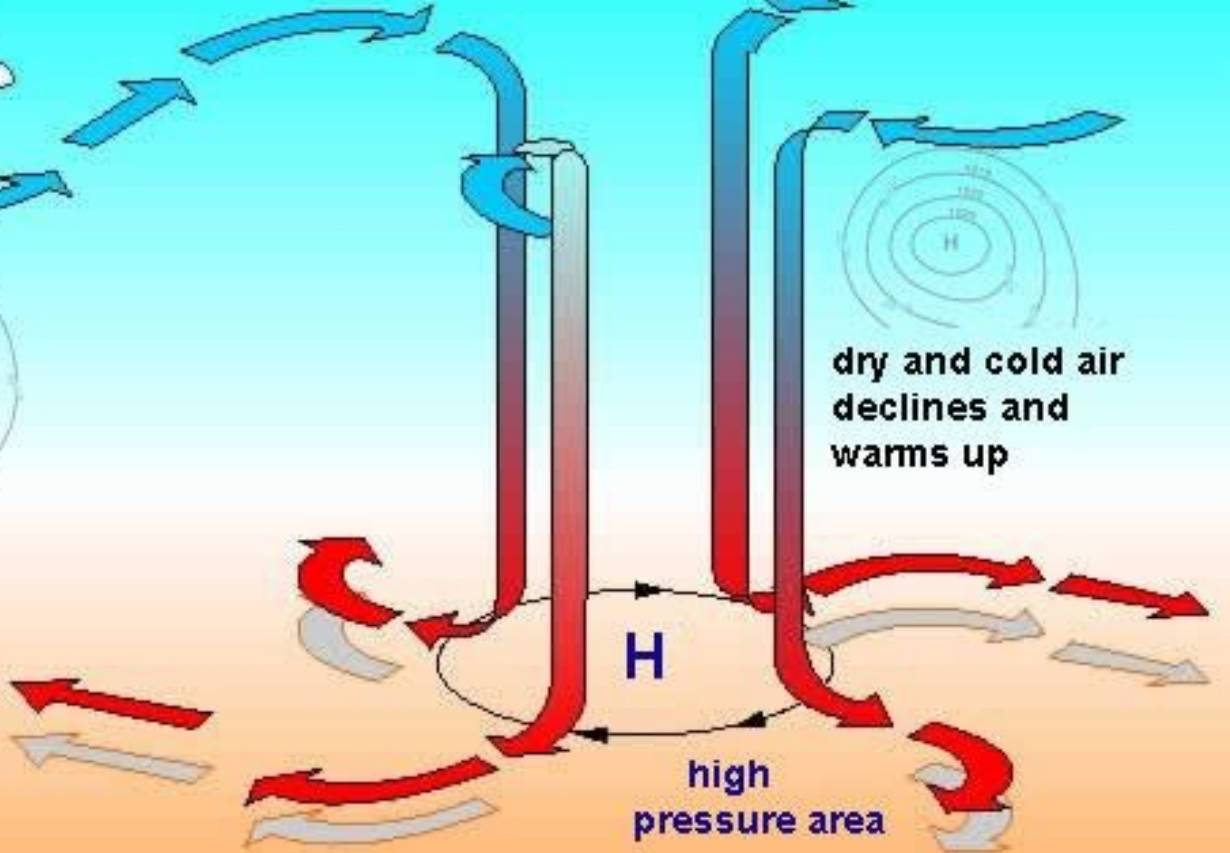
Clouds from those it is raining



moist warm air rises and cools down



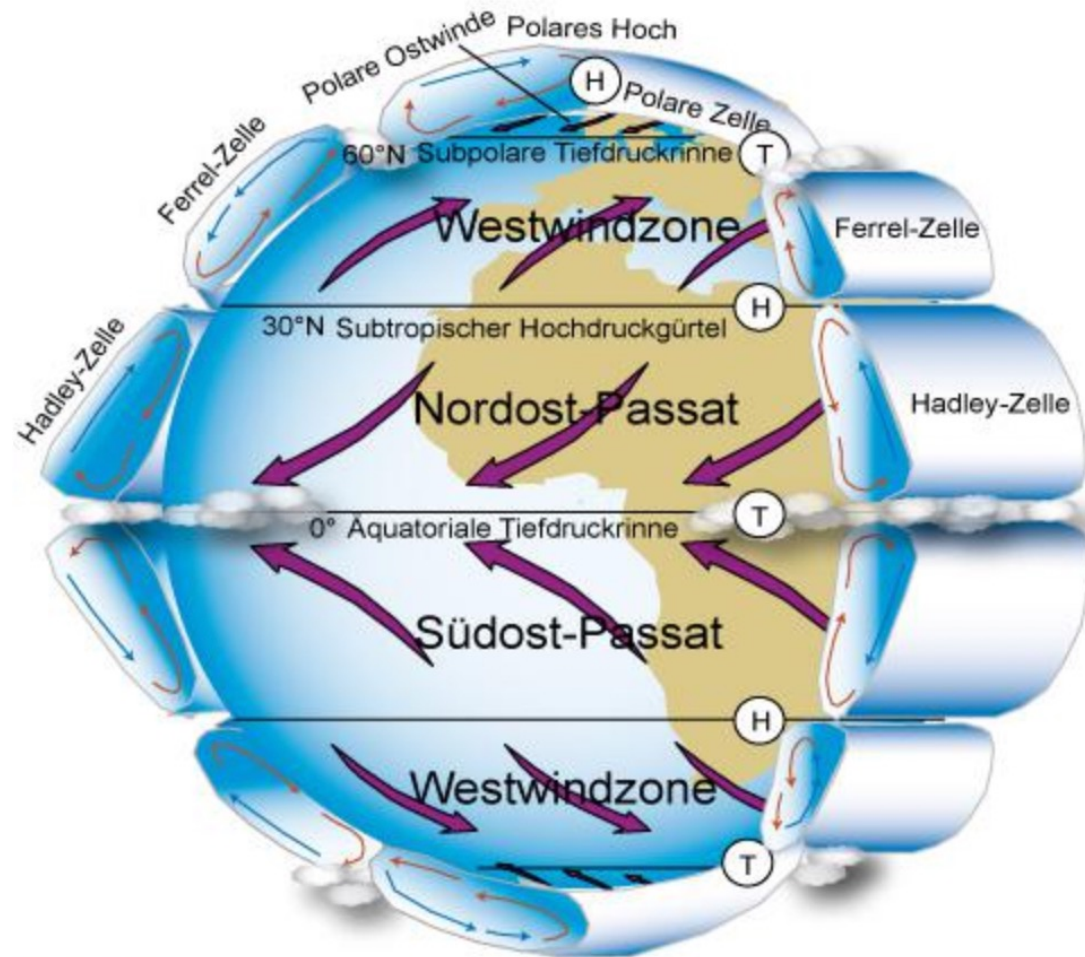
Low pressure area

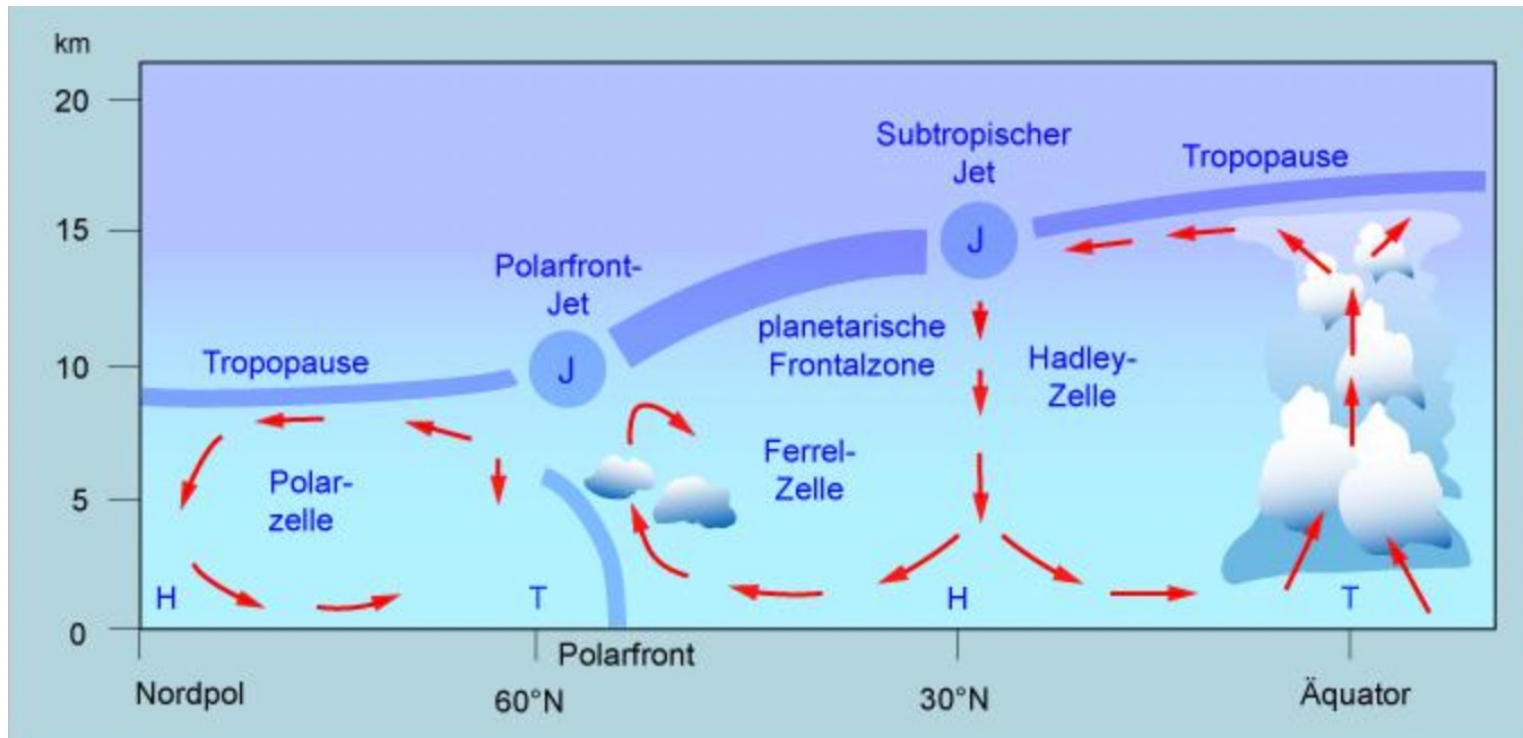


dry and cold air declines and warms up

high pressure area

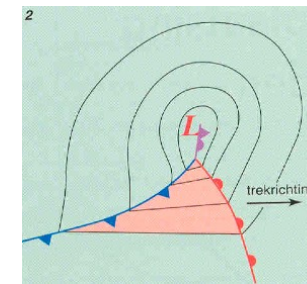
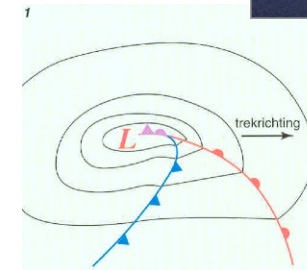
wind blow in the clockwise direction from center.



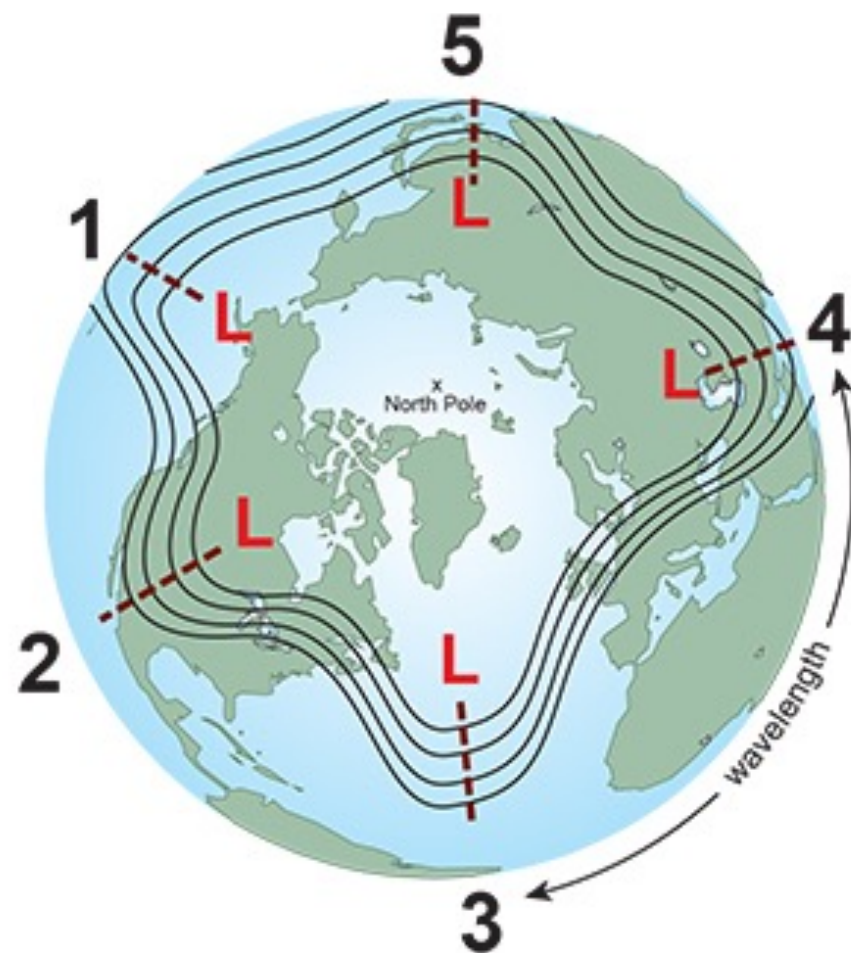




# Trekrichtingen depressies

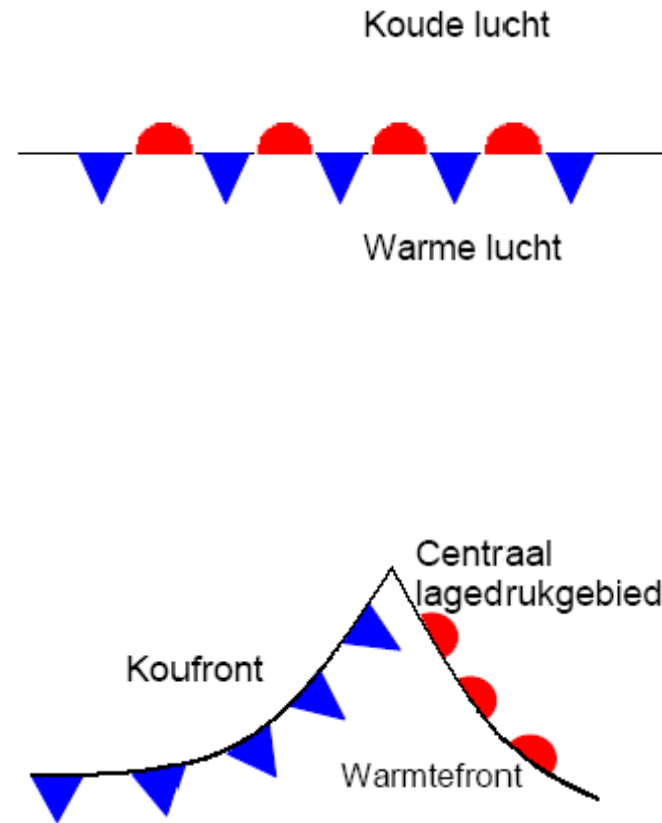
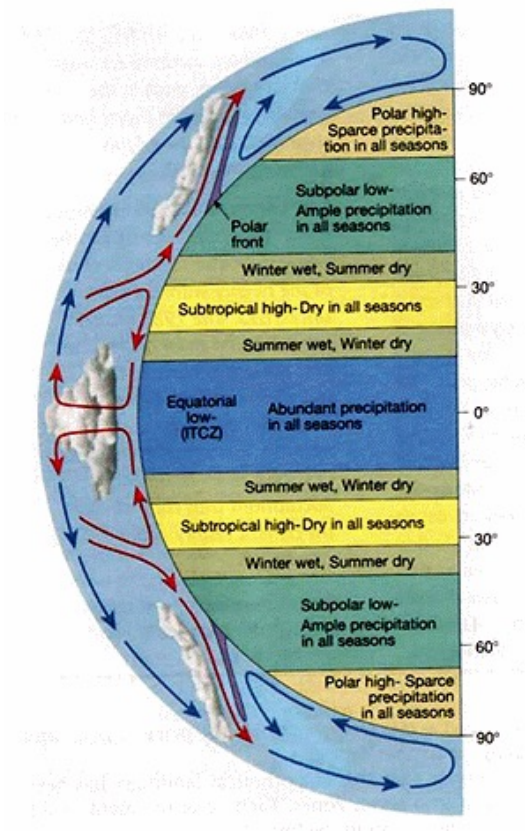


## Rosby Waves



National Weather Service

# Fronten



# Front ontwikkeling

