



# **RealPEP-P2 : Observation-based Weather Analysis and Nowcasting (QPN)**

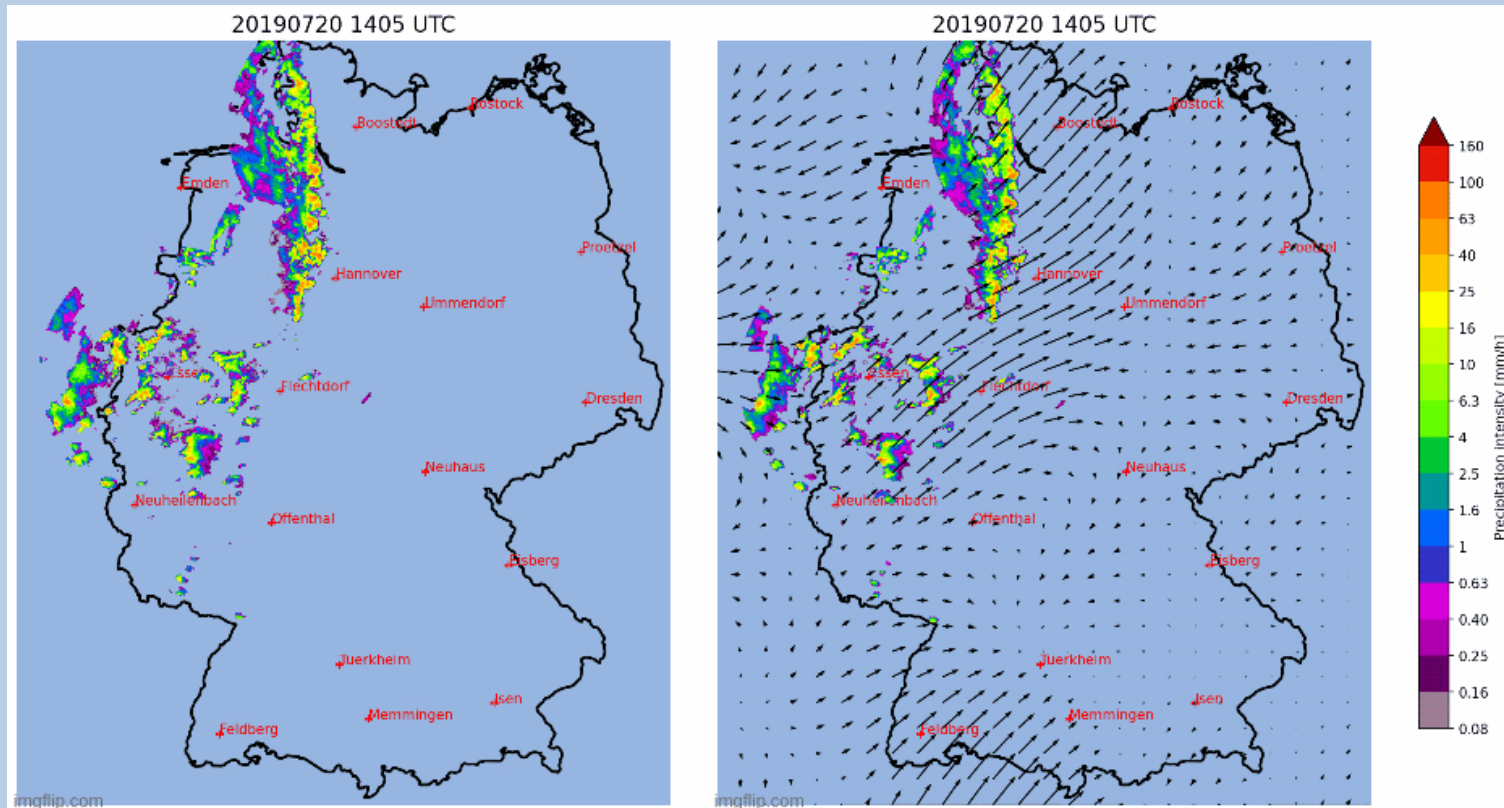
**Presented by Mathias Emond and Silke Troemel**

**On the 16 th of May 2023**

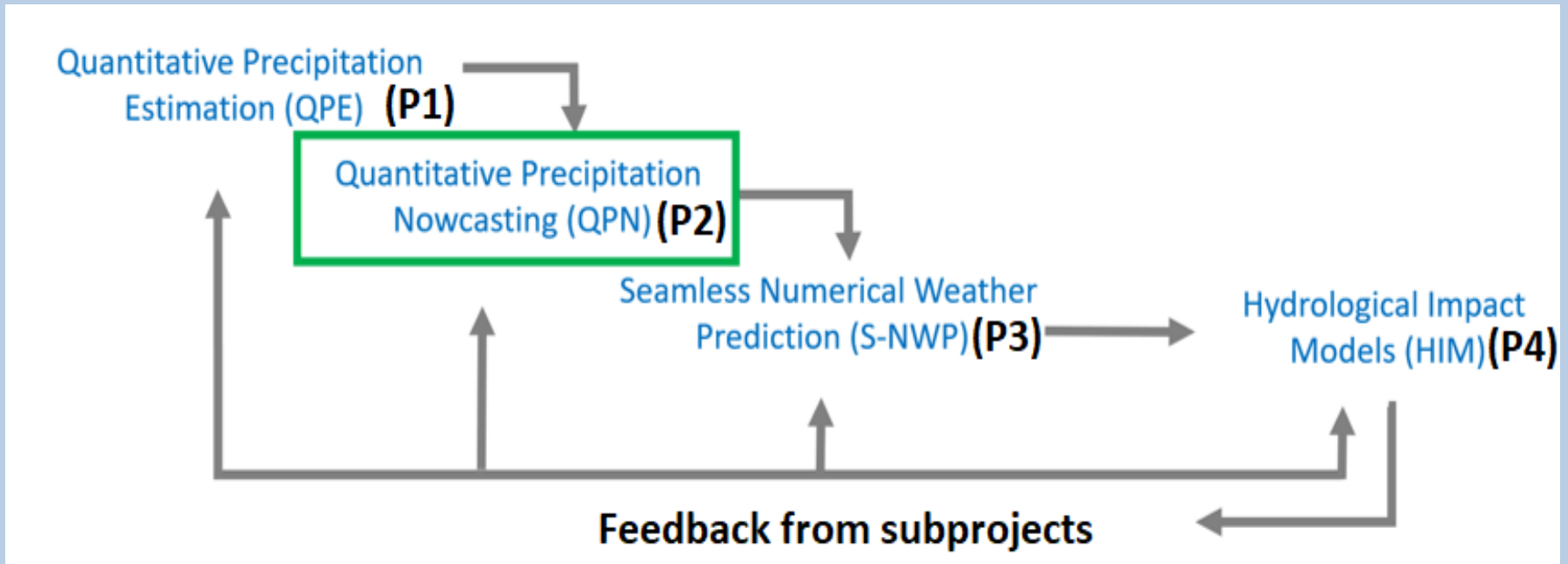
# What is nowcasting ?

QPE

Nowcast



# The subproject P2 among RealPEP



Cooperation between P2 and P4:

Poméon T et al, 2020 « *Performance of a PDE-Based hydrologic Model in a Flash Flood Modeling Framework in Sparsely-Gauged Catchments* »

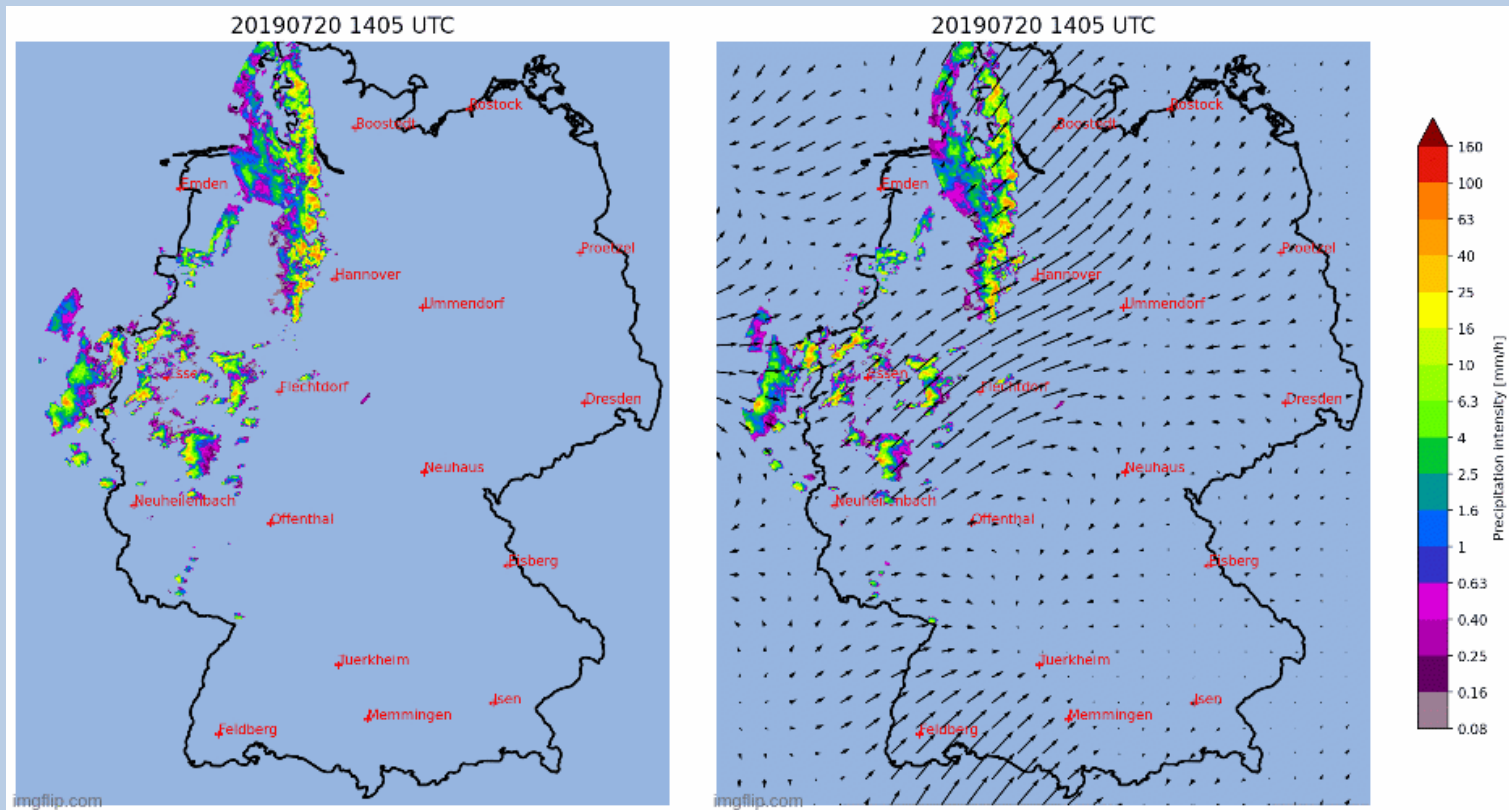
Saadi, M et al, 2022 « *Comparison of three radar-based precipitation nowcasts for the extreme July 2021 flooding event in Germany* » (under review)

# P2-Phase I

## P2-Phase I : Lagrangian advection

QPE

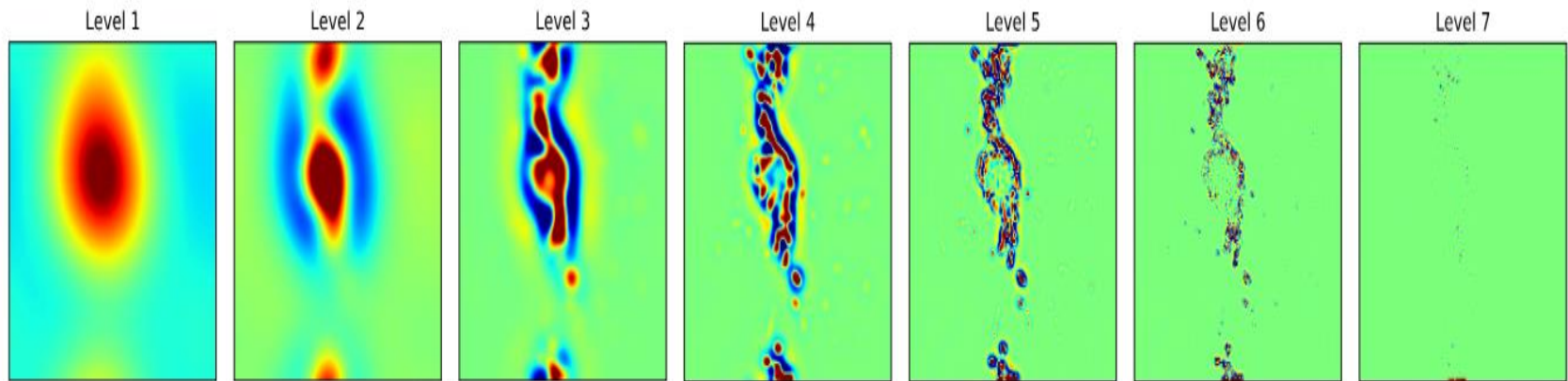
Advection



# P2-Phase I

## P2-Phase I : SPROG (Seed, 2003)

Cascade Decomposition and Spatial Filtering Nowcasting

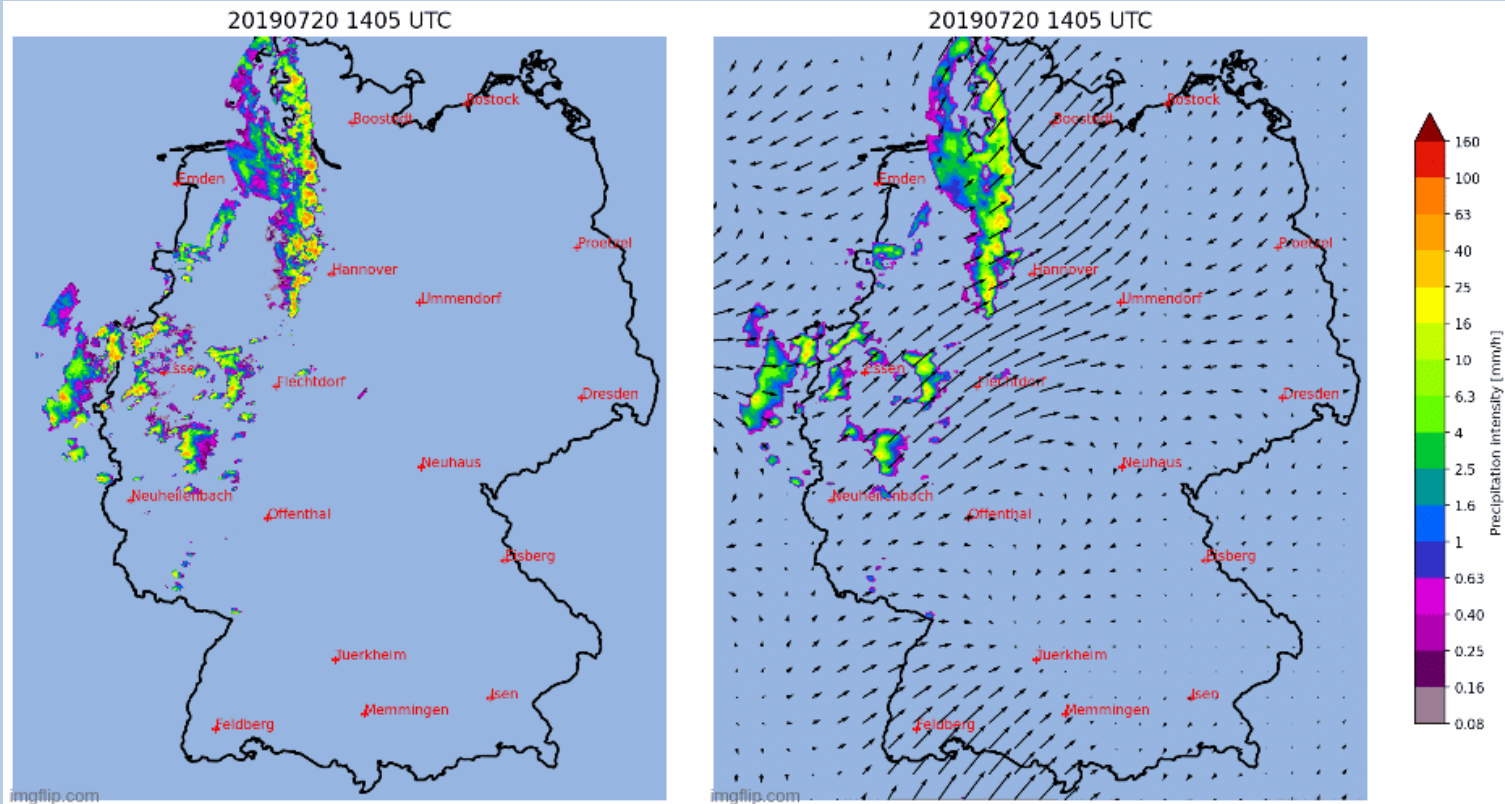


# P2-Phase I

## P2-Phase I : SPROG (Seed, 2003)

QPE

SPROG

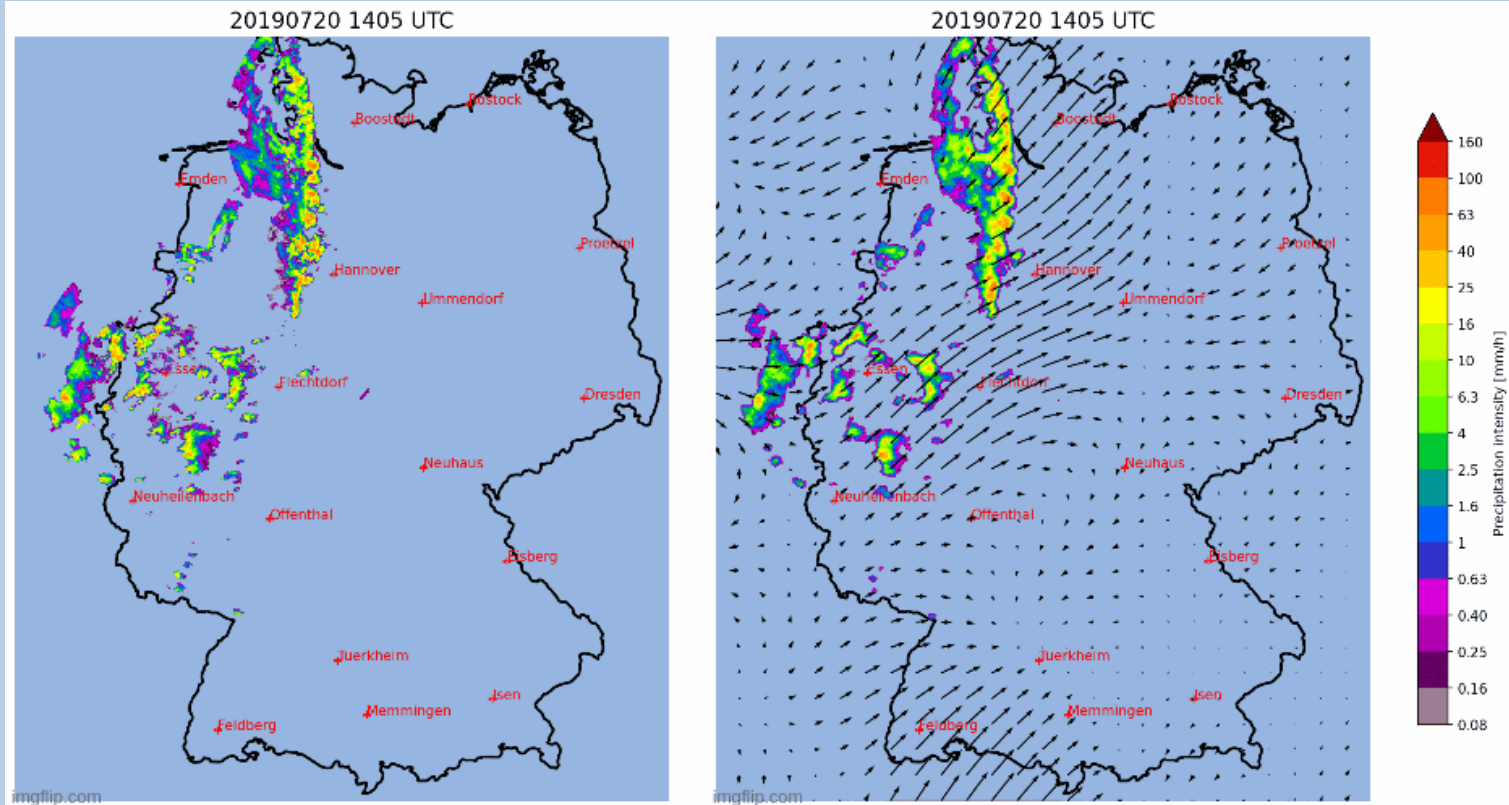


# P2-Phase I

## P2-Phase I: STEPS (Bowler, 2006)

QPE

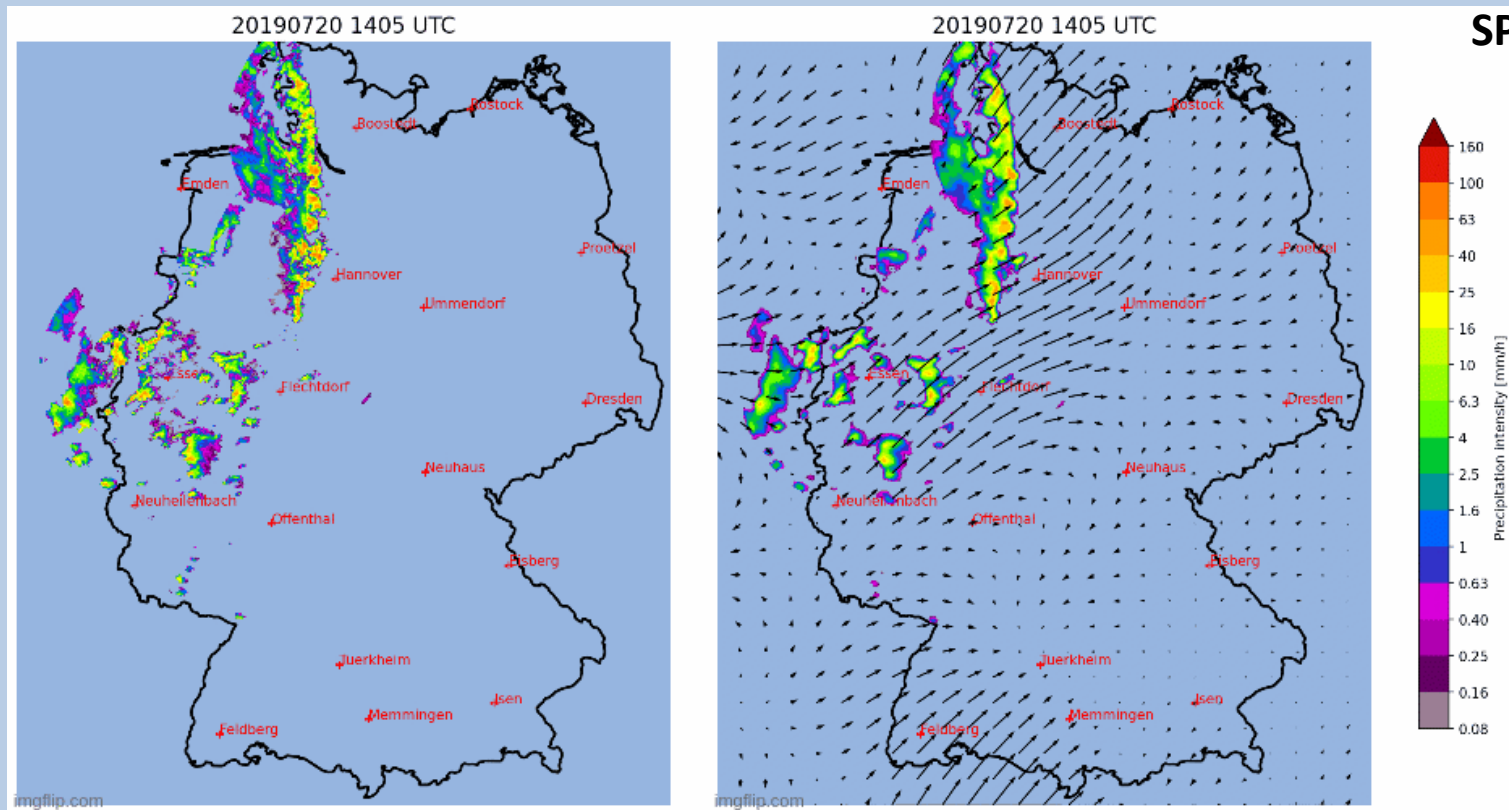
STEPS



# P2-Phase I

## P2-Phase I: SPROG-LOC (Reinoso-Rondinel, 2022)

QPE



16/05/2023

Mathias Emond

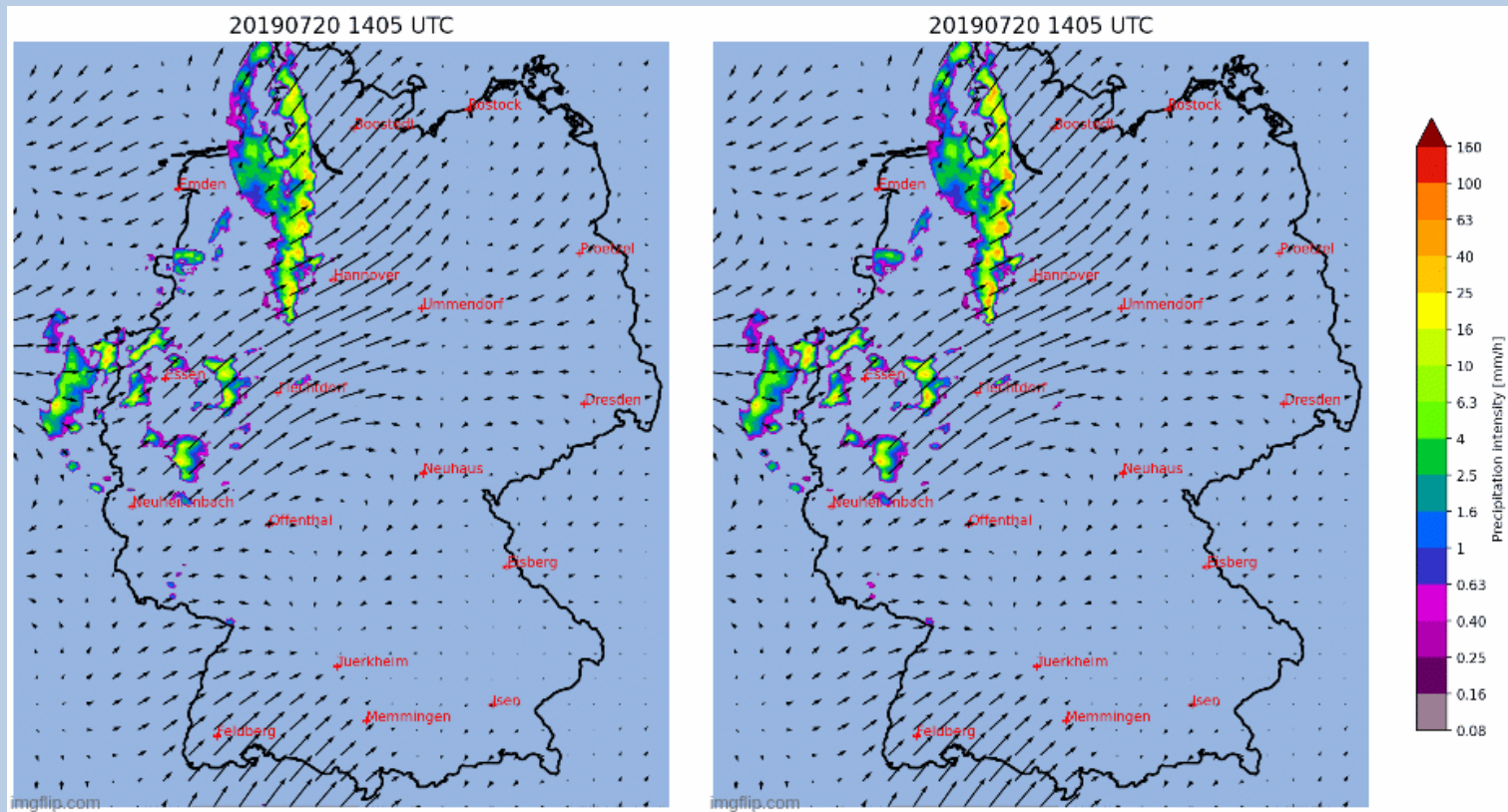


# P2-Phase I

## P2-Phase I: SPROG vs SPROG-LOC

SPROG

SPROG-LOC



16/05/2023

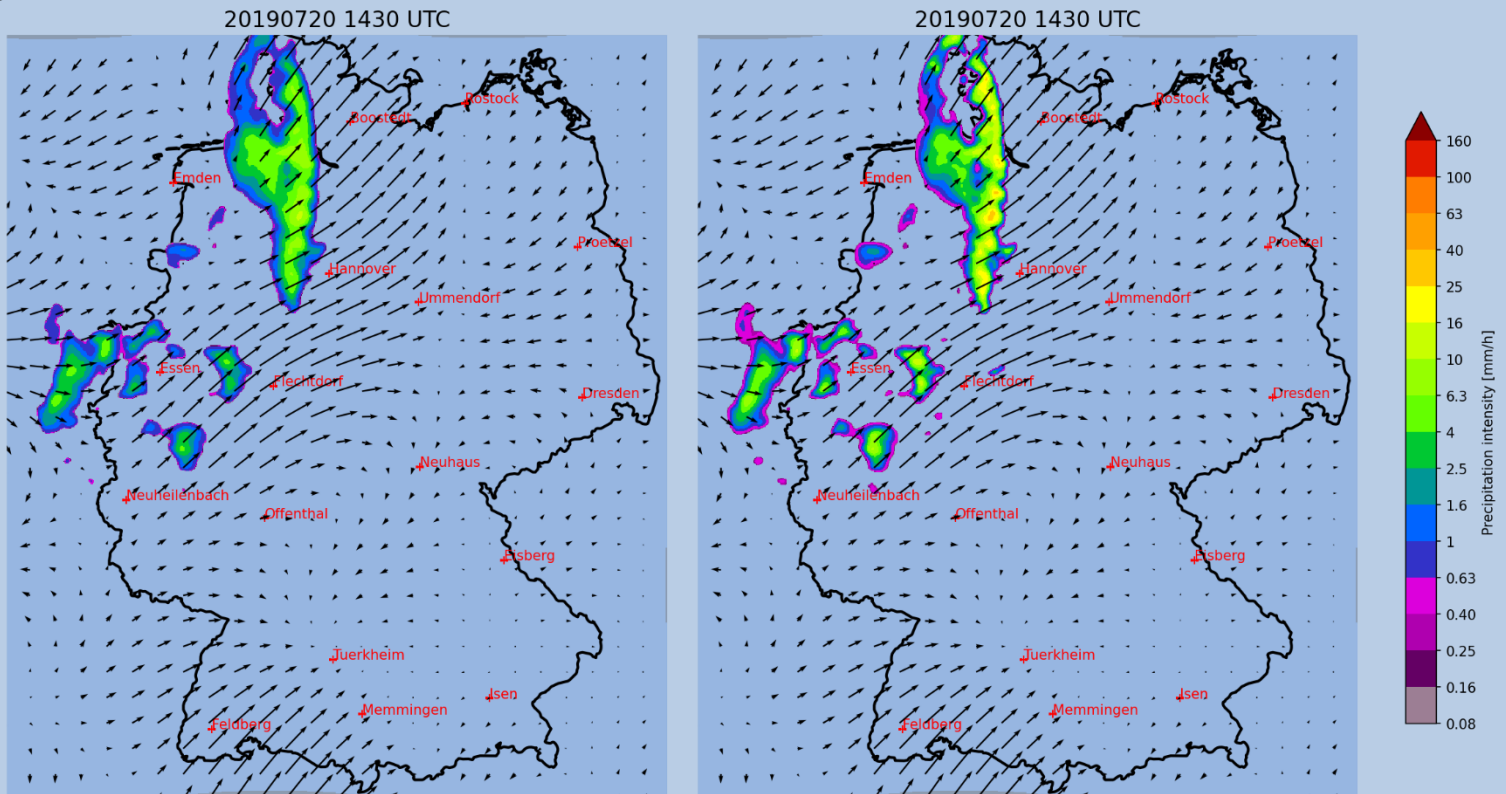
Mathias Emond

# P2-Phase I

## P2-Phase I: SPROG vs SPROG-LOC

SPROG

SPROG-LOC

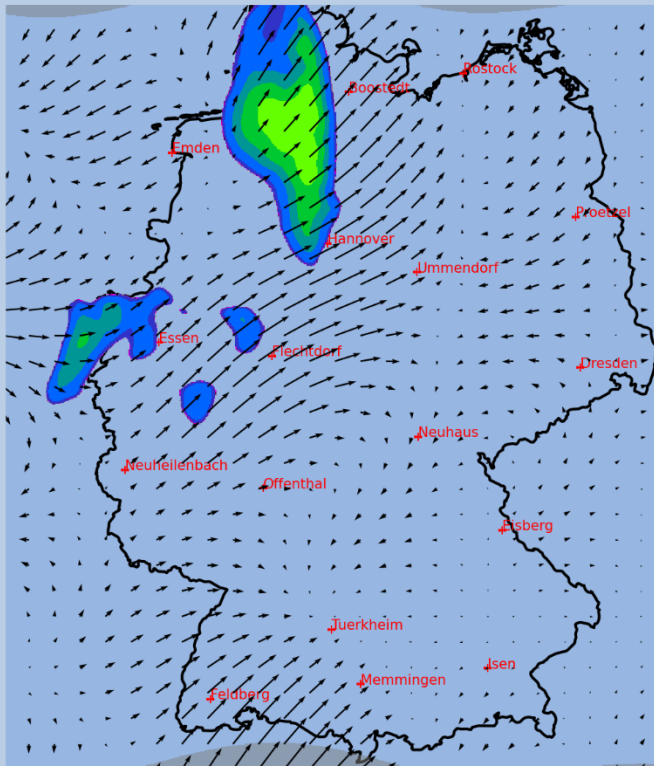


# P2-Phase I

## P2-Phase I: SPROG vs SPROG-LOC

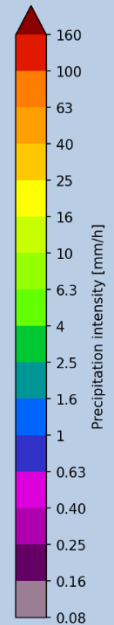
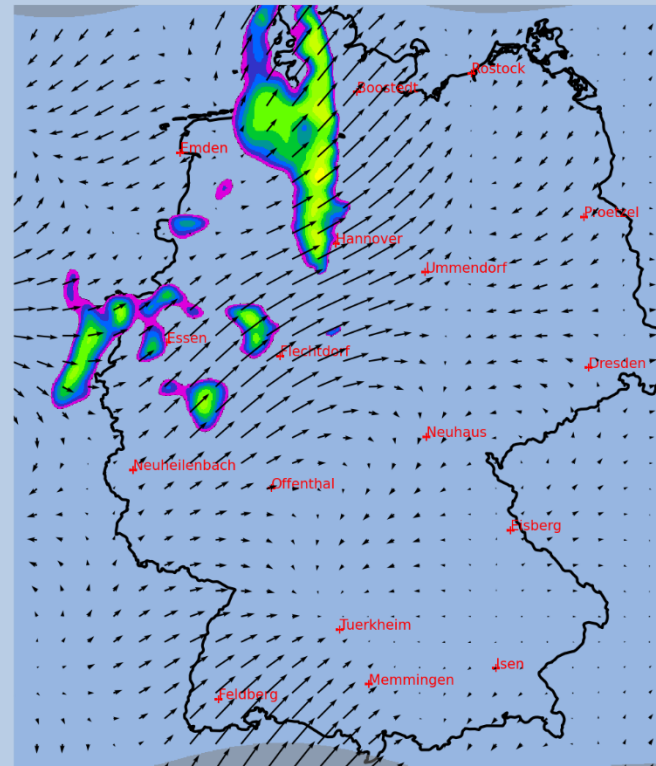
SPROG

20190720 1530 UTC



SPROG-LOC

20190720 1530 UTC

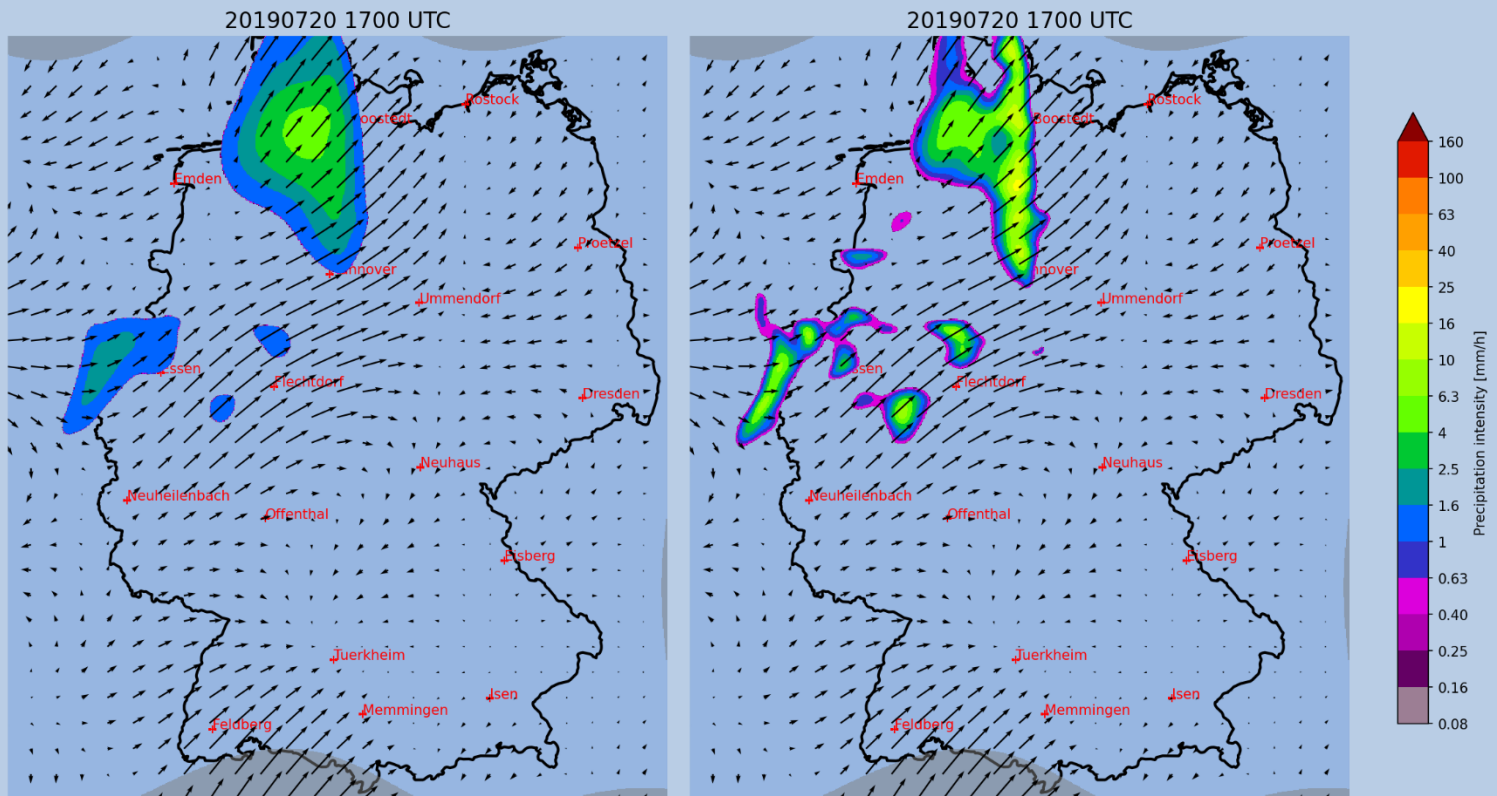


# P2-Phase I

## P2-Phase I: SPROG vs SPROG-LOC

SPROG

SPROG-LOC

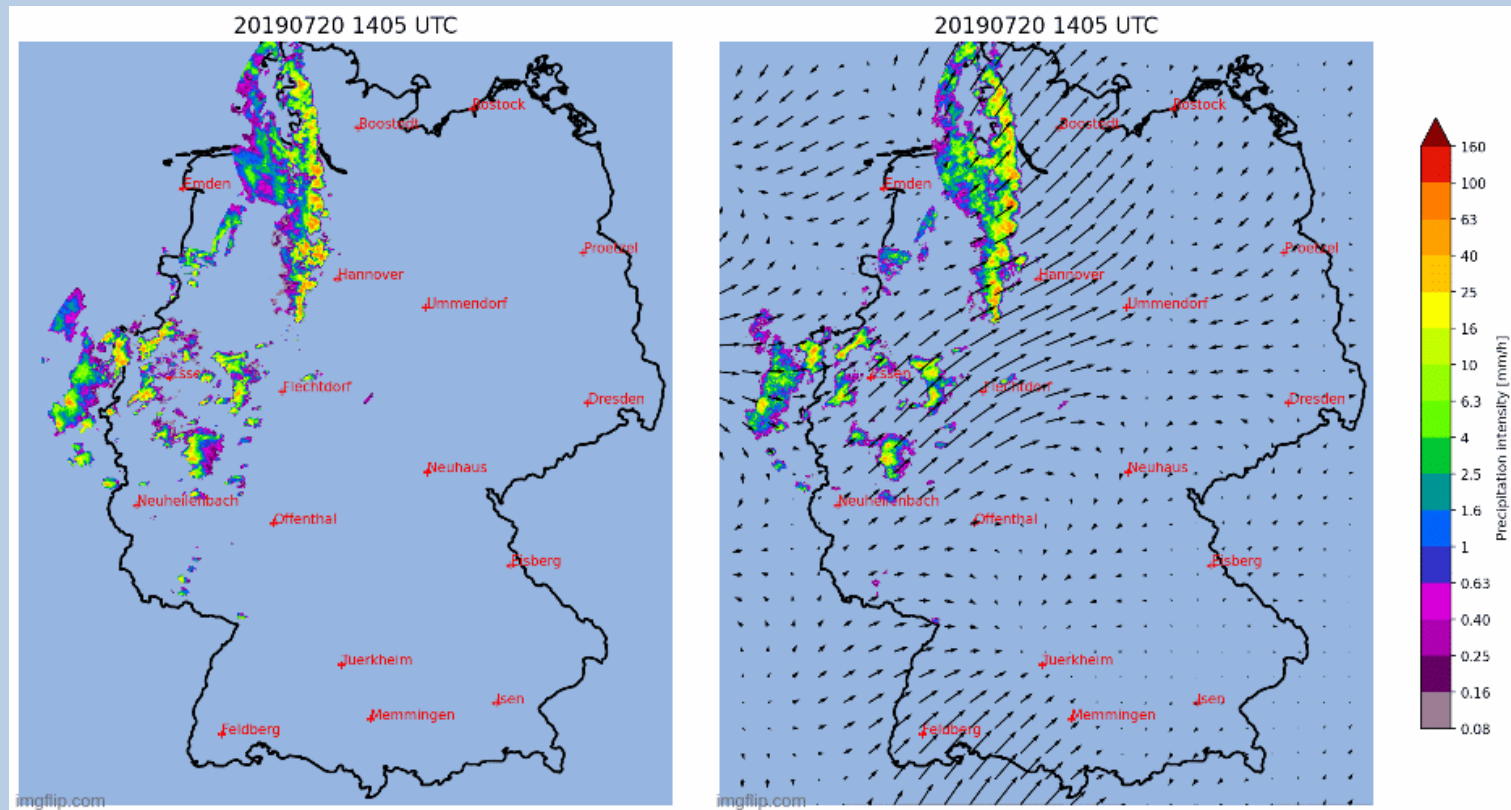


# P2-Phase II

## P2-Phase I: STEPS-LOC

QPE

STEPS-LOC

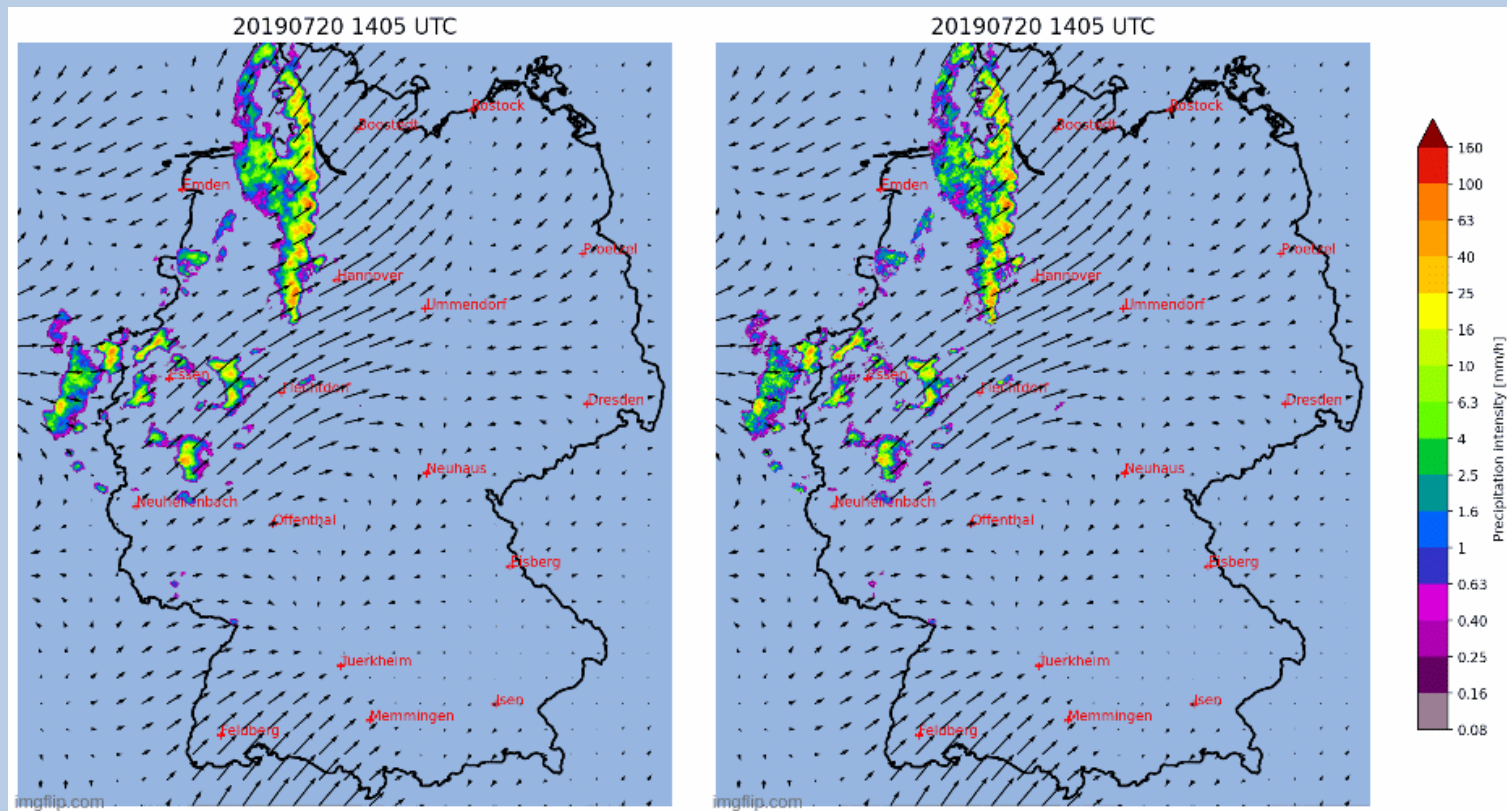


# P2-Phase II

## P2-Phase I: STEPS vs STEPS-LOC

STEPS

STEPS-LOC



# P2-Phase II

To remember:

$$\text{STEPS} = \text{SPROG} + \text{noise}$$

$$\text{STEPS-LOC} = \text{SPROG-LOC} + \text{noise}$$

# P2-Phase II

## To do in P2-Phase II:

- Benchmark over 120 days of C-band Radar data of our more recent nowcasting models
- Evaluation of the new QPE's products uncertainties
- Detection of updrafts using Z-dr columns and size-sorting in convective events
- Detection of stratiform rain enhancement through the study of  $K_{DP}$  between  $-10^{\circ}\text{C}$  and  $-15^{\circ}\text{C}$
- Use of Satellites observation for feeding a machine learning neural network (PredRNN) to include CI



# On the Benchmark

## QPE's from P1:

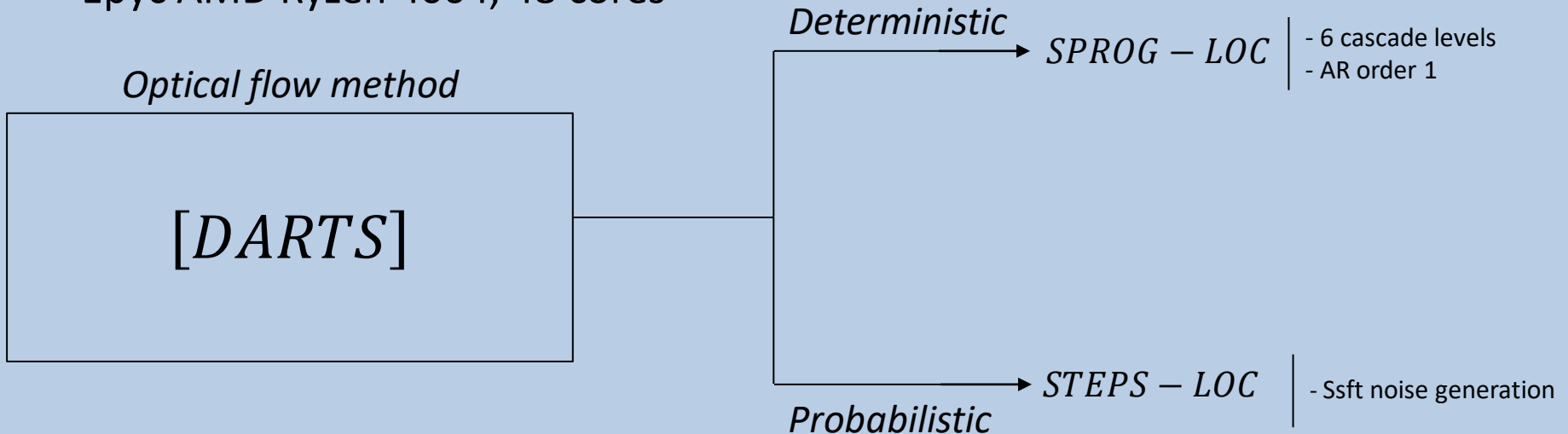
Three types of QPE	Days available
$R(A_h)R(K_{DP})$ (hybrid*)	2019-07-20
$R(A_v)R(K_{DP})$ (hybrid*)	2018-08-09
$R(K_{DP})$	2018-07-28
*(if $Z_h > 40$ dB, $R(K_{DP})$ is used)	2017-07-19

From : Juyu Chen et al, 2021 « *Assessing the Benefits of Specific Attenuation for Quantitative precipitation Estimation with a C-band Radar Network* »

# On the Benchmark

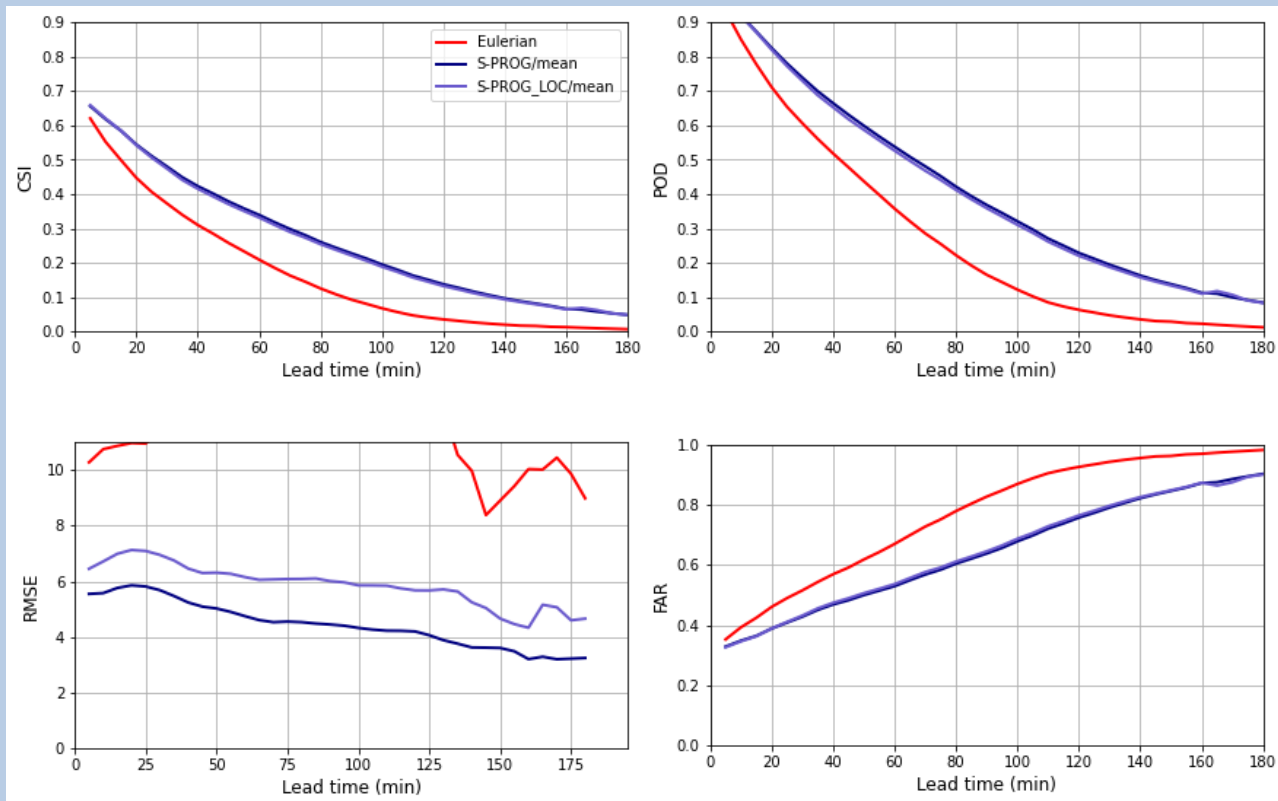
## Method for the benchmark:

- Nowcast of 3 hours
- 120 days of data
- One nowcast initialized every 30 min
- Epyc AMD Ryzen 4004, 48 cores



# On the Benchmark

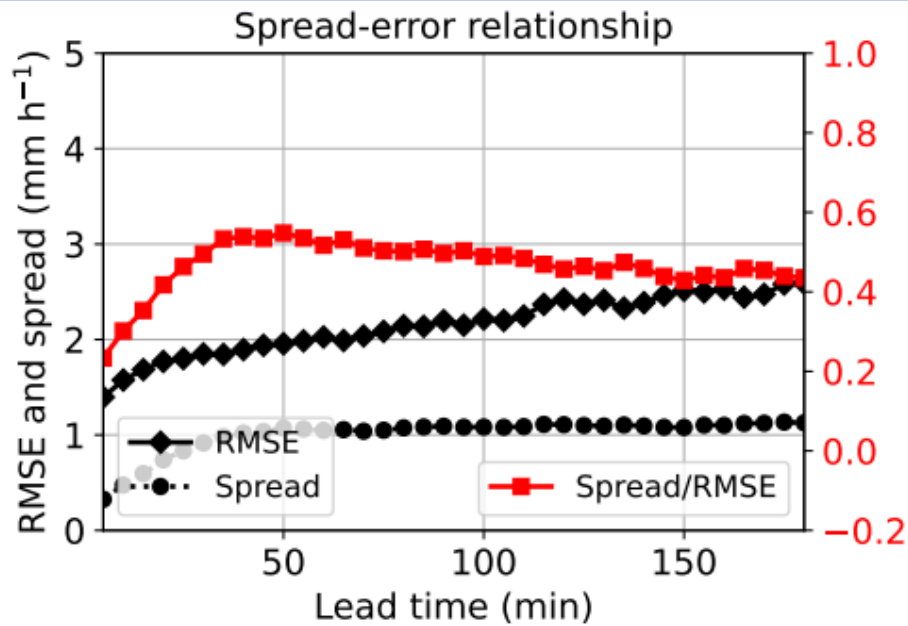
## Example with the day 2017-07-19:



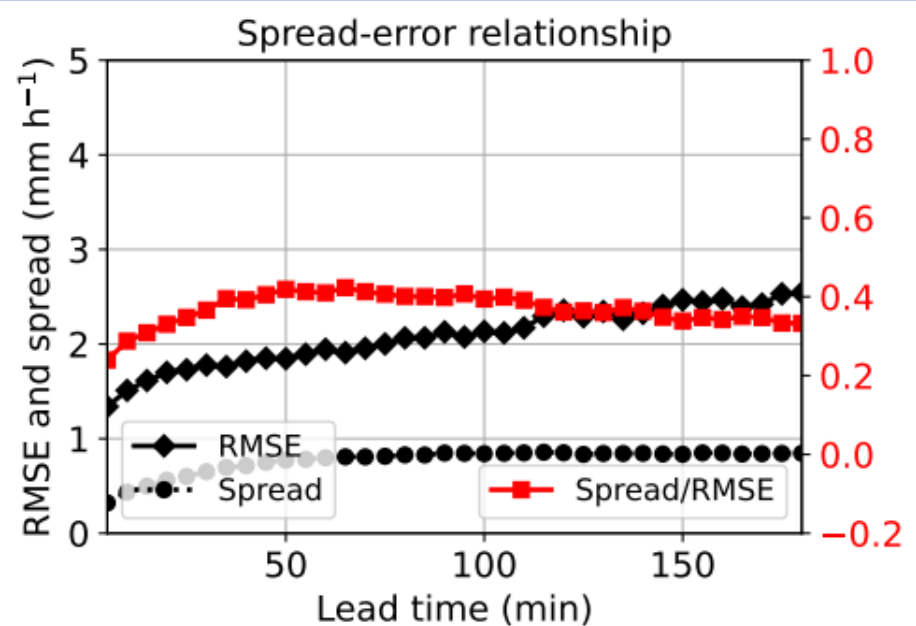
# On the Benchmark

Example with the day 2017-07-19:

STEPS



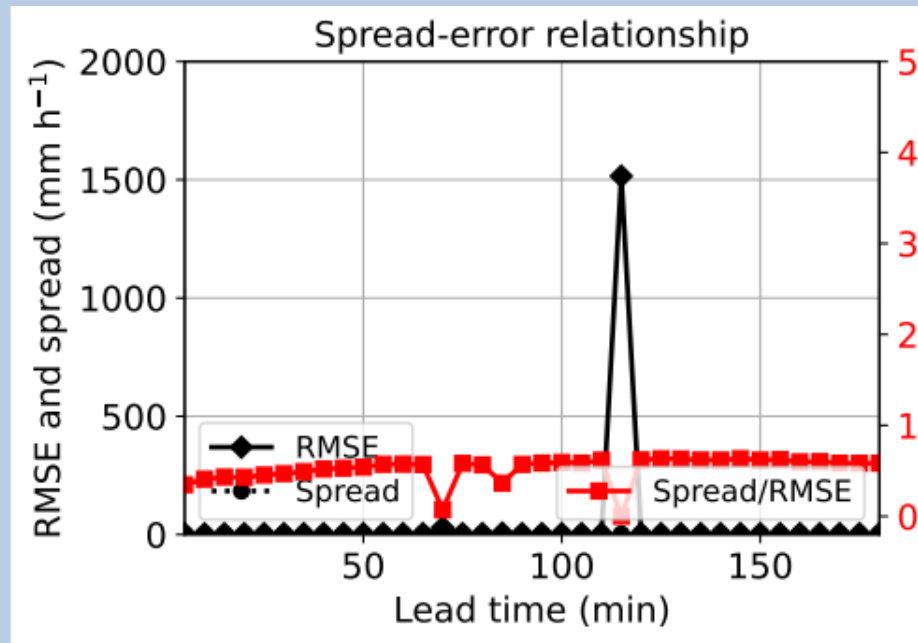
STEPS-LOC



# On the Benchmark

## Issue with the day 2019-07-20:

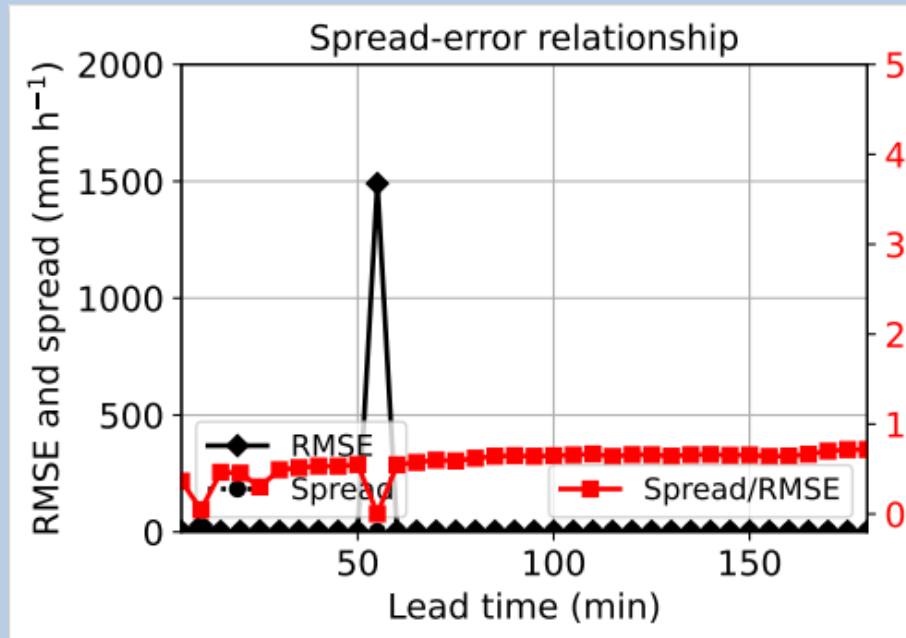
Nowcast from 1400 UTC to 1700 UTC



# On the Benchmark

## Issue with the day 2019-07-20:

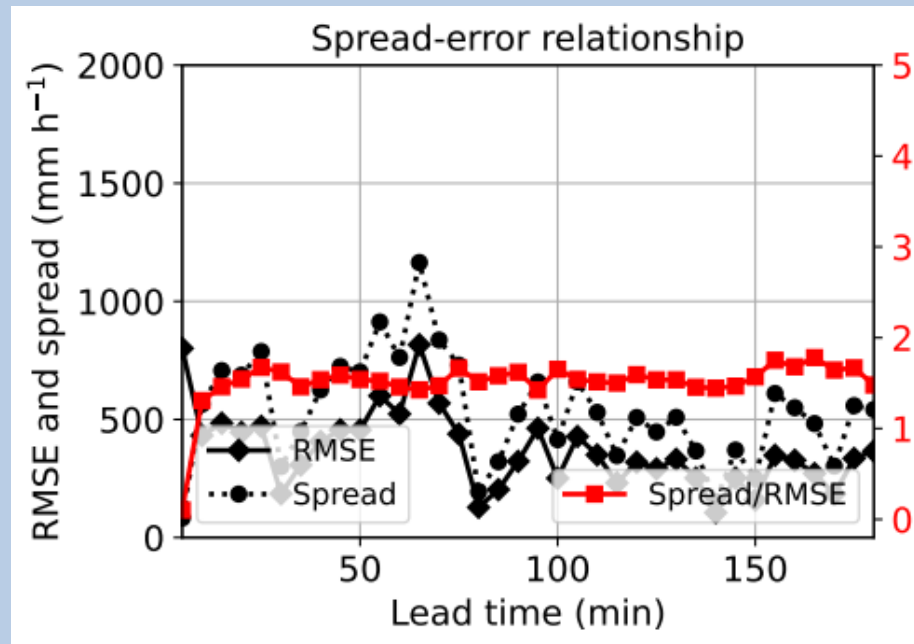
Nowcast from 1500 UTC to 1800 UTC



# On the Benchmark

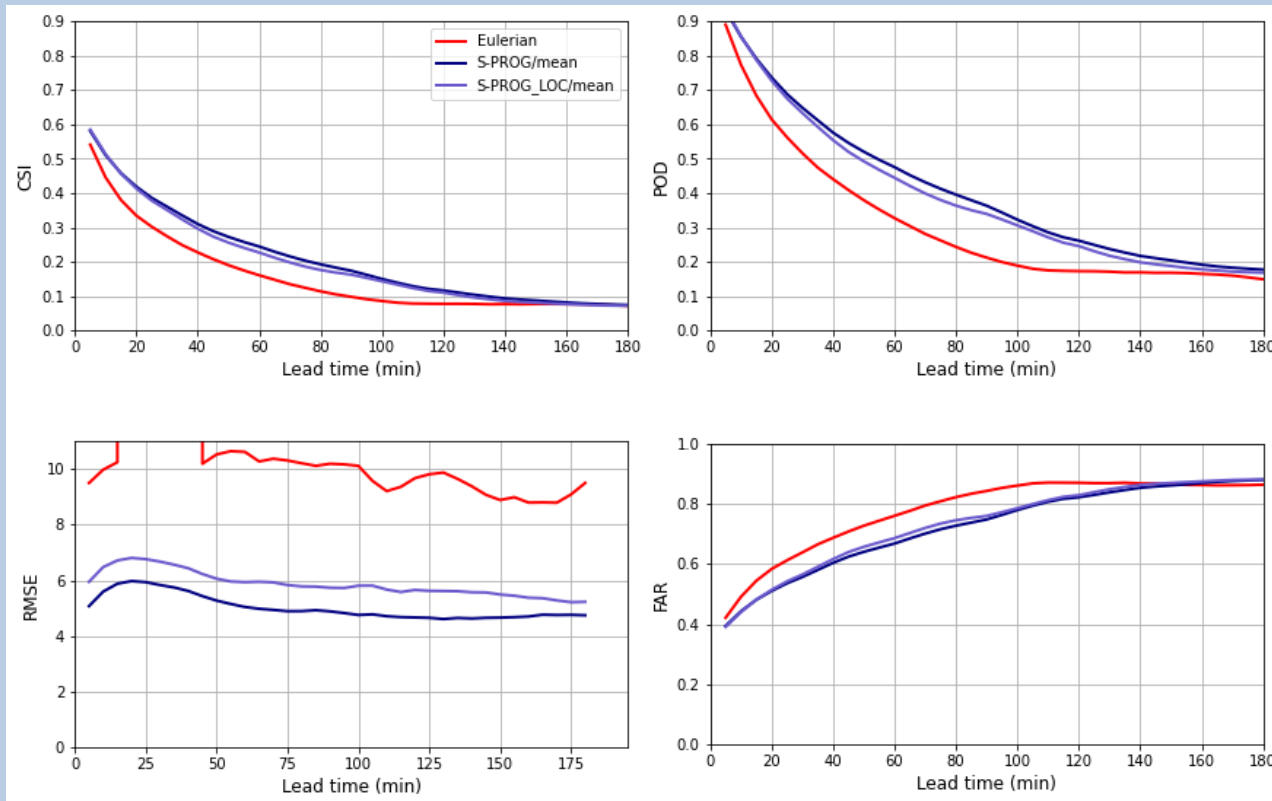
## Issue with the day 2019-07-20:

Nowcast from 1600 UTC to 1900 UTC



# On the Benchmark

## Issue with the day 2019-07-20:





# P2-Phase II

To remember:

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$$\text{STEPS-LOC} = \text{SPROG-LOC} + \text{noise}$$

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**Thank you for your attention**

# Questions