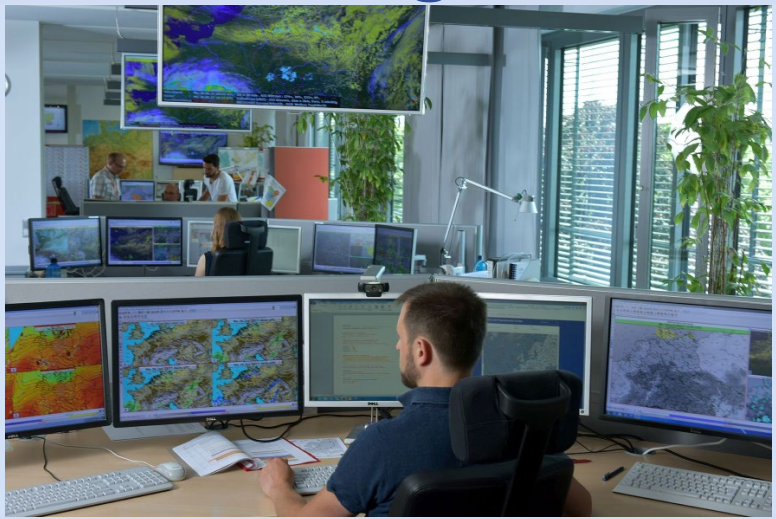
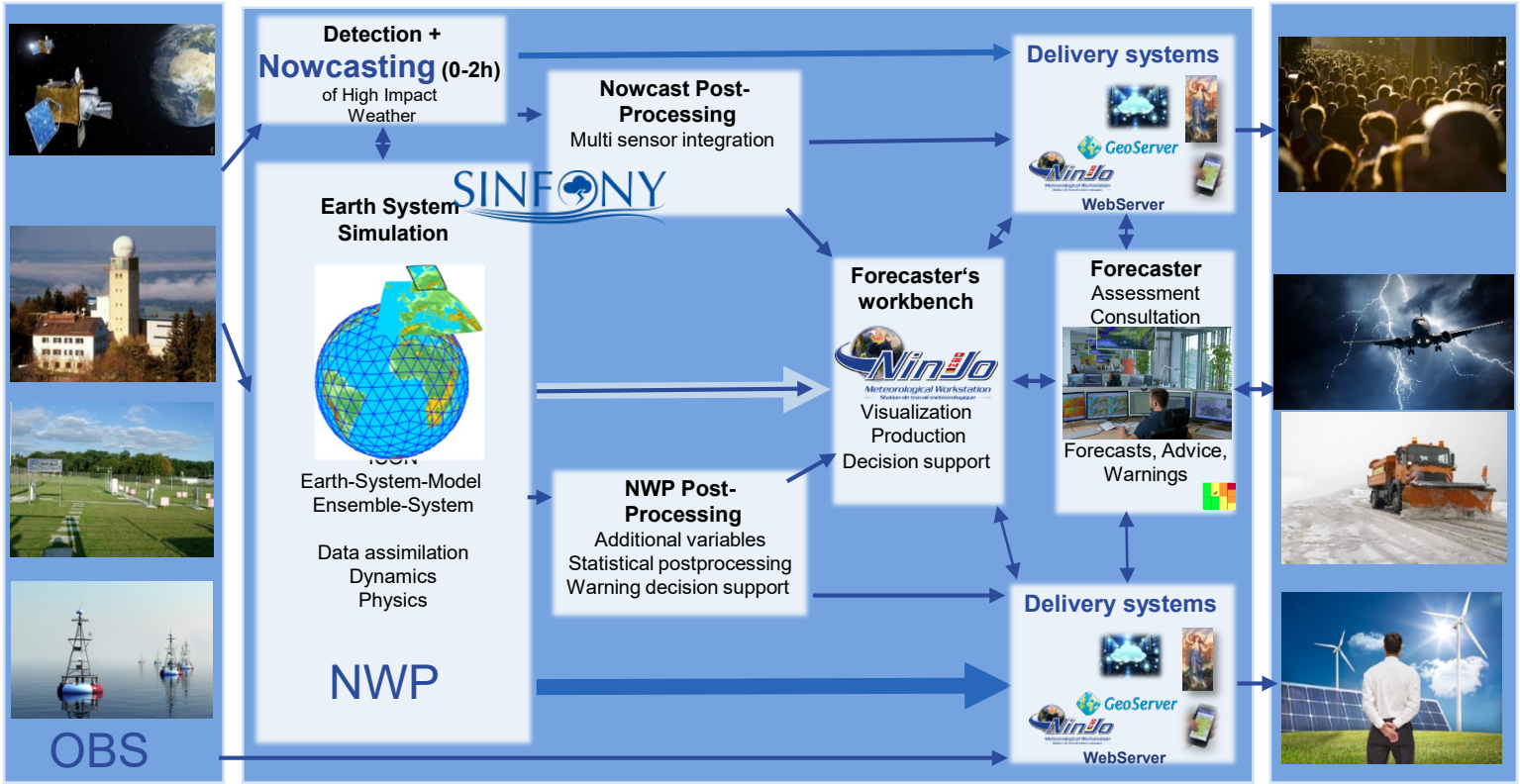
Use of numerical weather prediction in operational forecasting and warning services



Franz Molé
Head of DWD Forecast and Advisory Centre

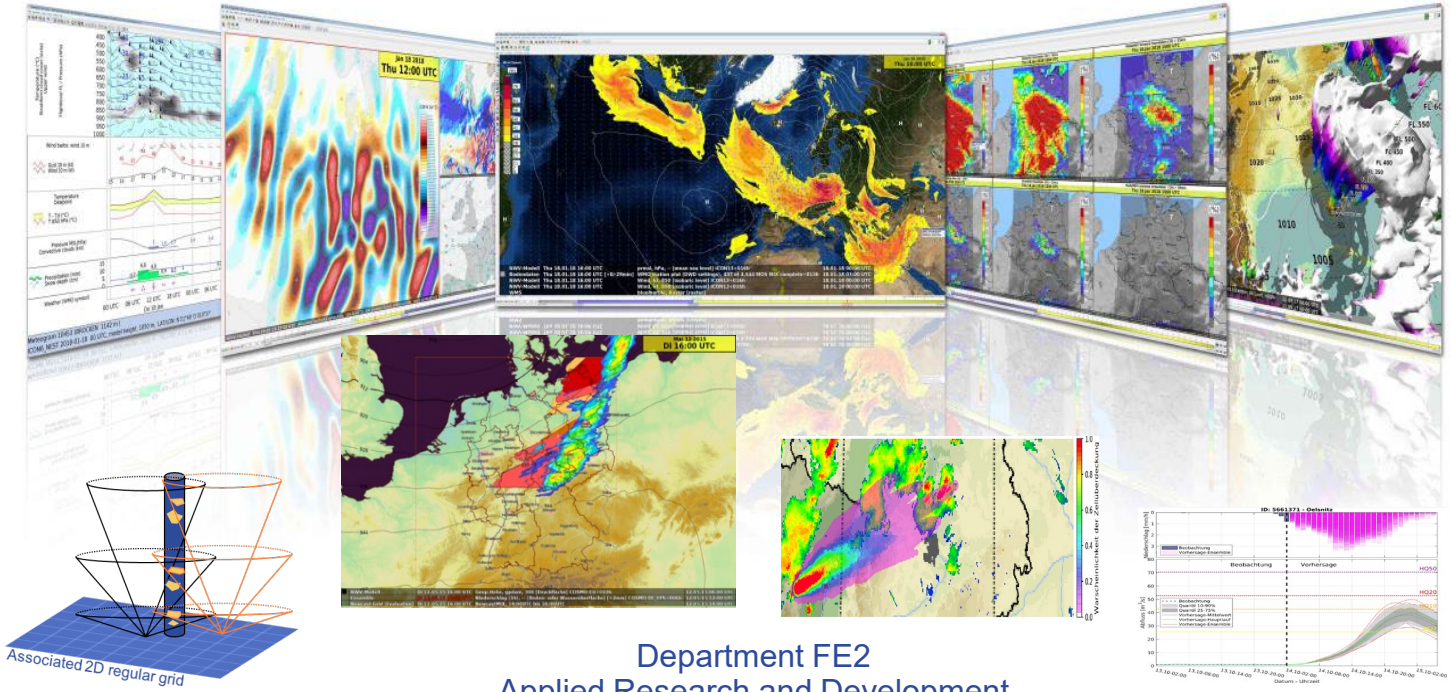
Value Chain for our services at DWD



we are forecasting and issuing warnings with

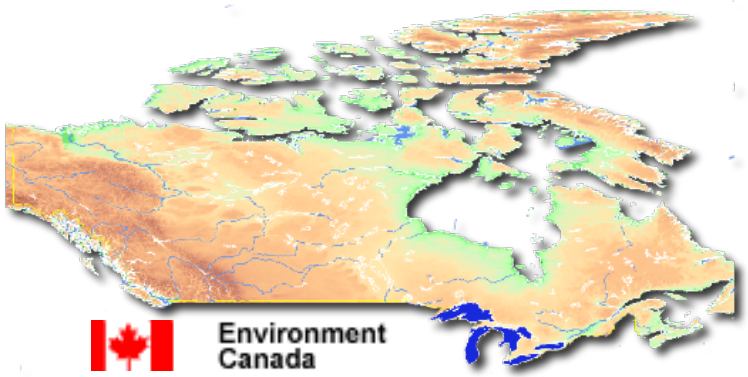
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

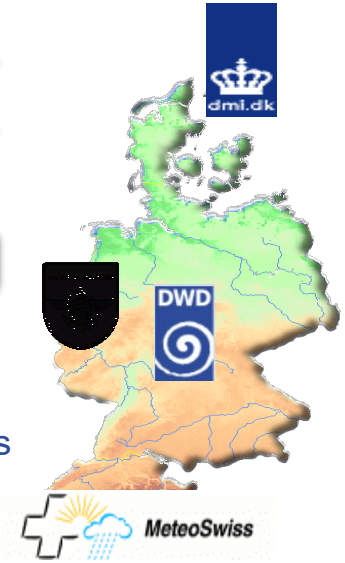
Meteorological Workstation and much more



Department FE2
Applied Research and Development
Dirk Heizenreder

consortium





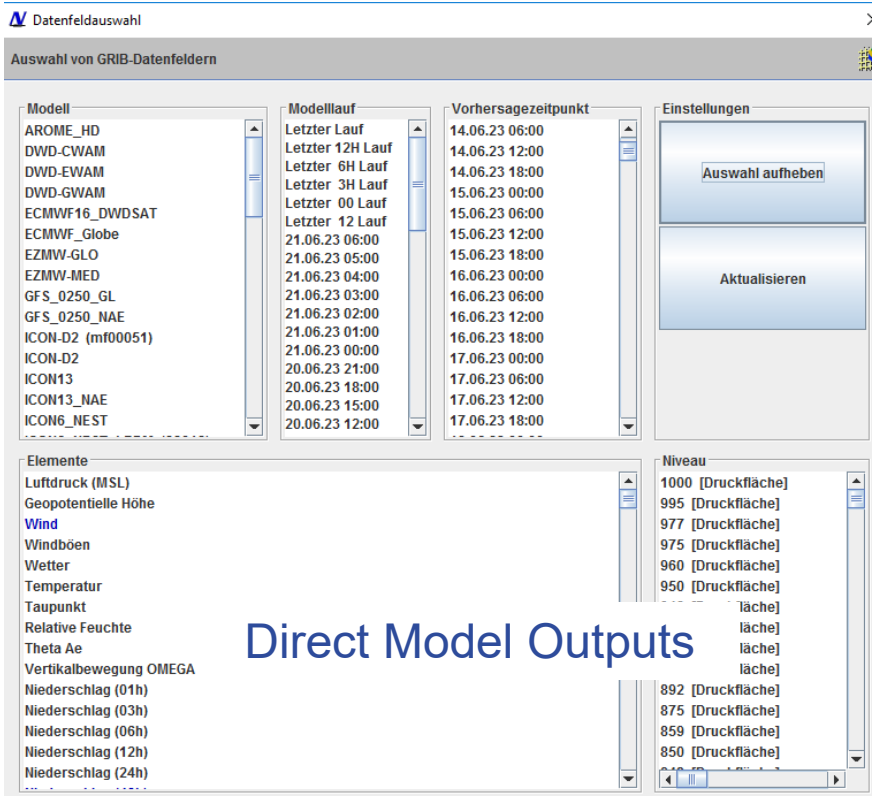
- International collaboration by 5 Met Services
- Official Agreement signed in 2006
- Joint Development and Maintenance

NinJo – Realtime access to all data

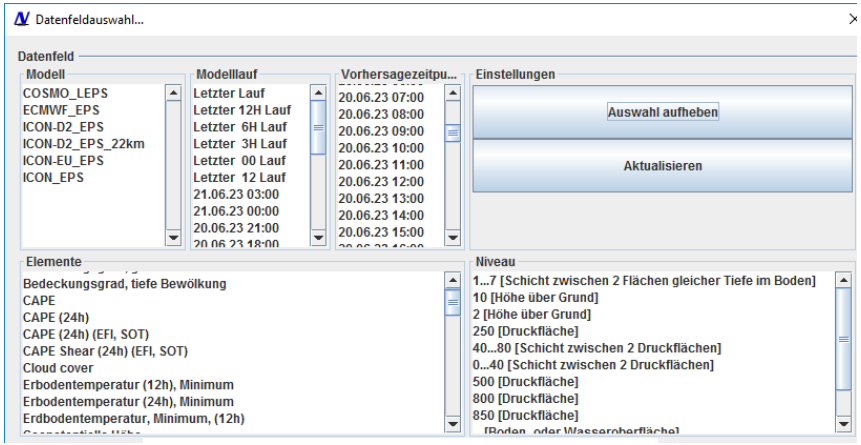
Deutscher Wetterdienst
Wetter und Klima aus einer Hand
DWD

NinJo
Meteorological Workstation
Station de travail météorologique

NWP Data within NinJo



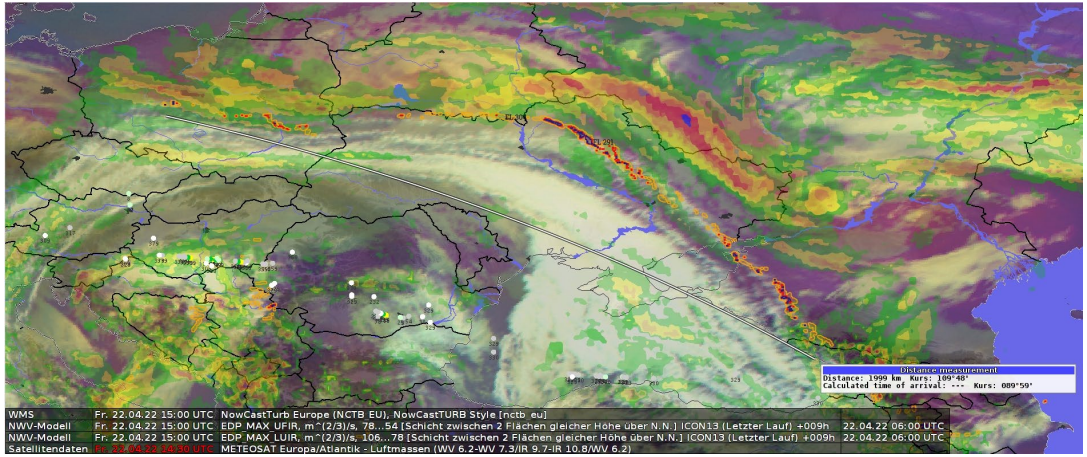
Direct Model Outputs



Ensemble Data Layer

Applications for aviation customers

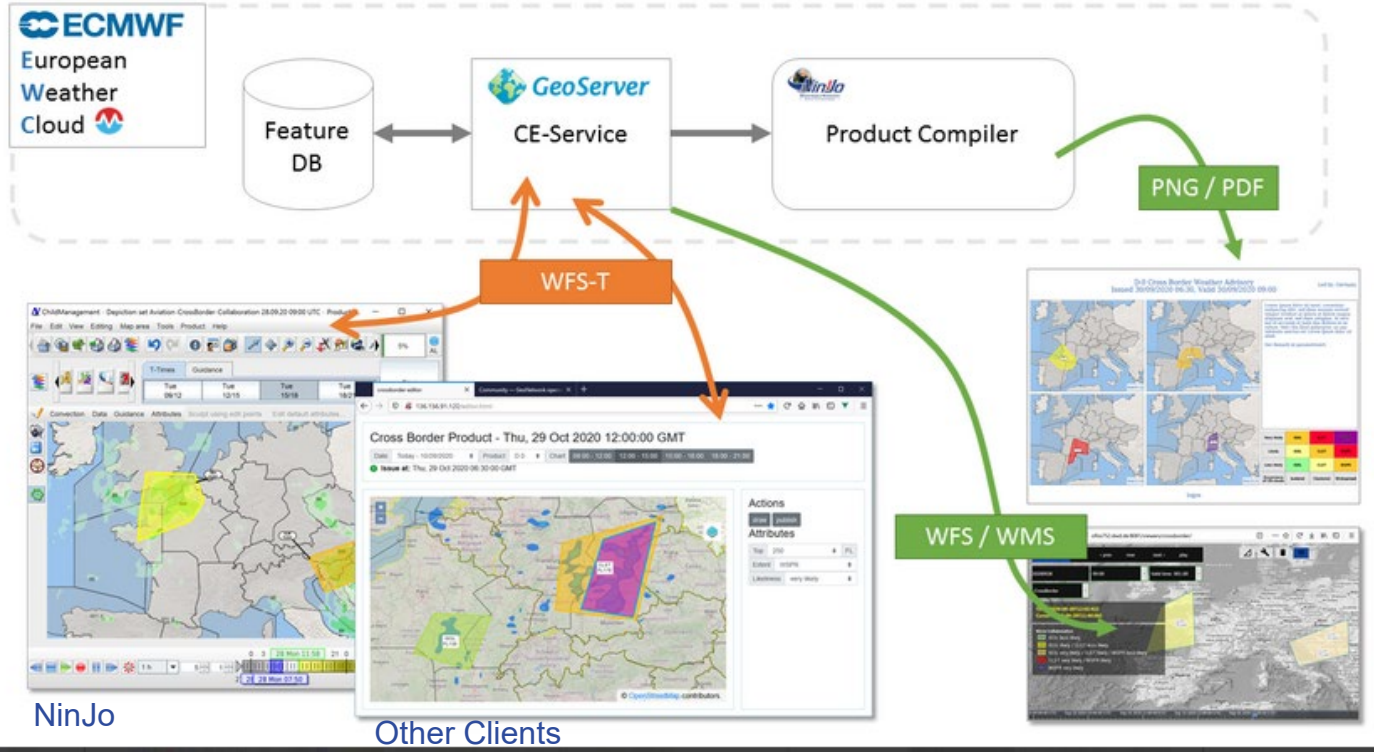
- AutoMETAR
- Detection of turbulence and convection
- ADWICE, AutoTAF



Nowcast-TURB (Polygone)+ ICON-EDP,
A.Barleben(WV24) R. Müller (FE23)

EUFOCS (European CrossBorder Projekt)

NinJo - development of tools to support efficient weather advice



Example – global status of concection (WebGIS/DWD)

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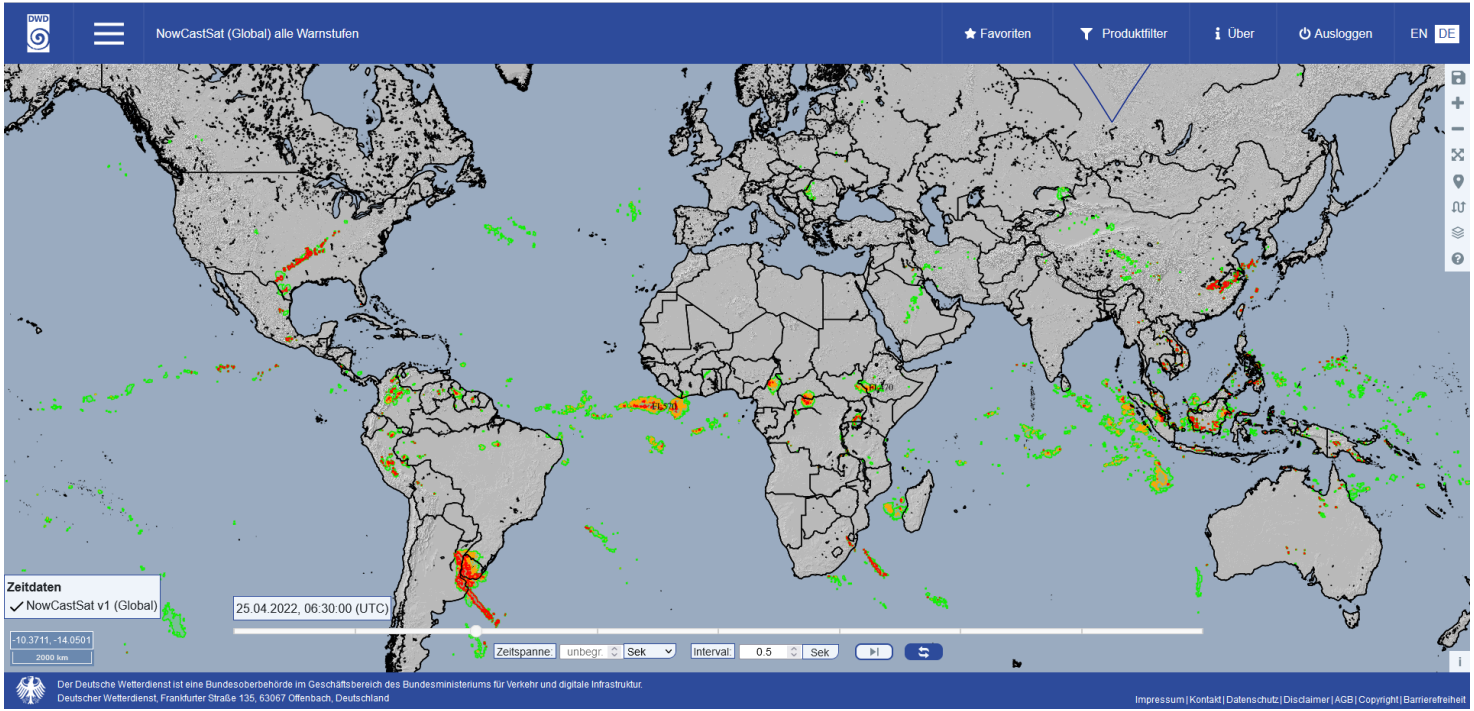
Wetter und Klima aus einer Hand



NowCastSat-Aviation (NCS-A) 25.04.2022, 06:30:

Cockpit of the Lufthansa (eRouteManual/LSY)

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Lufthansa flight over China during the trial phase in 2021.

Operational at Lufthansa in the cockpits for long distance Flights since May 2022.

Situational awareness:
Area beyond waypoint PADNO (outside the onboard radar) is free of sev thunderstorms.

Bordradar

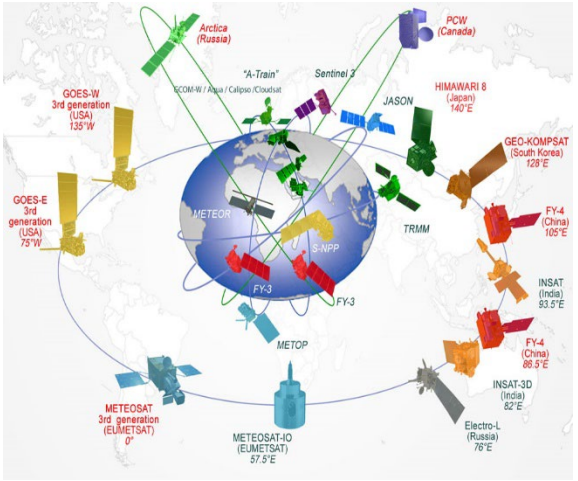
Electronic-Flight-Bag

Matthias Jerg, Axel Barleben, DWD

Global Nowcasting of Convection for Aviation

Input data:

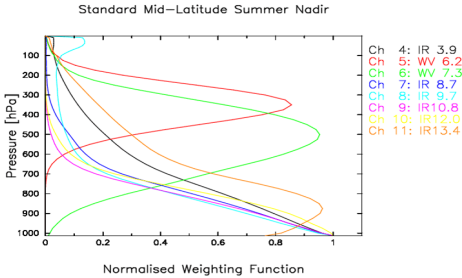
- ➔ Measurements from geostationary SAT: MSG, -IODC, HIMAWARI, GOES-16/17
- ➔ Global lightning data Vaisala GmbH.
- ➔ NWP (ICON) data for filtering to reduce FAR.



Result of the NowCastSat-Aviation (NCS-A):

- ○ severity of convection
- ○ cloud top
- ○ Nowcasting up to +2h using “Optical Flow”

convection	property	threshold
Light	shallow convection **or** lightning	BT_WV062 – BT_WV073 > -1 **and** KO<2 **or** lightning_20min
Moderate	mature deep convection **or** overshooting top	BT_WV062 – BT_WV073 > 0.7 **or** BT_WV062 – BT_IR108 > 2 **and** KO<2
severe	lightning	lightning_20min



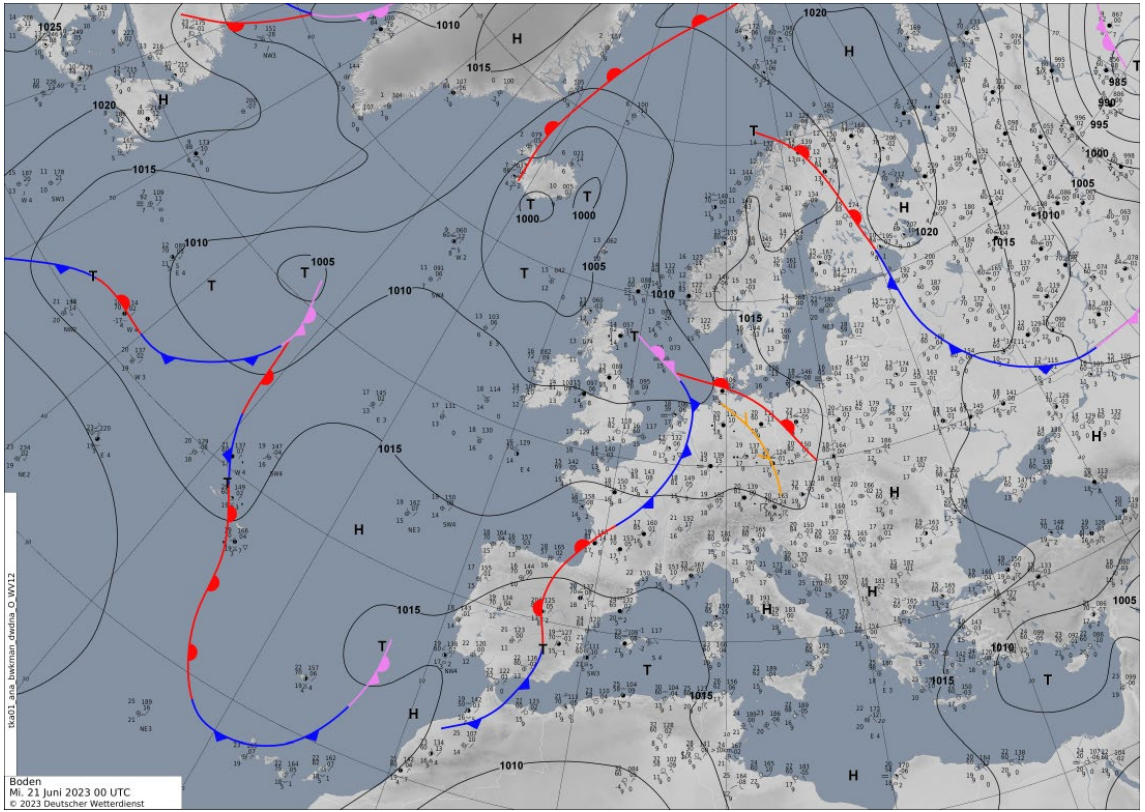
Axel Barleben, Richard Müller DWD

Current Severe Weather Situation

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Analysis Chart
produced within NinJo

Today 00 UTC

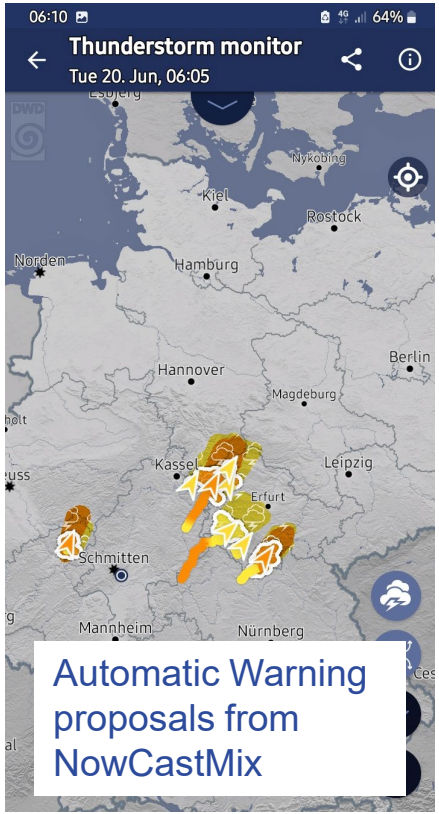


Current Severe Weather Situation

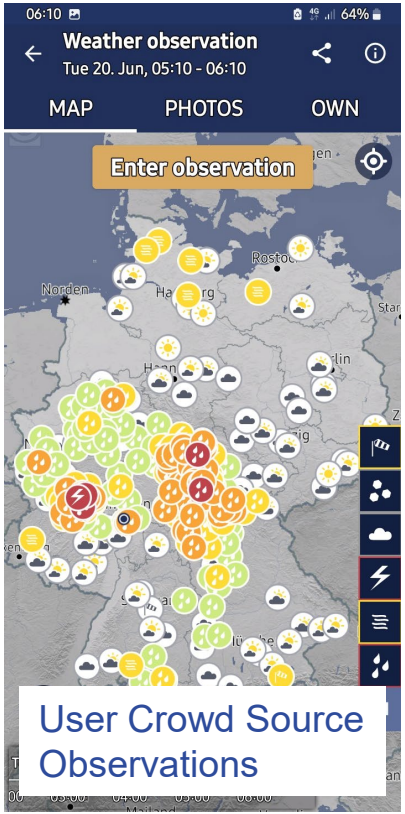
Products for general public within the DWD WarnWeather APP yesterday morning

Products within the DWD APP WarnWeather

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

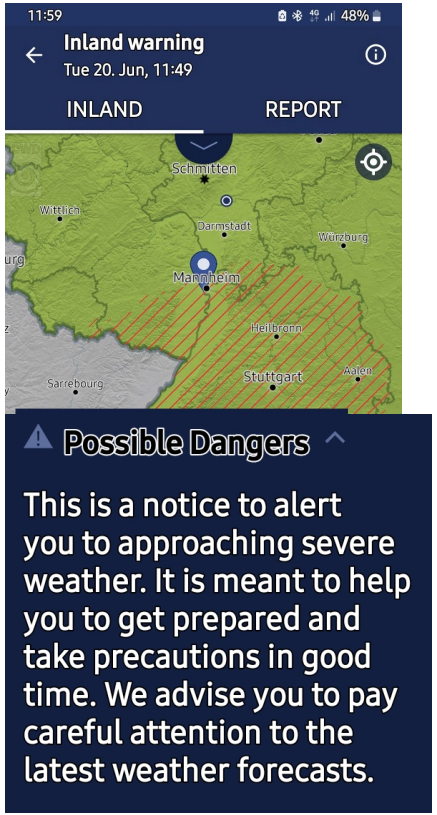


Automatic Warning proposals from NowCastMix



User Crowd Source Observations

Warning Trend for Offenbach

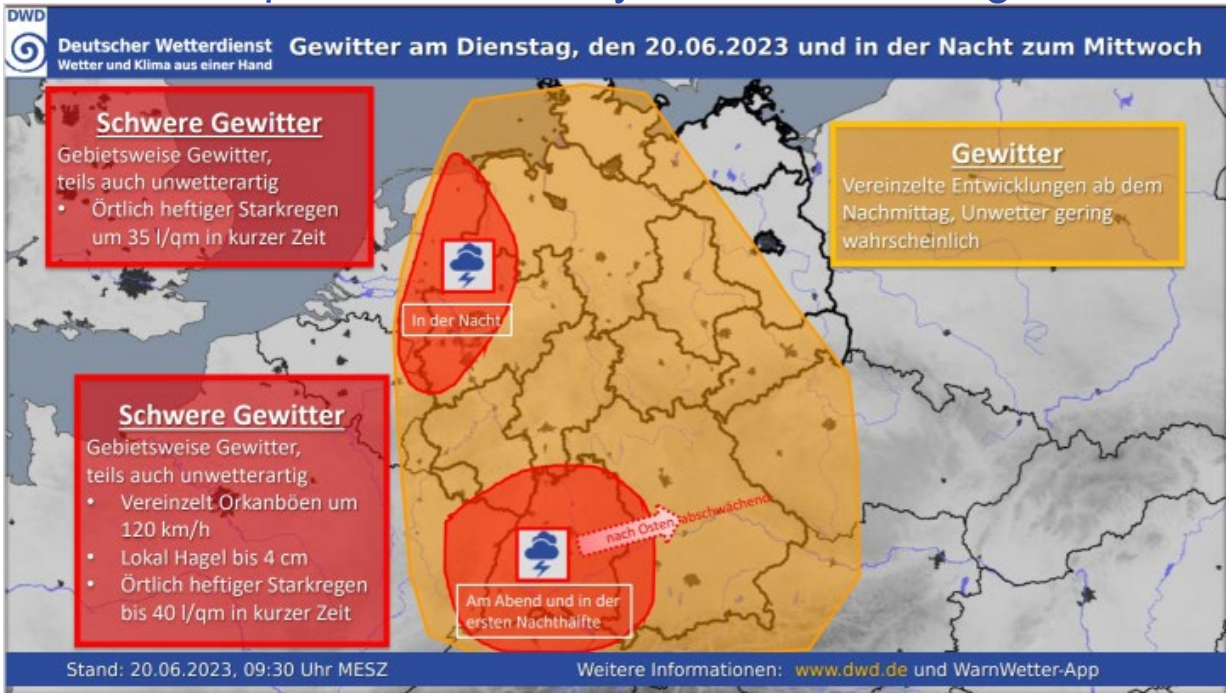


Issued Pre-Warning

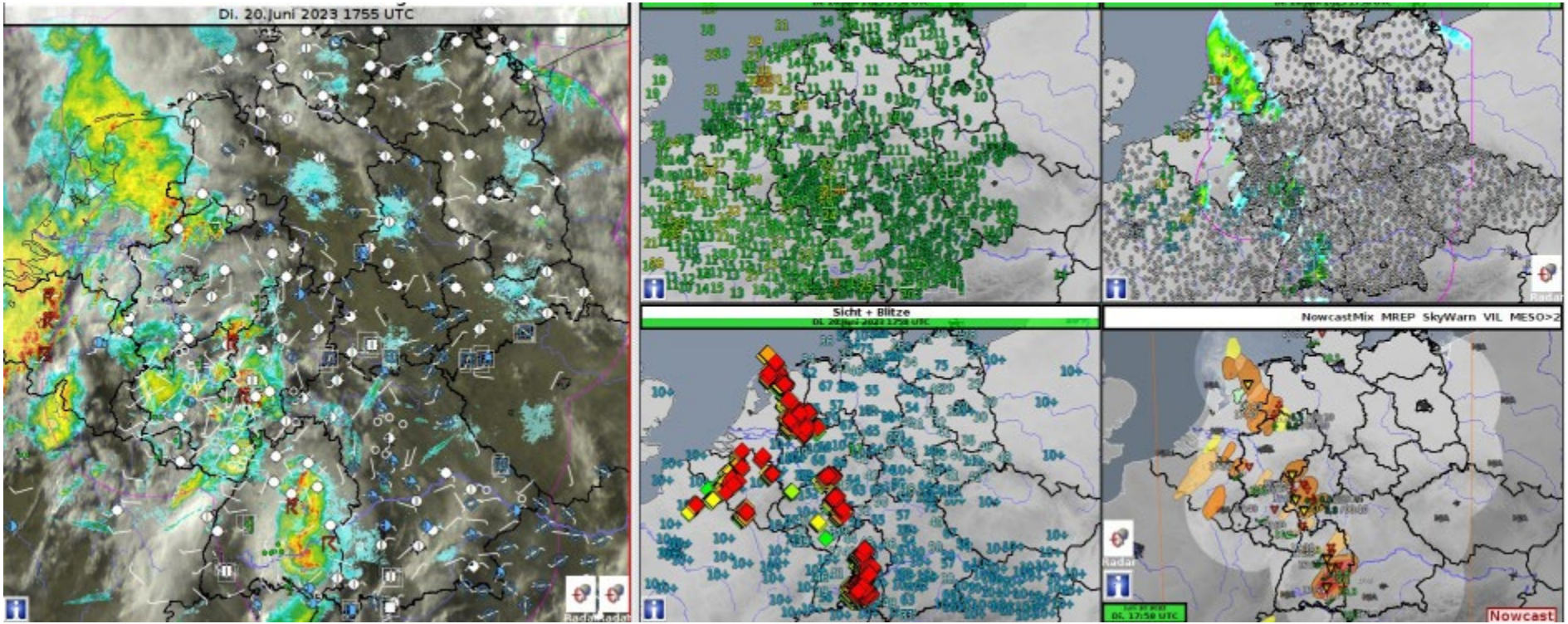
Current Severe Weather Situation

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Situation Map issued Tuesday until this morning for Civil Protection



Current Severe Weather Situation

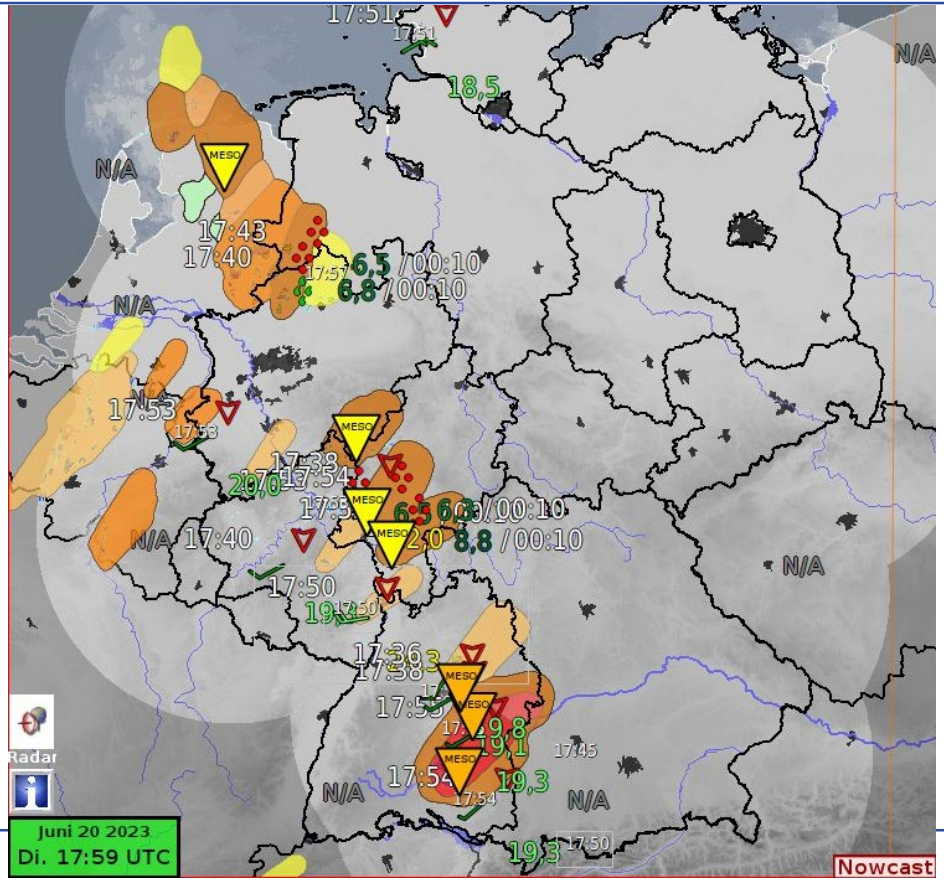


Monitoring Tue 17:55 UTC Weather, Gusts, Lightning, Prec1h, NowCastMix

Current Severe Weather Situation

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

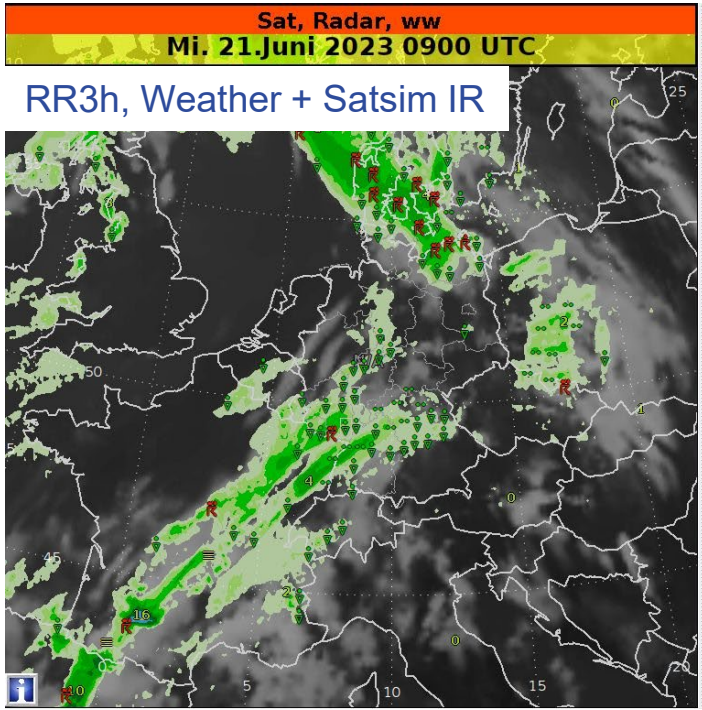
Monitoring Tue 17:59 UTC NowCastMix Mesocyclone Warnings



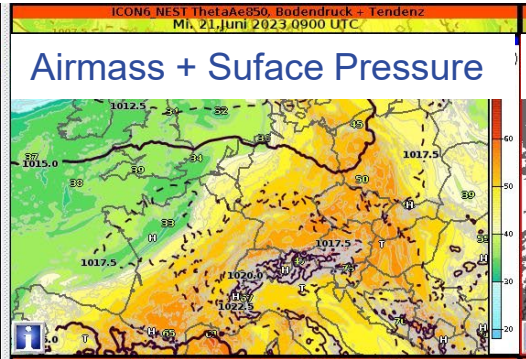
Current Severe Weather Situation

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

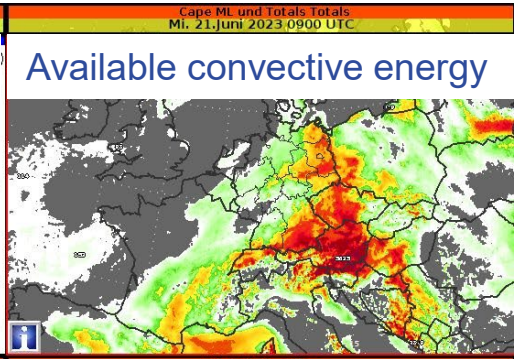
Simulated situation from ICON-EU (Tue 12 run) for today 9 UTC



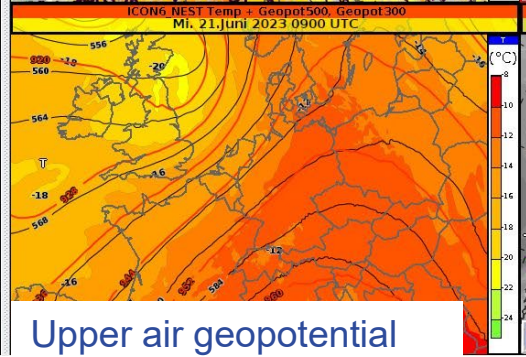
RR3h, Weather + Satsim IR



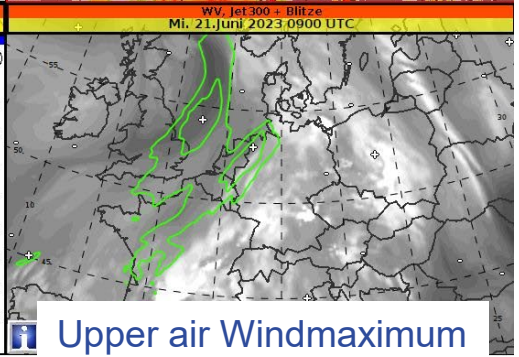
Airmass + Suface Pressure



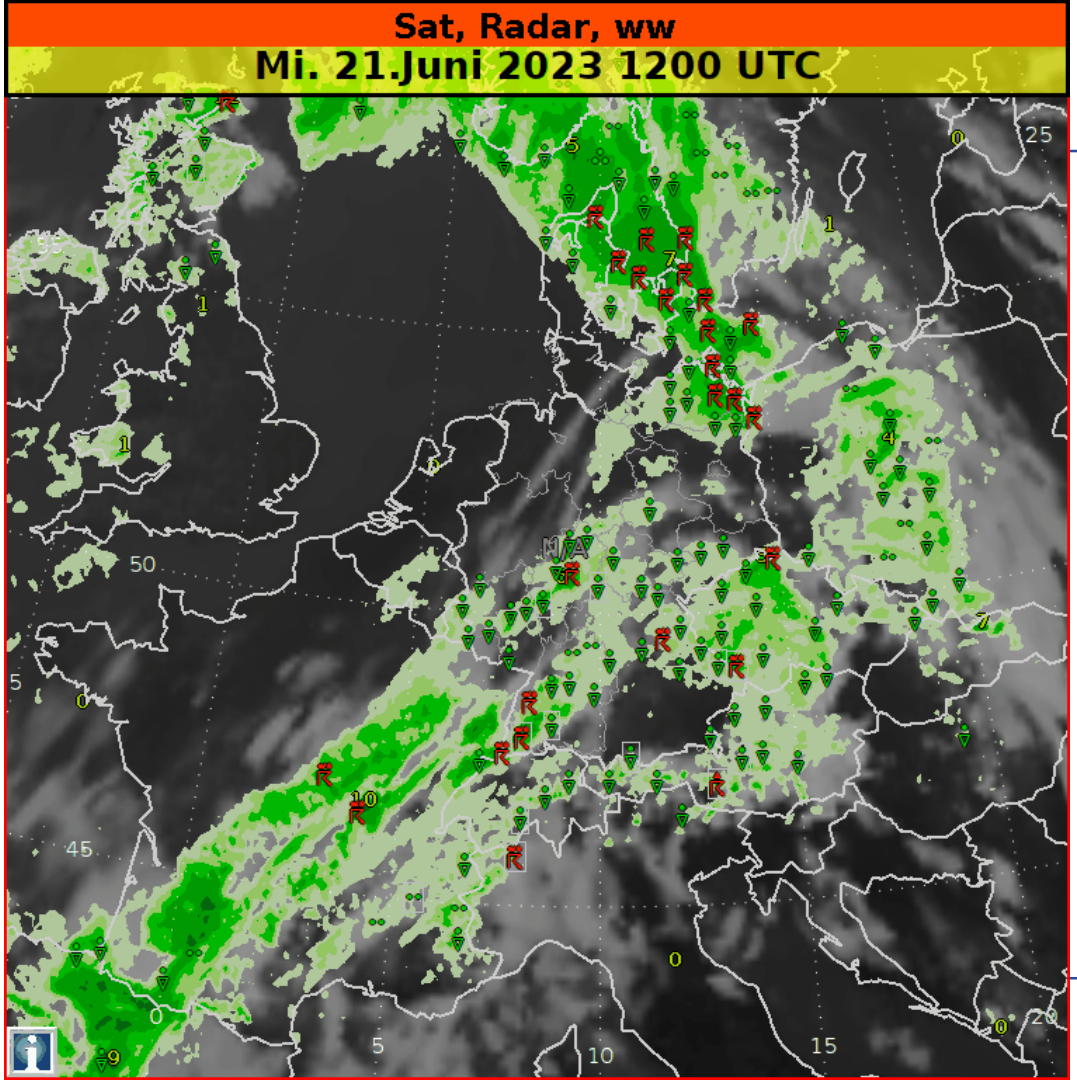
Available convective energy



Upper air geopotential and Temperature



Upper air Windmaximum and Water Vapor Satsim



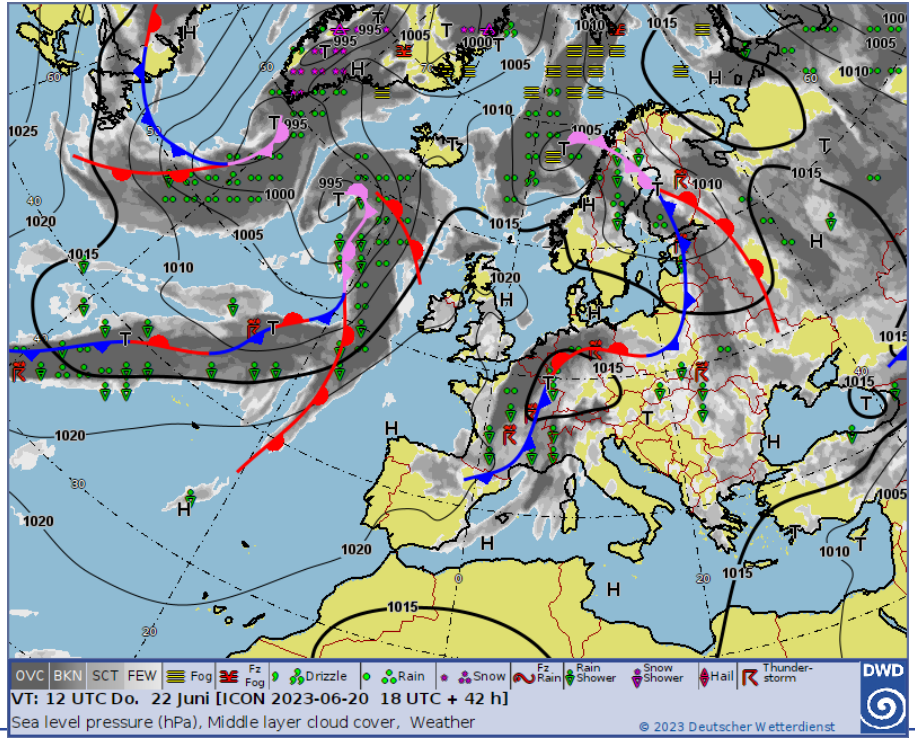
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

RR3h, Weather + Satsim IR
Loop from today 12 until Friday 00 UTC
simulated from ICON-EU (Tue 12 run)

Severe Weather Situation Thursday

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Forecast for Thursday 12 UTC from ICON with surface fronts produced via NinJo

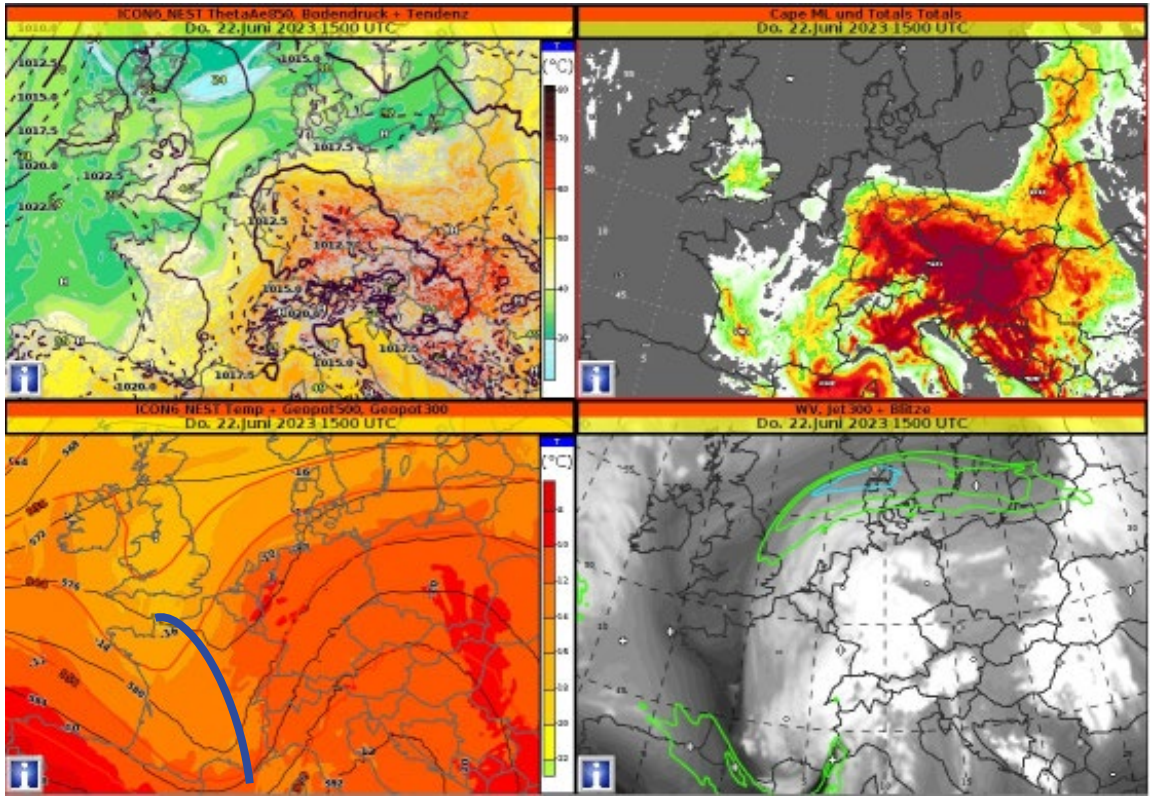


Severe Weather Situation Thursday

Deutscher Wetterdienst
Wetter und Klima aus einer Hand

ICON-EU (Tue 12) forecast for Thursday 15 UTC

Extreme Instability with CAPE ~4000 J/kg ahead of a trough aproaching from SW

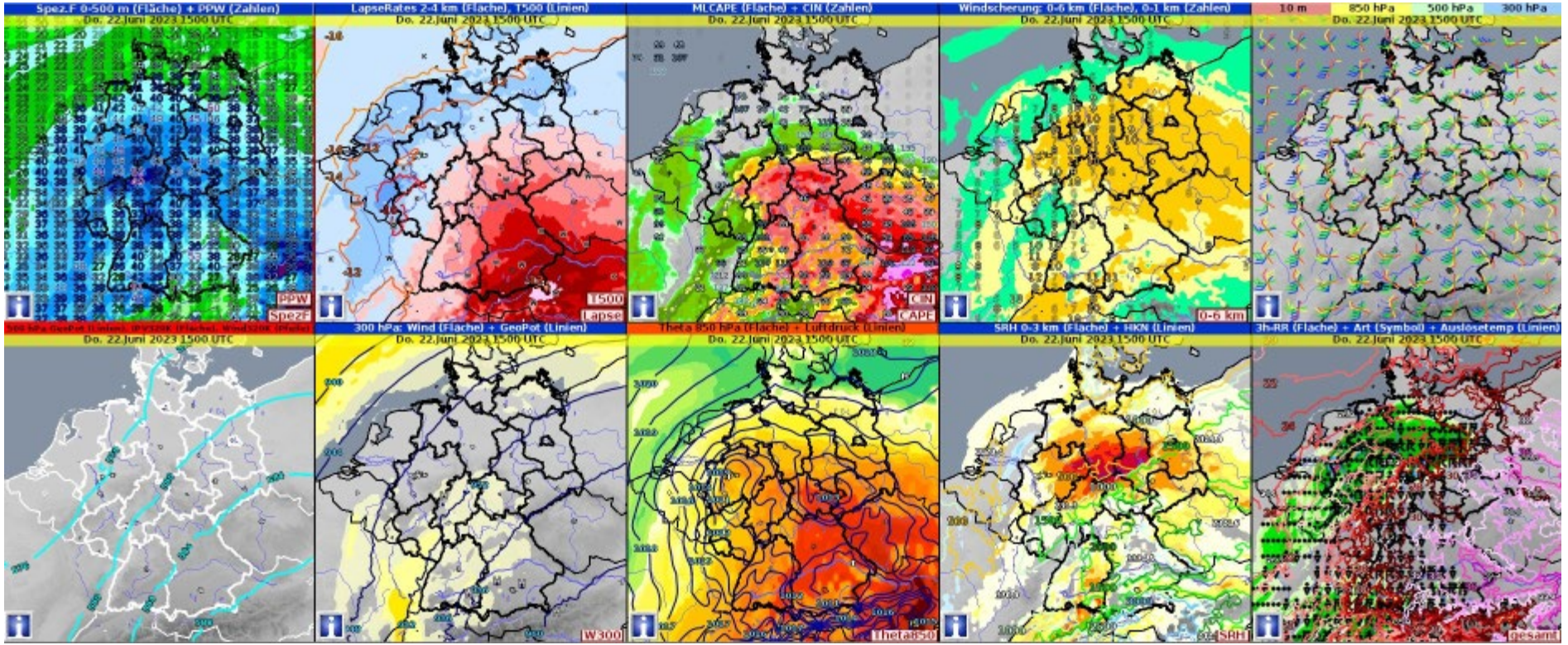


Severe Weather Situation Thursday

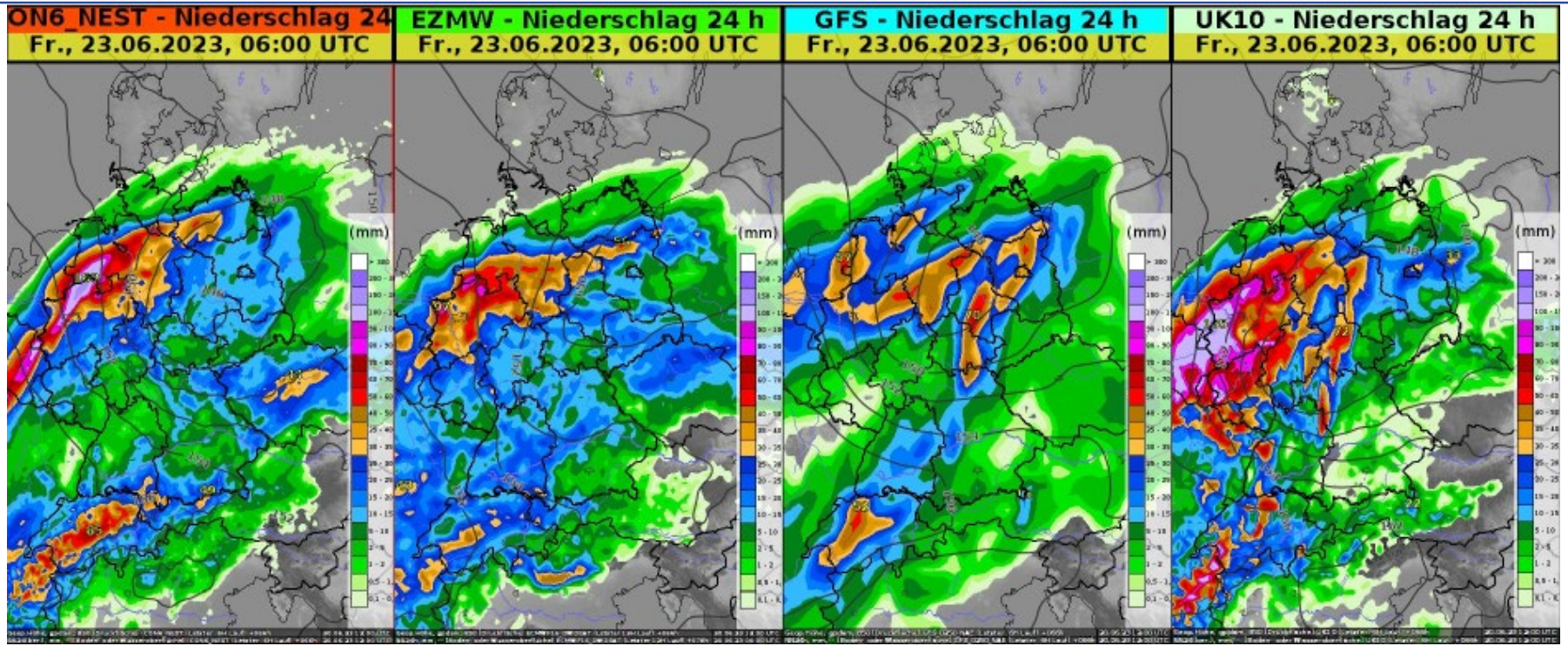
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

ICON-D2 (Tue 12) forecast for Thursday 15 UTC

Fields necessary to calculate tunderstorm type potential for large hail hurricane force and tornados



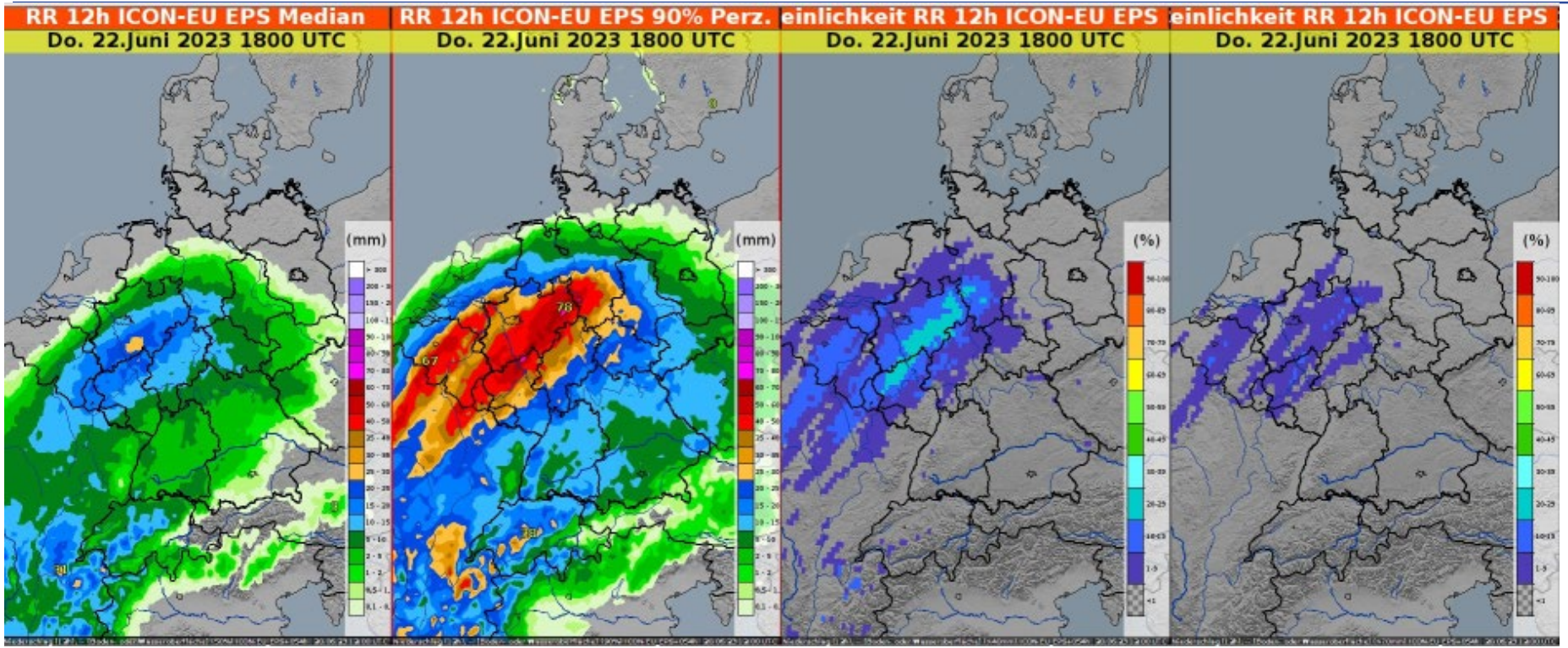
Severe Weather Situation Thursday



RR24h Do00 - Fr00 NWP Comparison (DWD, EZMW, GFS, MetOffice) pink: > 100 mm

Severe Weather Situation Thursday

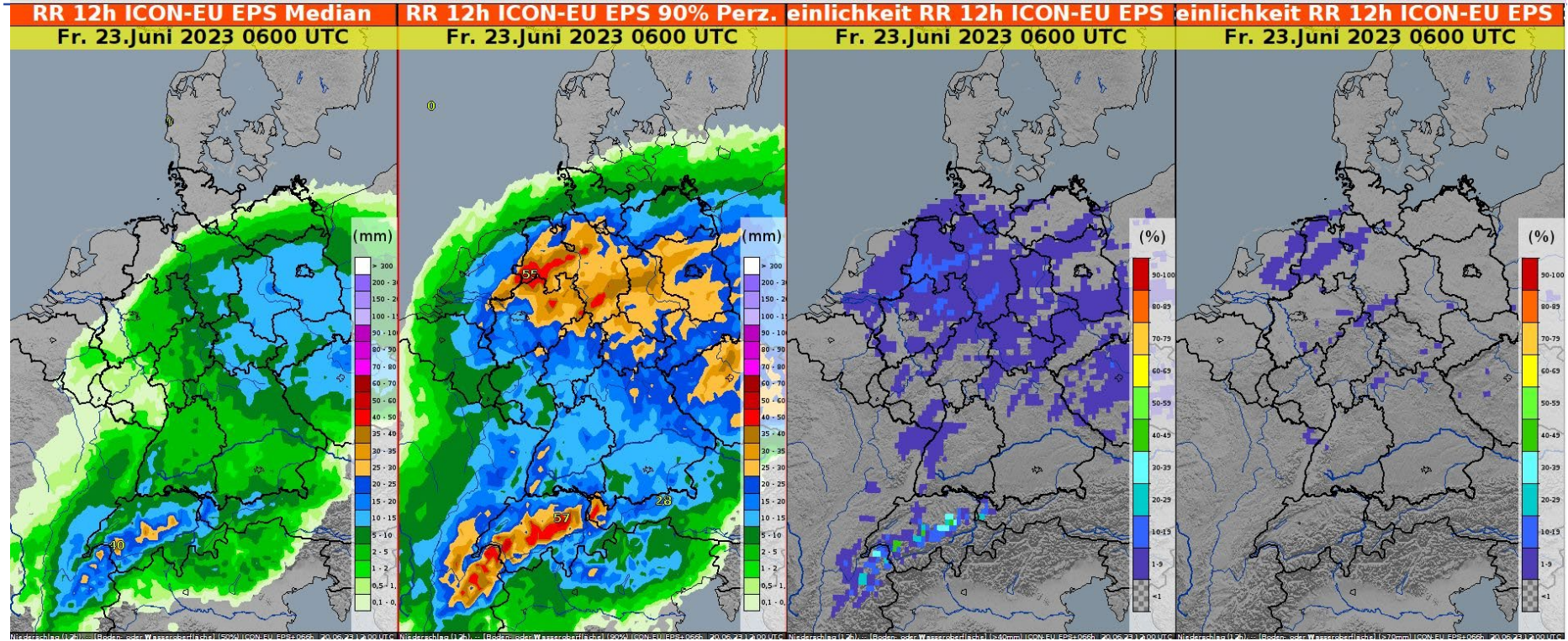
Deutscher Wetterdienst
Wetter und Klima aus einer Hand



RR12 Icon EU EPS Do 18 UTC mean, 90% Perz, Prob for Severe, Prob extreme Prec.

Severe Weather Situation Thursday

Deutscher Wetterdienst
Wetter und Klima aus einer Hand



RR12 Icon EU EPS Fr 06 UTC, mean, 90% Perz, Prob for Severe, Prob extreme Prec.

Severe Weather Situation Thursday

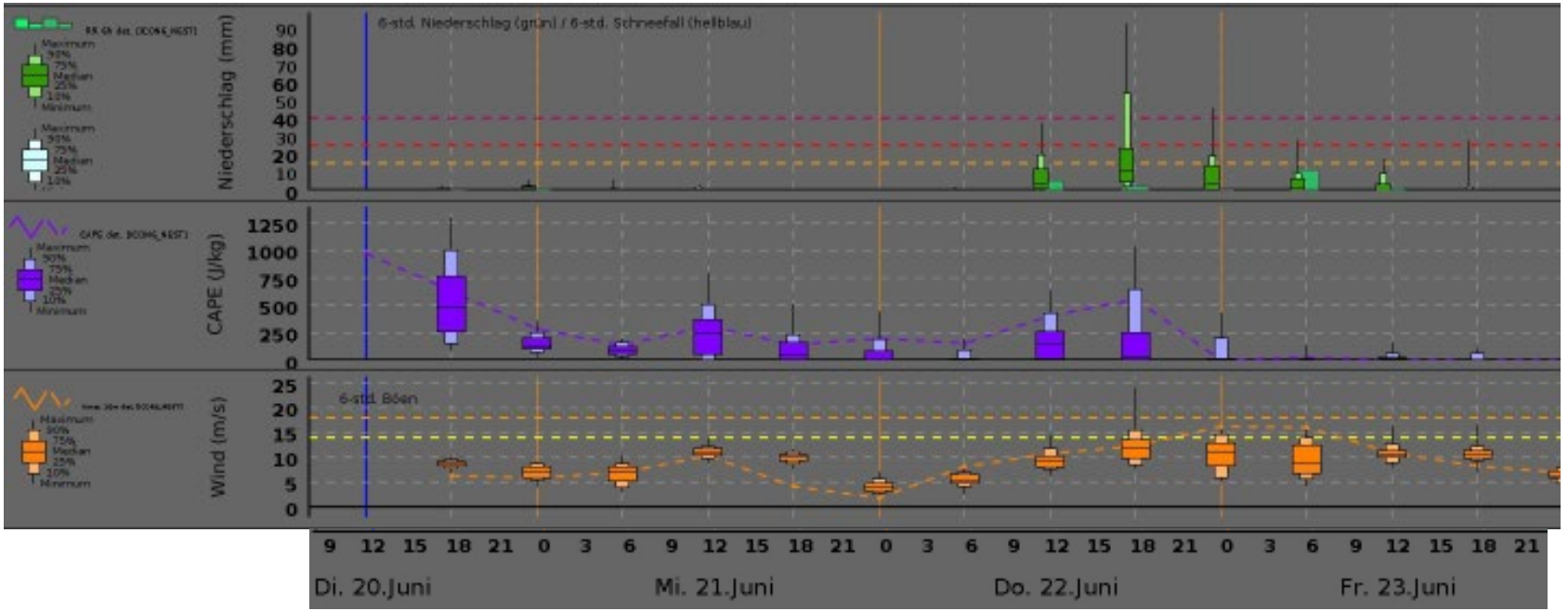
Deutscher Wetterdienst
Wetter und Klima aus einer Hand

Icon EU EPS Meteogram Di 12 – Fr 21 UTC for Offenbach

Precip.

Cape

Gusts



Thank you very much
for your attention!
Any quetions?
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+49(0)6980622600