



Meteorologisk  
institutt

# Nowcasting in weather warnings

03.06.2022

Klassifisering: Åpen / Intern / Skjermet

# Subjects for this presentation

- An overview of MET Norway's danger warnings
- An overview of MET Norway's nowcasting tools
- Weather case(s) where nowcasting was used
- Wishes for the future

# Danger warnings issued by MET Norway

- Wind
- Rain
- **Rain flood**
- **Lightning**
- Snow
- Blowing snow
- Ice
- High tide
- Forest fire
- Polar lows
- Icing on vessels

# Rain flood - Warning criteria

## Old criteria

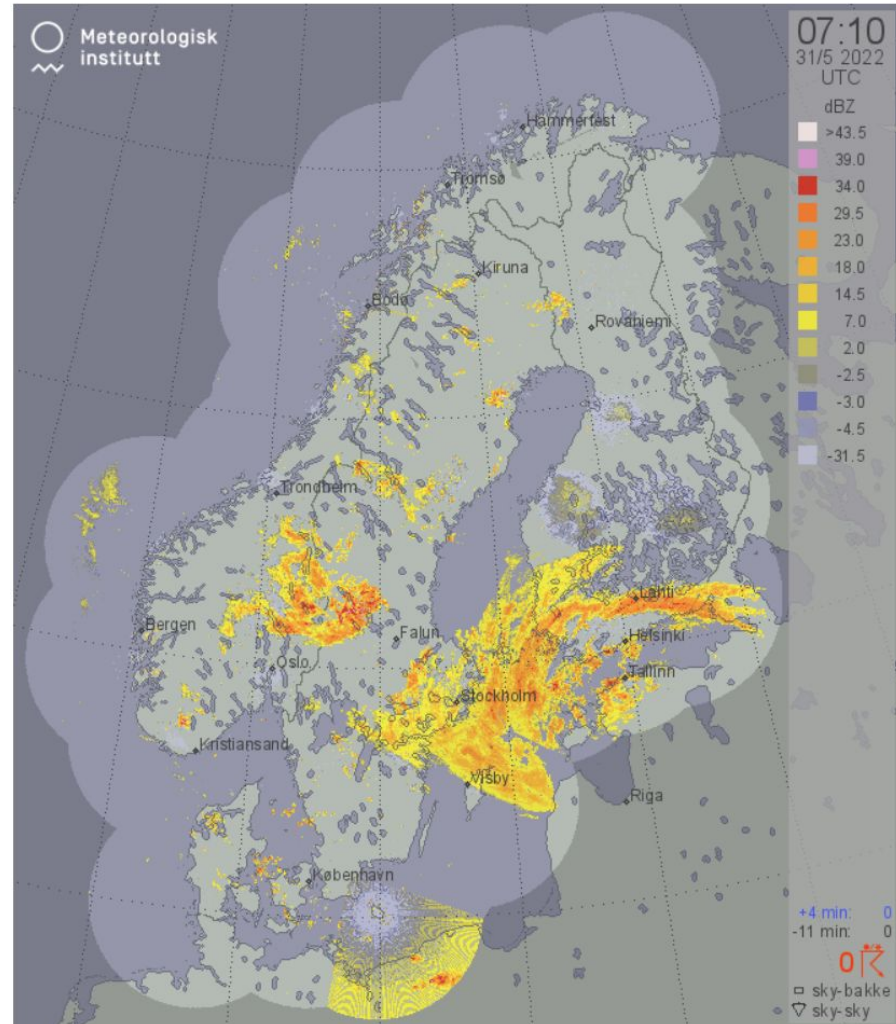
Accumulation period	Area		
1 hour	City	15 mm	20 mm
1 hour	Countryside	20 mm	25 mm
3 hours	City	25 mm	30 mm
3 hours	Countryside	30 mm	35 mm

## New criteria

Accumulation period	Area		
1 hour	All	15 mm	35 mm

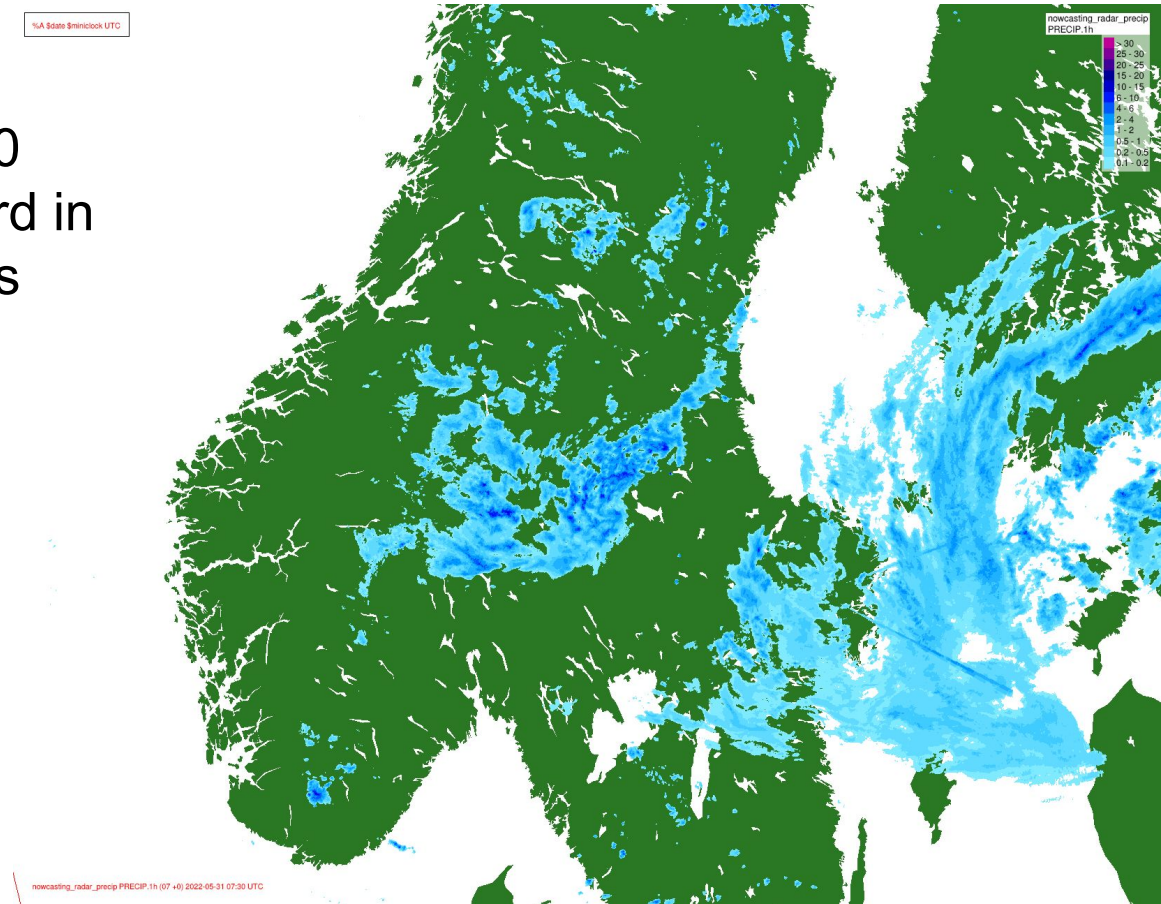
# Rain flood - nowcasting tools

- Radar
  - Animation showing precipitation and thunder from 3 hours ago until present time



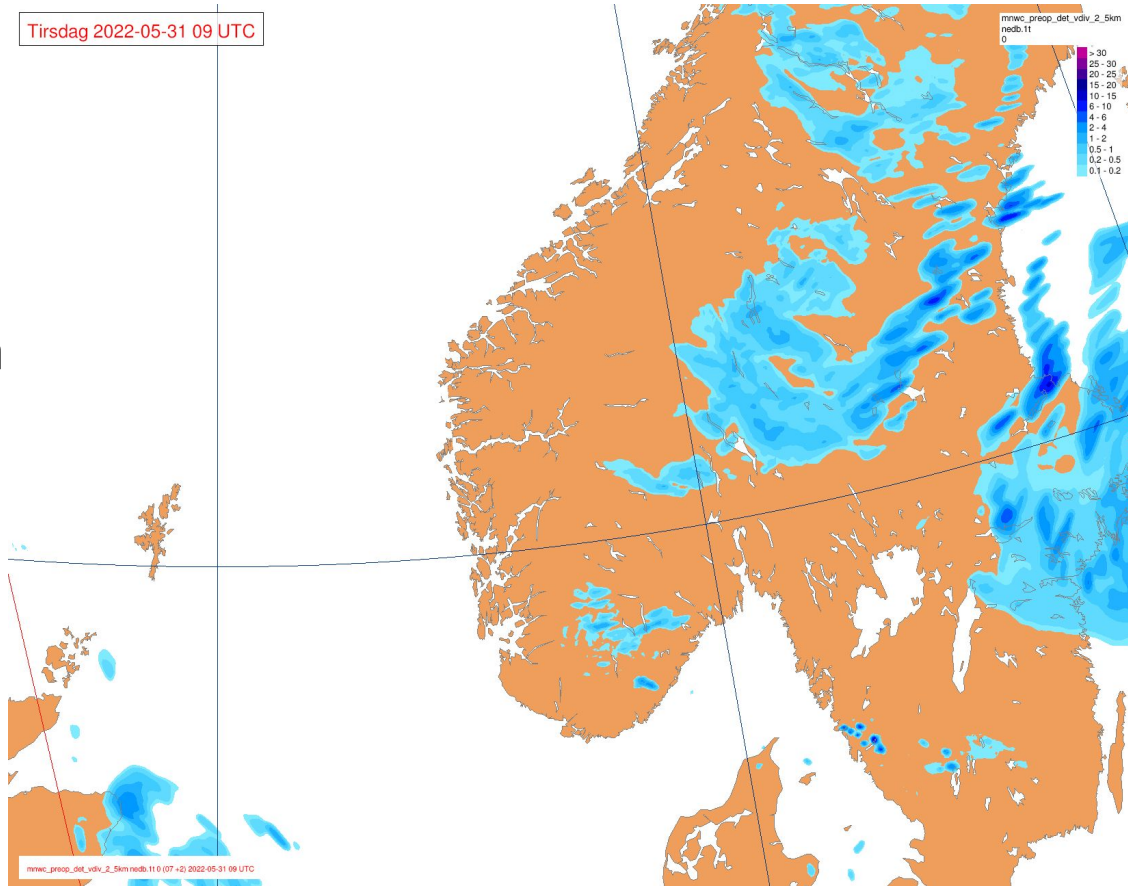
# Rain flood - nowcasting tools

- Nowcasting model
  - Projected precipitation 90 minutes forward in time, 5 minutes interval



# Rain flood - nowcasting tools

- New Nowcasting model: MNWC
  - Projected precipitation 9 hours forward in time, 1 hour interval

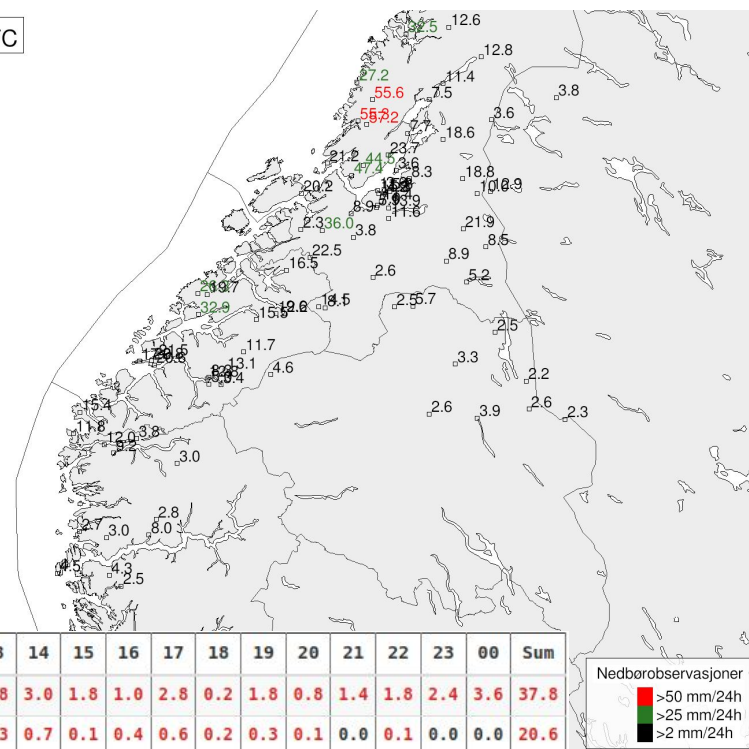




# Rain flood - nowcasting tools

- Official observations
  - Lists with hourly data and 24h accumulation period
  - Maps with 12h or 24h accumulation period

Søndag kl. 06 UTC



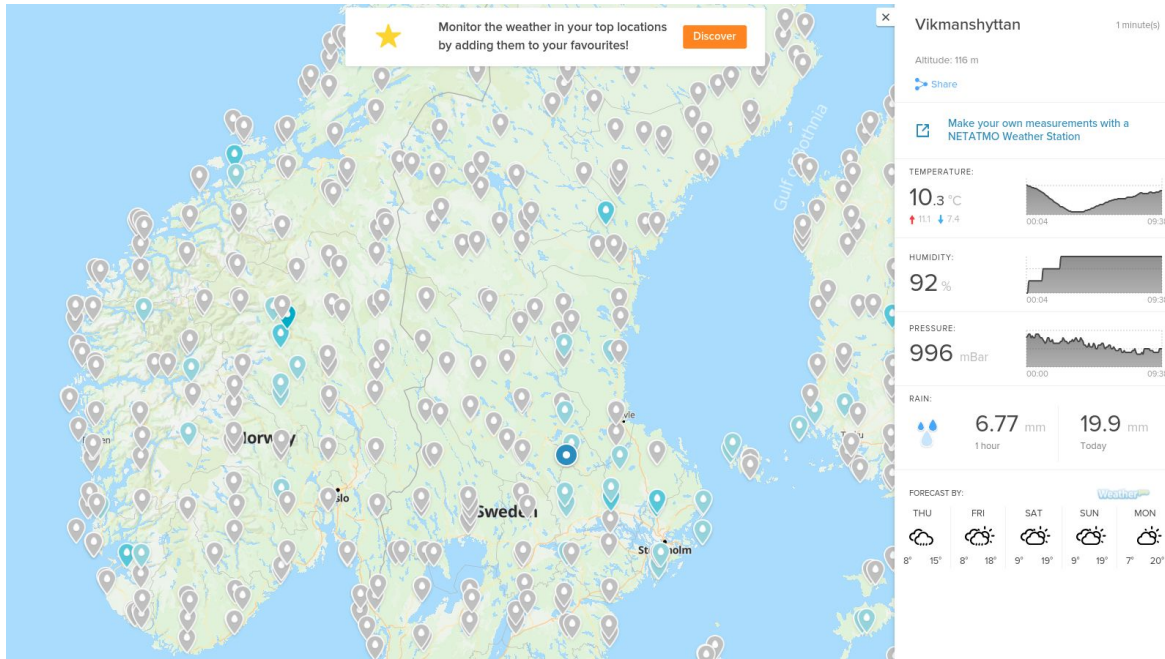
Stasjonsnavn/Klokkeslett (kan sorteres)	moh	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	00	Sum
71320 - Rissa III		0.2	0.2	1.4	0.8	2.2	1.4	1.0	1.0	1.0	1.0	2.2	2.0	2.8	3.0	1.8	1.0	2.8	0.2	1.8	0.8	1.4	1.8	2.4	3.6	37.8
67560 - Kotsøy		1.4	0.4	0.2	0.8	0.9	2.8	2.1	2.3	2.2	2.7	1.2	0.8	0.3	0.7	0.1	0.4	0.6	0.2	0.3	0.1	0.0	0.1	0.0	0.0	20.6
69380 - Meråker - Vardetun		0.2	0.2	0.6	0.6	0.7	0.6	0.8	1.2	1.1	0.3	0.1	0.1	0.1	0.9	1.2	1.1	0.7	1.1	1.3	1.0	1.8	2.0	1.0	1.6	20.3
68290 - Selbu II		0.2	0.0	0.0	0.8	1.4	1.3	1.7	2.0	1.6	1.7	0.5	0.4	1.0	1.2	1.2	0.7	0.0	0.2	0.0	0.6	0.2	0.1	1.0	0.6	18.4
65451 - Hitra - Sandstad II		0.5	0.8	0.5	0.4	0.3	0.6	2.0	1.5	0.6	1.0	1.6	0.4	0.3	0.0	0.1	0.1	0.0	0.2	0.0	0.5	0.7	1.0	0.6	1.5	15.2
70850 - Snåsa - Kjevlia		0.4	0.1	1.2	0.3	0.2	0.2	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4	1.3	1.1	0.9	0.9	0.9	1.7	10.2
73550 - Gartland		0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	2.1	0.4	0.4	0.4	0.4	0.9	1.0	1.3	1.0	0.8	9.9
72710 - Overhalla - Skogmo		0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.4	0.8	1.0	0.8	1.0	1.0	0.6	1.0	1.6	0.6	9.6

Nedbørsobservasjoner  
 >50 mm/24h  
 >25 mm/24h  
 >2 mm/24h



# Rain flood - nowcasting tools

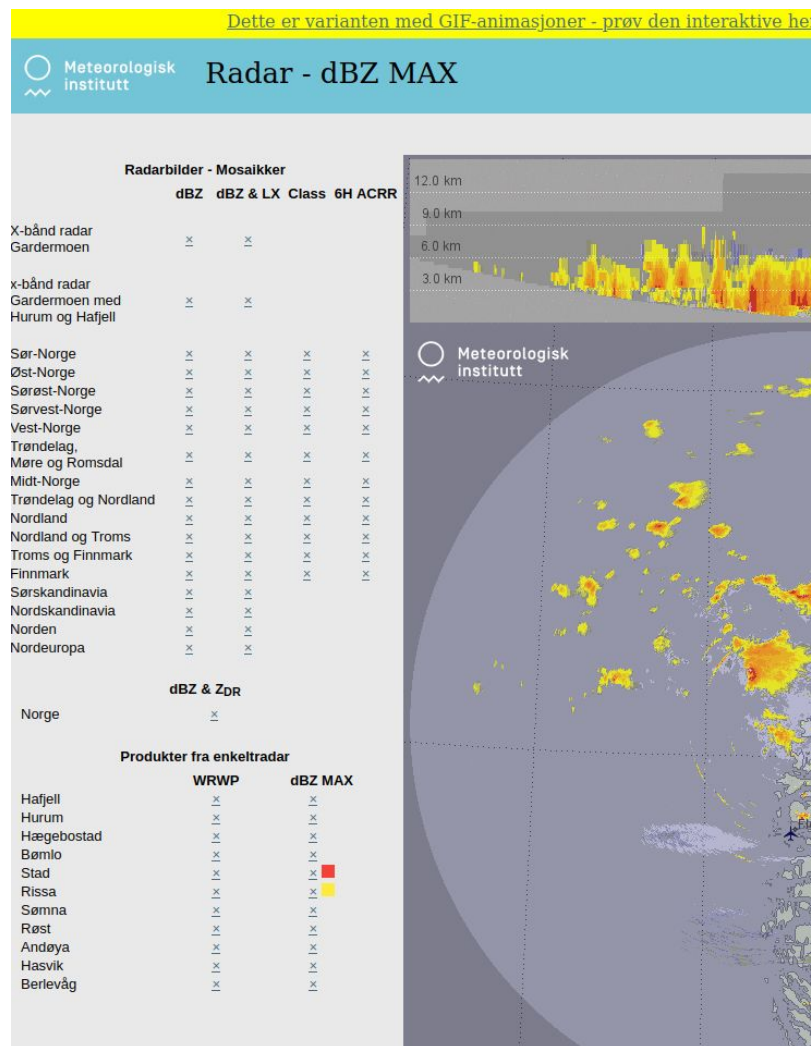
- [Netatmo](#): Private observations
  - Hourly and daily accumulated precipitation



- 

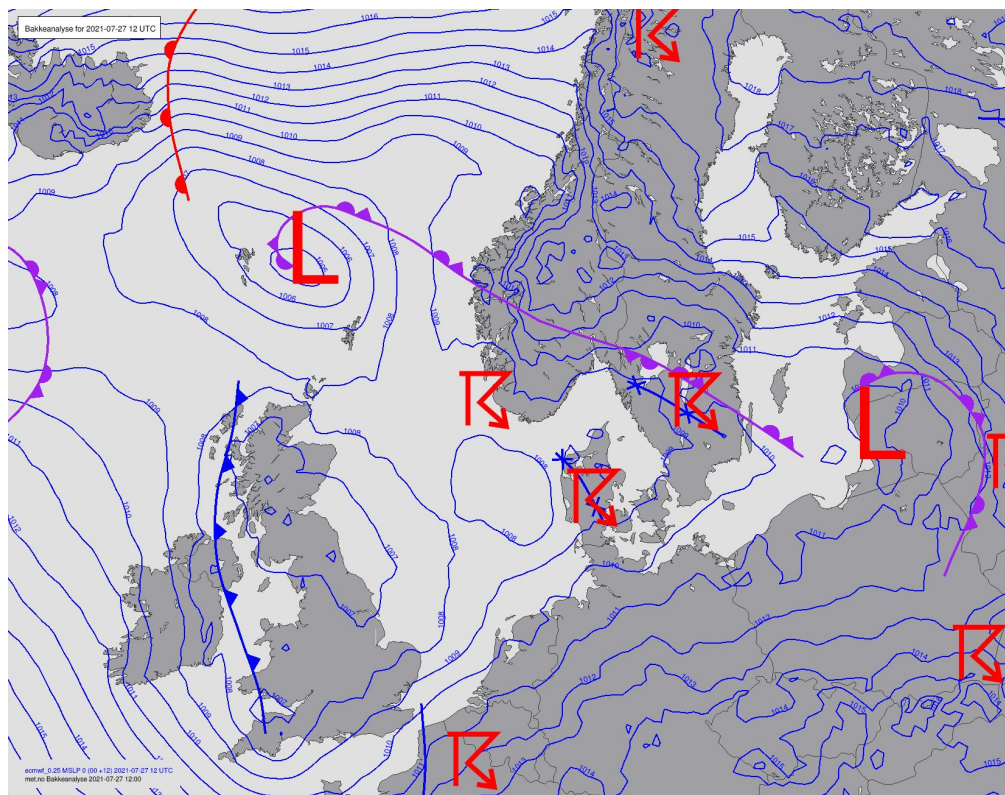
# Lightning - nowcasting tools

- New radar product
  - maxdBz radar reflectivity >44 above 2-3km height implies lightning is likely to begin in 30 minutes
  - Predicts lightning in a cell from
    - < 15 minutes ago (red)
    - 15-30 minutes ago (yellow)
    - 30-45 minutes ago (green)



# 27.07.2021

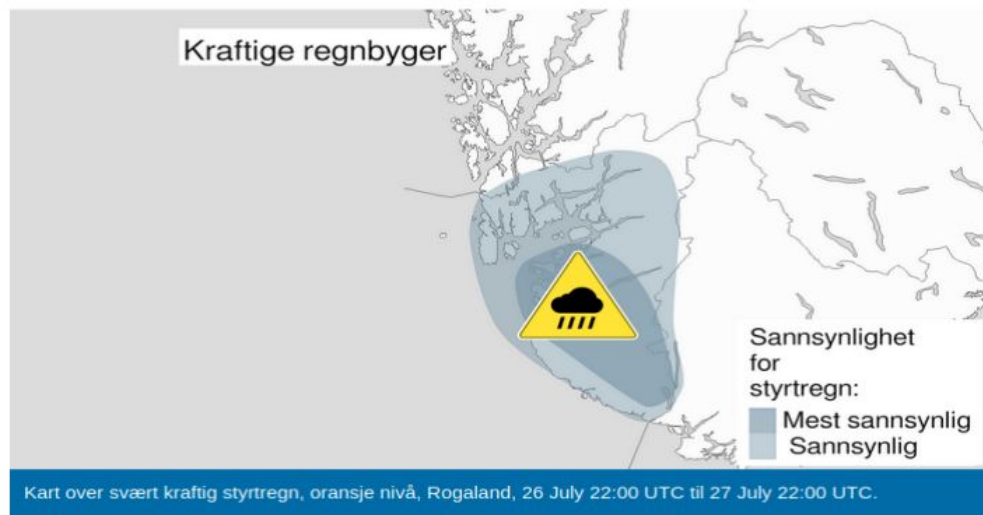
- The weather situation:
  - A high pressure system with warm, moist air was replaced by a synoptic low pressure system
  - Vertical wind shear
  - High level trough
  - High dew point temperature
  - High specific humidity
  - High CAPE values





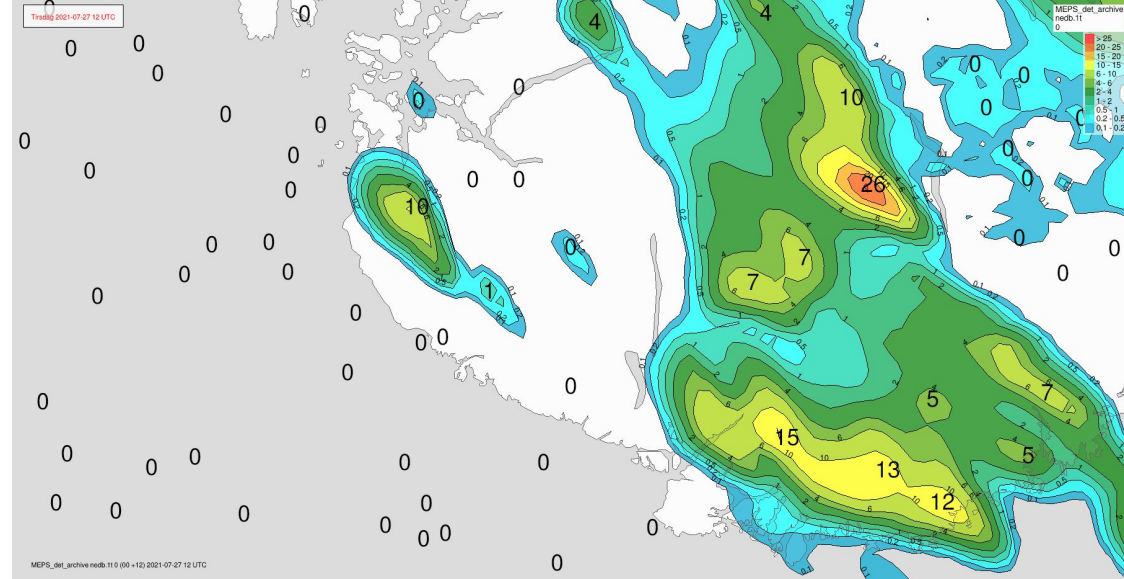
# 27.07.2021

- A yellow rain flood danger warning was issued one day in advance for SW Norway
- A yellow lightning danger warning was issued one day in advance for parts of southern Norway

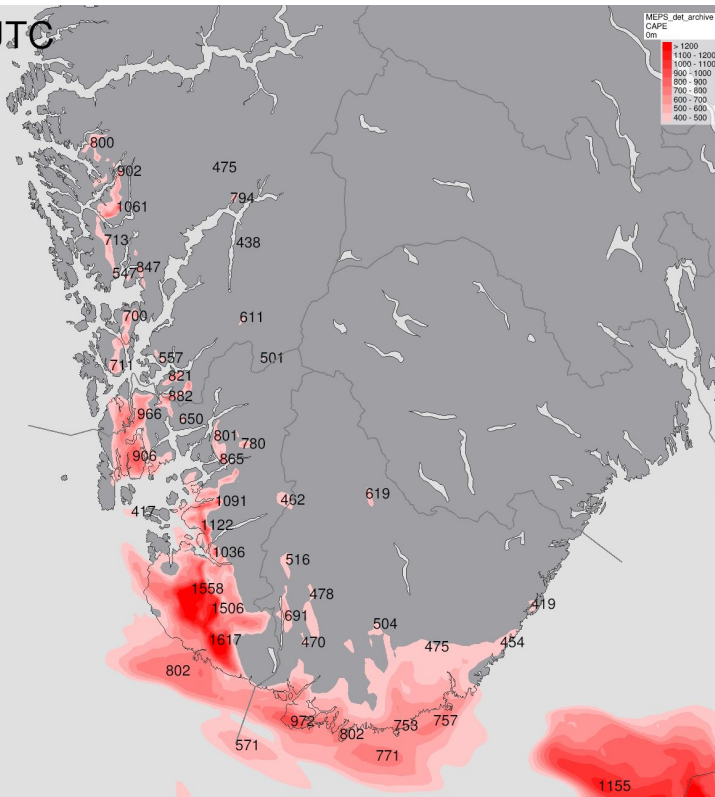


# 27.07.2021

- 1h precipitation from the MEPS weather model



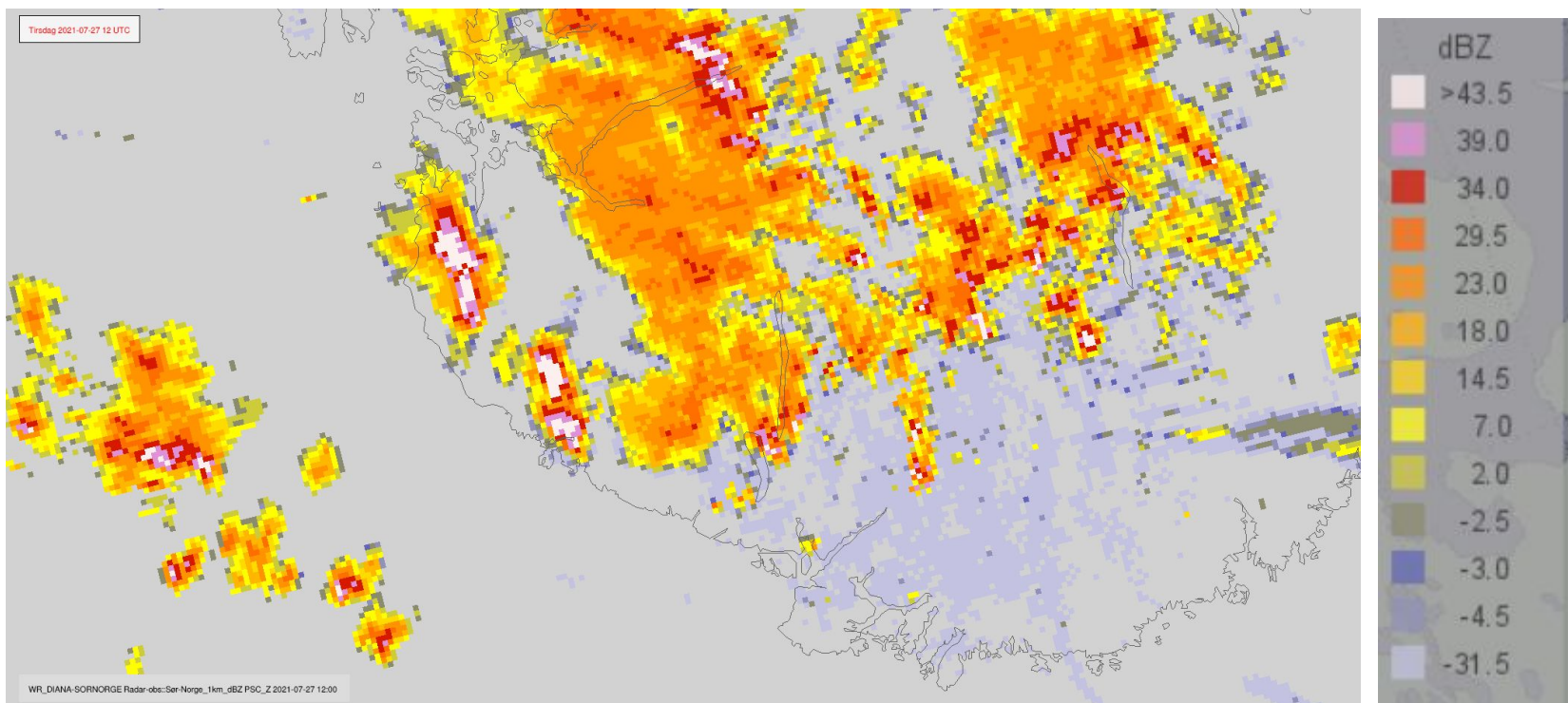
2021-07-27 13 UTC



- CAPE values (instability index) from the MEPS weather model

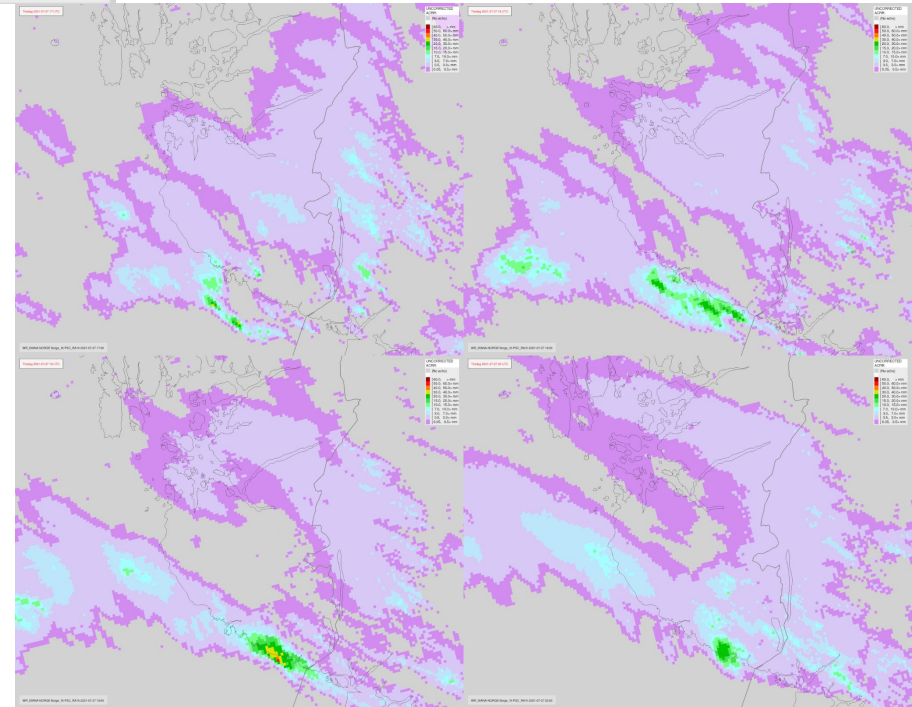
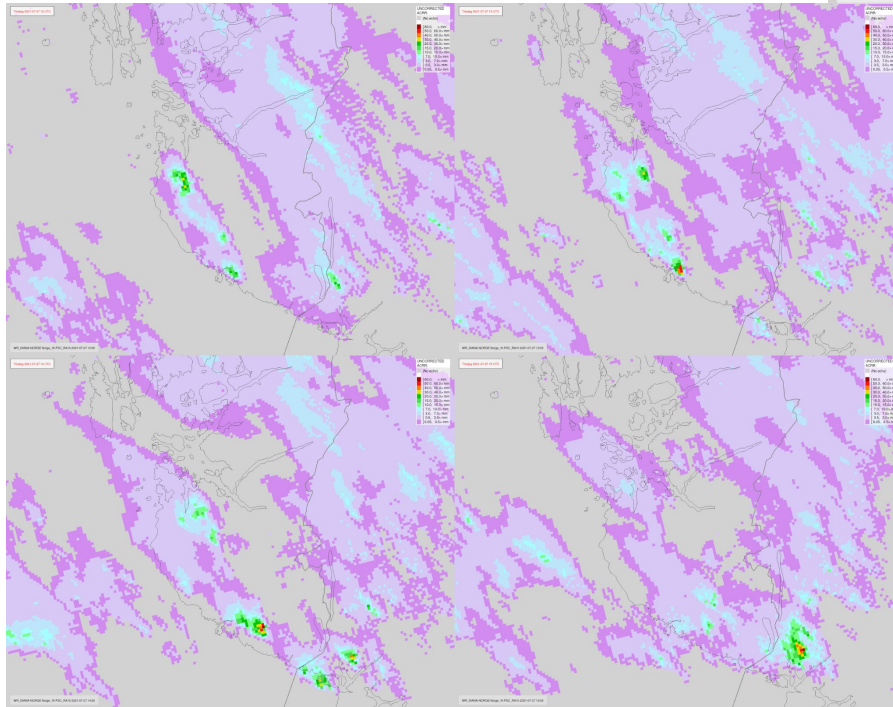
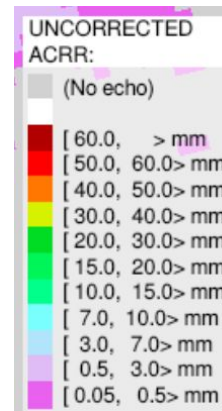
# 27.07.2021

- Hourly radar animation from 12 UTC - 24 UTC
- The danger warning in SW Norway was upgraded from yellow to orange level in the afternoon



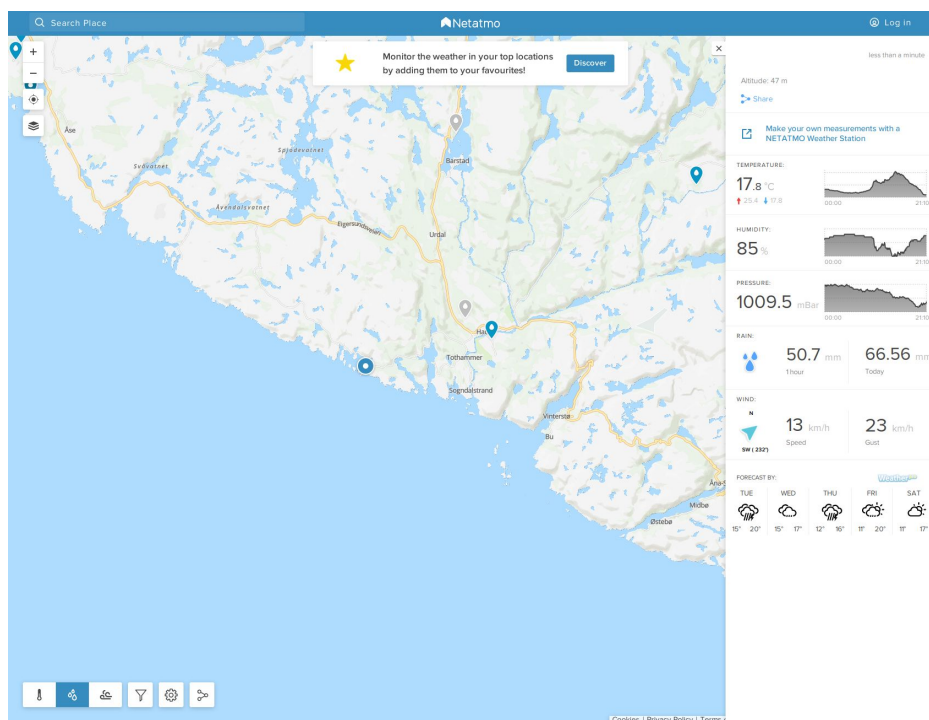
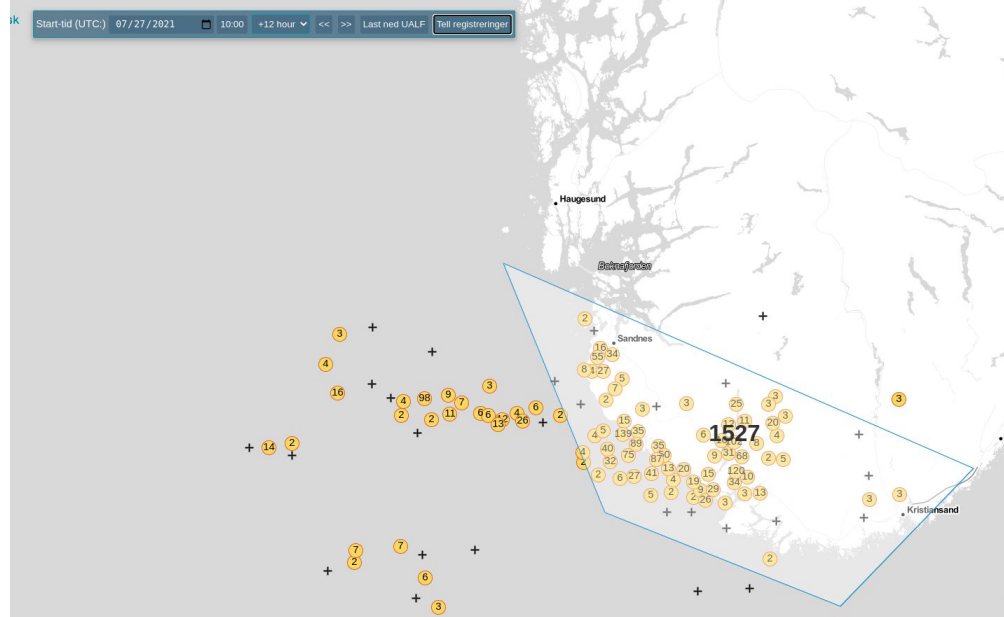


# 27.07.2021



- Hourly accumulated precipitation from the radar at 12-15 UTC (left) and 17-20 UTC (right)

# 27.07.2021



	Stasjonsnavn	Klokkeslett	RR_1
1	44080 - OBRESTAD FYR (24 moh)	02:00	27.0
2	44300 - SÆRHEIM (87 moh)	15:00	20.4
3	44730 - SANDNES - ROVIK (19 moh)	16:00	11.9
4	43010 - EIK - HOVE (65 moh)	10:00	11.7
5	44610 - KVITSØY - NORDBØ (21 moh)	02:00	10.4
6	44530 - TJELTA (29 moh)	03:00	9.7
7	43010 - EIK - HOVE (65 moh)	09:00	9.2
8	46220 - GULLINGEN SKISENTER (639 moh)	17:00	8.5
9	44300 - SÆRHEIM (87 moh)	02:00	8.3
10	44560 - SOLA (7 moh)	03:00	8.3



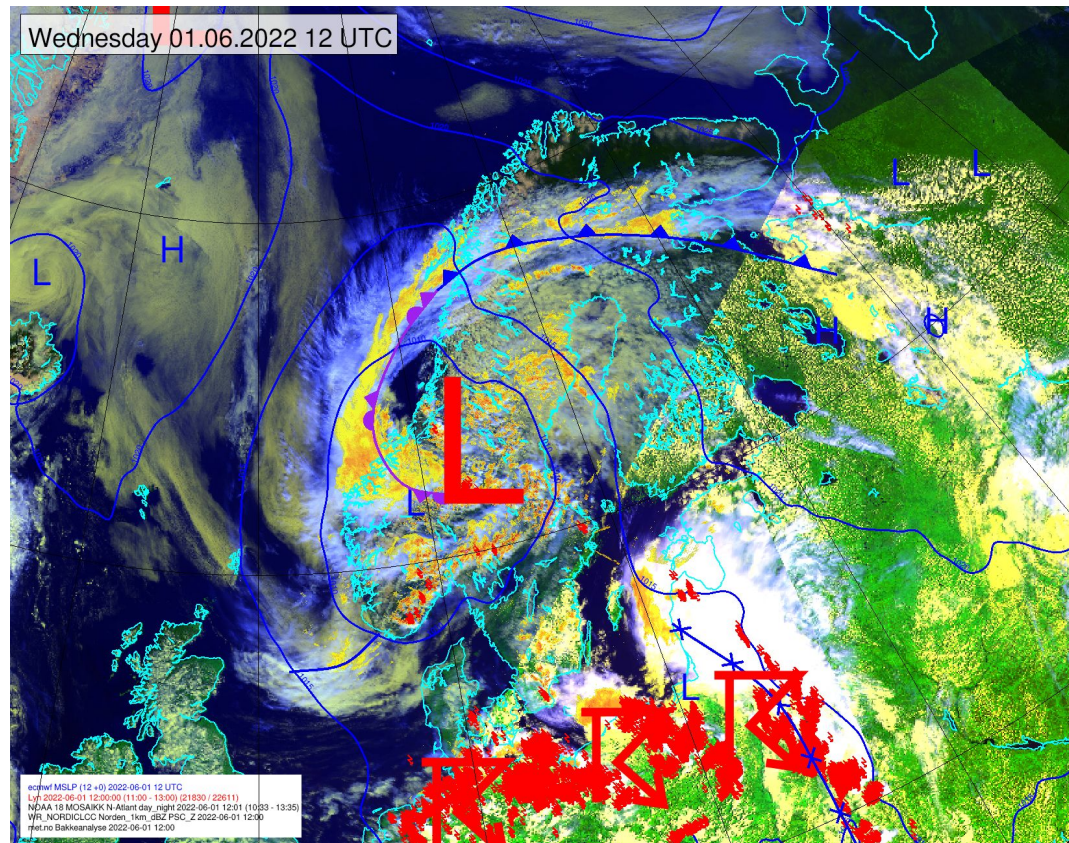
# 27.07.2021

- Summary:
  - The weather warning was upgraded to orange level due to nowcasting with radar and observations
  - The criteria for orange level was fulfilled locally by Netatmo stations
  - There were some damages due to the rain flood, but the heaviest rain avoided the most densely populated areas



# 01.06.2022

- The weather situation:
  - An occluded front bringing humid air masses and showers towards southern Norway
  - A yellow warning for lightning was issued for parts of Eastern Norway
  - It was decided to not issue a yellow warning for Mid- and Western Norway
  - Nowcasting was used to follow the situation during the afternoon/evening





# 01.06.2022

- All South Norway



- West Norway



24 timer ▾ Antall lyn: 60



- Mid Norway



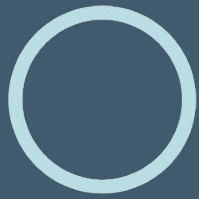
# 01.06.2022

- Summary
  - There was not enough observed lightnings in West or Mid Norway to issue a danger warning on this afternoon/evening
  - The forecaster has to follow such a situation closely, and this takes time
  - Automated suggestions for lightning danger warning would be a great help, f. ex. with a threshold of 200 lightnings in a given sized area

# What we would like to have

- Automatic suggestions for rain flood danger warnings
  - Based on radar reflectivity's calculated precipitation amount
  - Based on nowcasting model's predicted precipitation amount
  - Based on official observations
    - These are not densely situated
  - Based on private observations
    - Obviously wrong observations can be flagged
- Automatic suggestions for lightning danger warnings
  - Based on observations
  - Based on radar reflectivity?
- Automatic suggestions for other warnings (wind etc.)
  - Based on observations
  - Based on nowcasting model?





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