Modellauswertungen

```
C:\Users\fl-al\.conda\envs\ml\Lib\site-packages\keras\src\saving\saving_lib.py:396: UserWarning: S
kipping variable loading for optimizer 'adam', because it has 12 variables whereas the saved optim
izer has 2 variables.
  trackable.load_own_variables(weights_store.get(inner_path))
C:\Users\fl-al\.conda\envs\ml\Lib\site-packages\keras\src\saving\saving_lib.py:396: UserWarning: S
kipping variable loading for optimizer 'adam', because it has 12 variables whereas the saved optim
izer has 2 variables.
  trackable.load_own_variables(weights_store.get(inner_path))
C:\Users\fl-al\.conda\envs\ml\Lib\site-packages\keras\src\saving\saving_lib.py:396: UserWarning: S
kipping variable loading for optimizer 'adam', because it has 12 variables whereas the saved optim
izer has 2 variables.
  trackable.load_own_variables(weights_store.get(inner_path))
```

Modellzusammenfassungen

Gievenbeck_LSTM_Single_MSE2024-04-28

Alias: "Loss = MSE"

Model: "functional_1"

Layer (type)	Output Shape	Param #
input_layer (InputLayer)	(None, 24, 2)	0
lstm (LSTM)	(None, 32)	4,480
Out (Dense)	(None, 12)	396

Total params: 14,630 (57.15 KB)

Trainable params: 4,876 (19.05 KB)

Non-trainable params: 0 (0.00 B)

Optimizer params: 9,754 (38.11 KB)

Gievenbeck_LSTM_Single_MAE2024-04-28

Alias: "Loss = MAE"

Model: "functional_1"

Layer (type)	Output Shape	Param #
input_layer (InputLayer)	(None, 24, 2)	0
lstm (LSTM)	(None, 32)	4,480
Out (Dense)	(None, 12)	396

Total params: 14,630 (57.15 KB)

Trainable params: 4,876 (19.05 KB)

Non-trainable params: 0 (0.00 B)

Optimizer params: 9,754 (38.11 KB)

Gievenbeck_LSTM_Single_MAPE2024-04-28

Alias: "Loss = MAPE"

Model: "functional_1"

Layer (type)	Output Shape	Param #
input_layer (InputLayer)	(None, 24, 2)	0
lstm (LSTM)	(None, 32)	4,480
Out (Dense)	(None, 12)	396

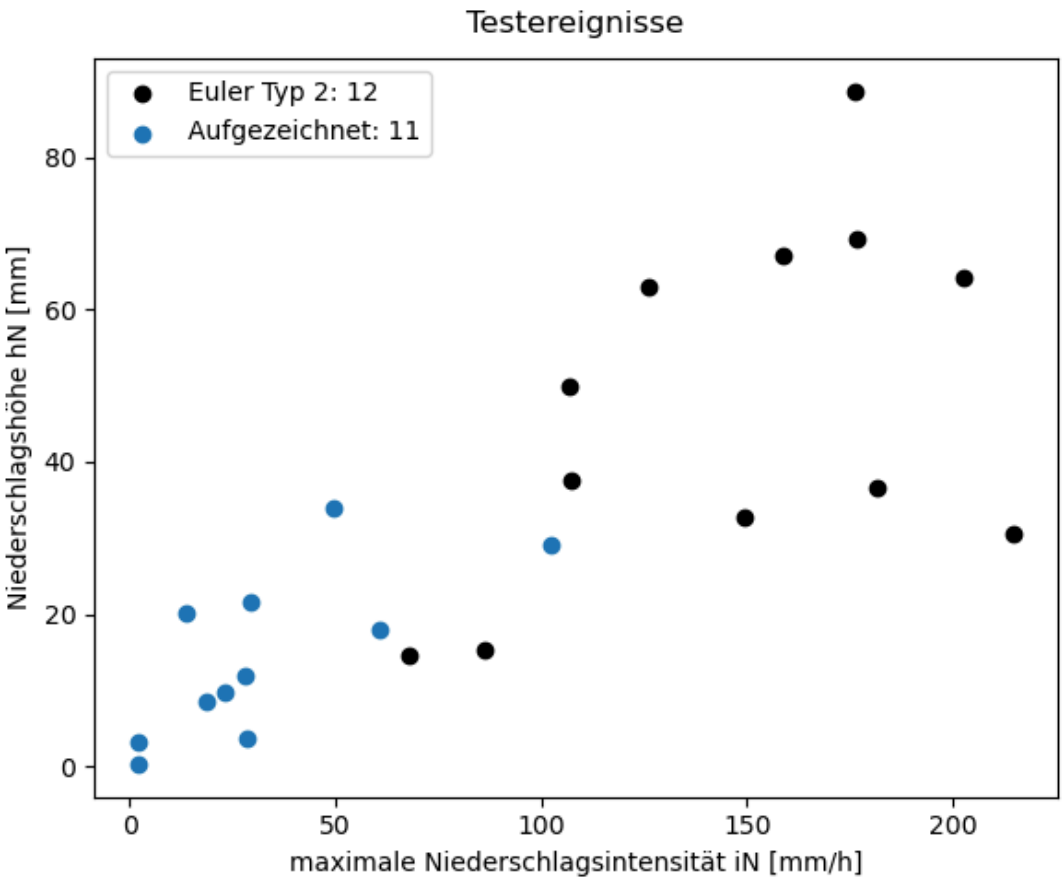
Total params: 14,630 (57.15 KB)

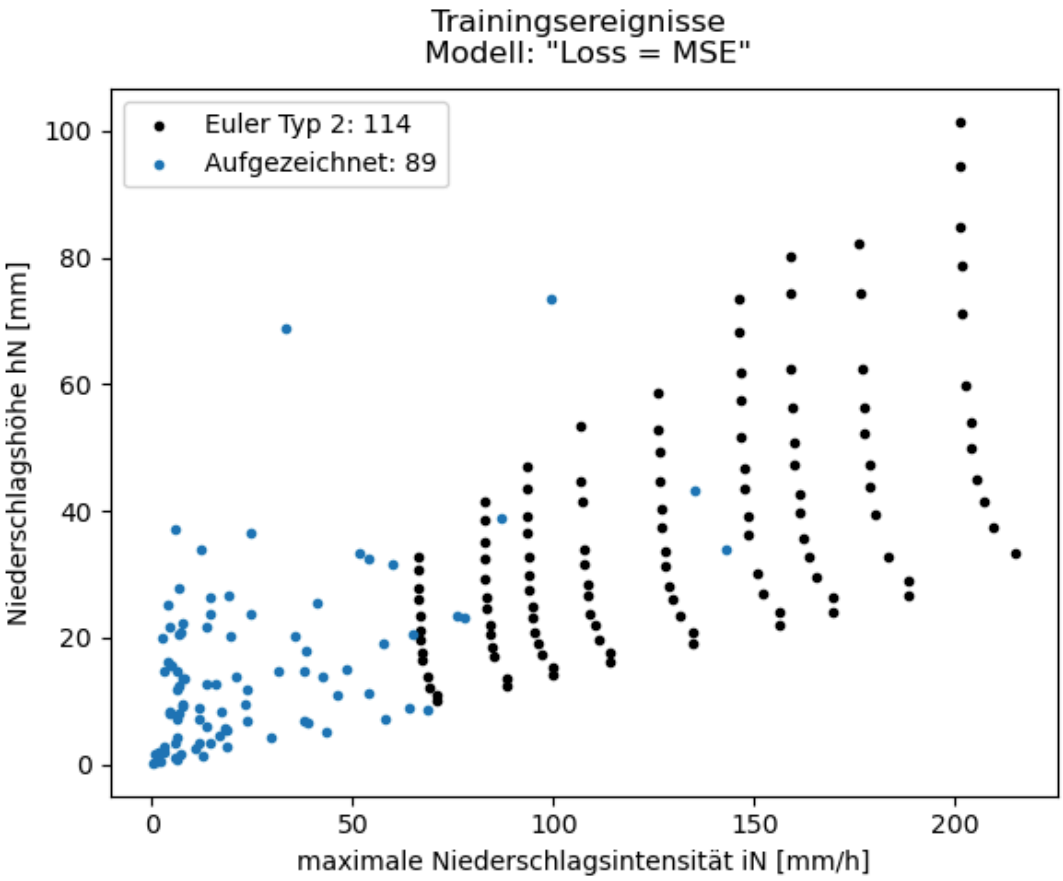
Trainable params: 4,876 (19.05 KB)

Non-trainable params: 0 (0.00 B)

Optimizer params: 9,754 (38.11 KB)

Datenaufteilung





Gesamtergebnisse der Modelle

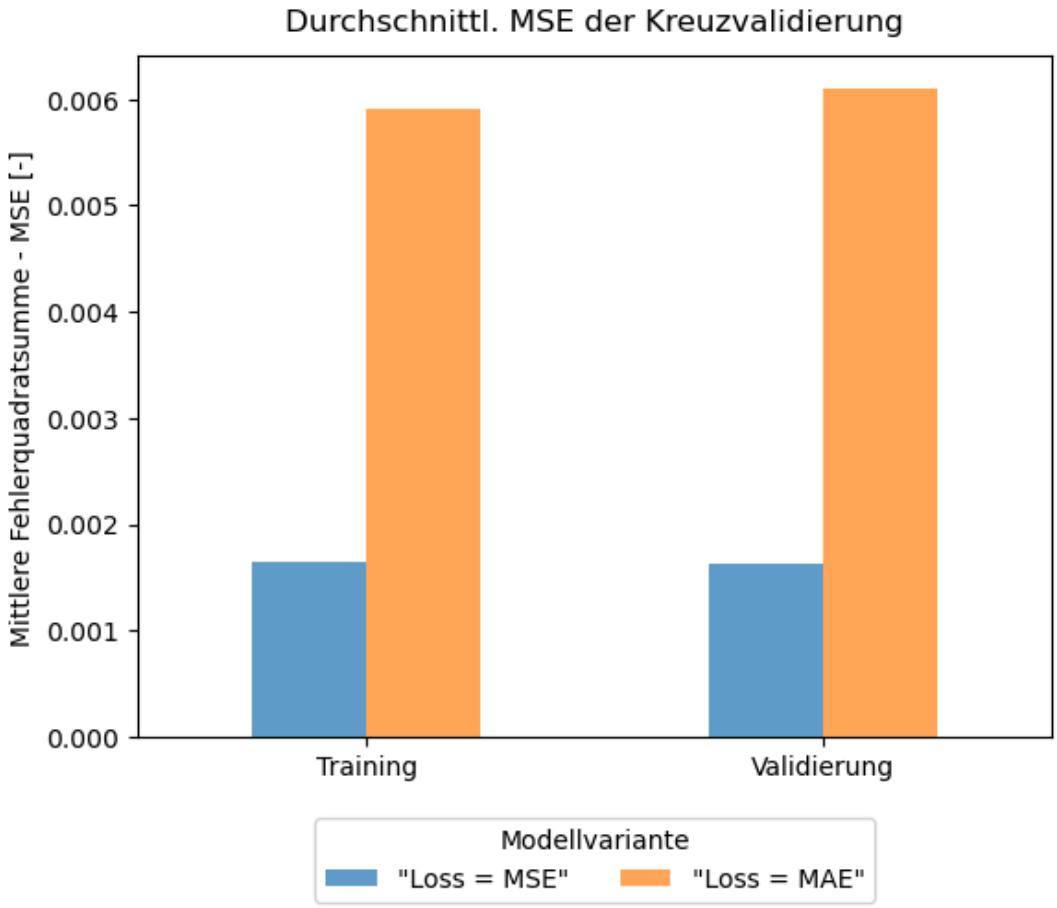
Auswertung des durchschnittlichen MSE der Kreuzvalidierung

Bei jeder Modellerstellung werden die Daten zufällig in Trainings- und Validierungsdaten aufgeteilt. Die Balken zeigen den durchschnittlichen MSE der Kreuzvalidierung für die Trainings- und Validierungsdaten.

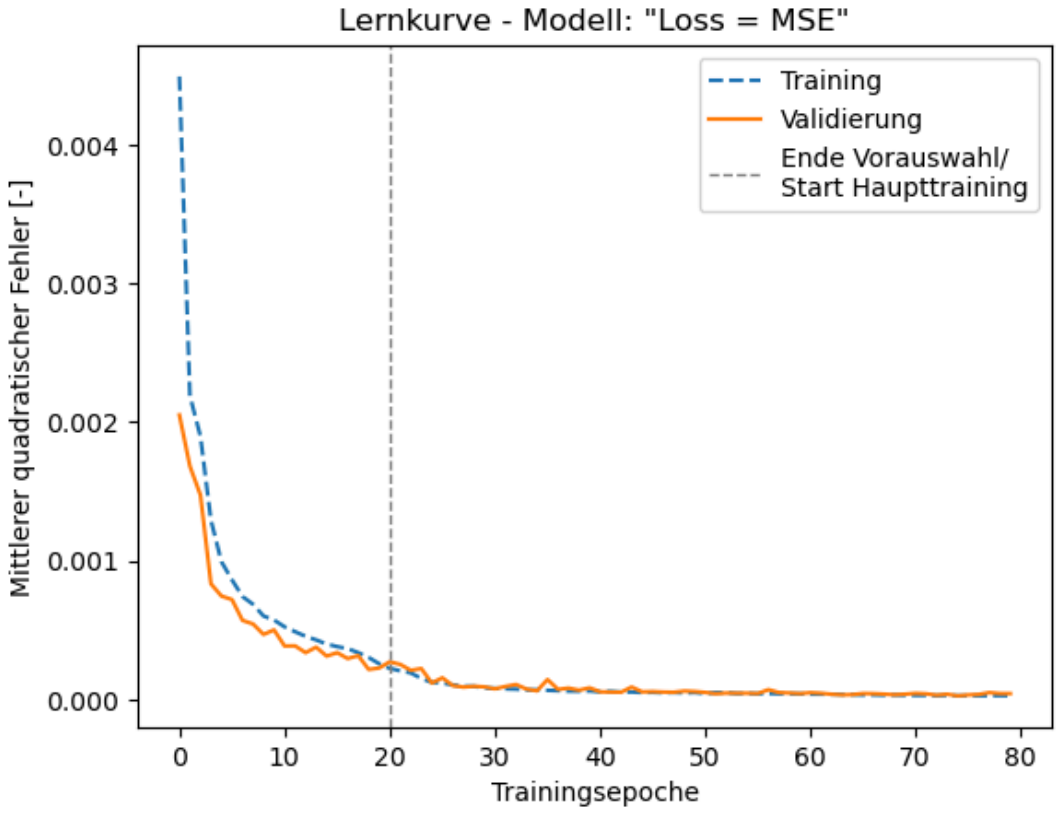
Hierbei ist zu beachten, dass diese Metrik vor der Datentransformation berechnet wurde und somit nur in diesem Verlgleich aussagekraft habe und mit nachfolgenden Metriken nicht vergleichbar ist.

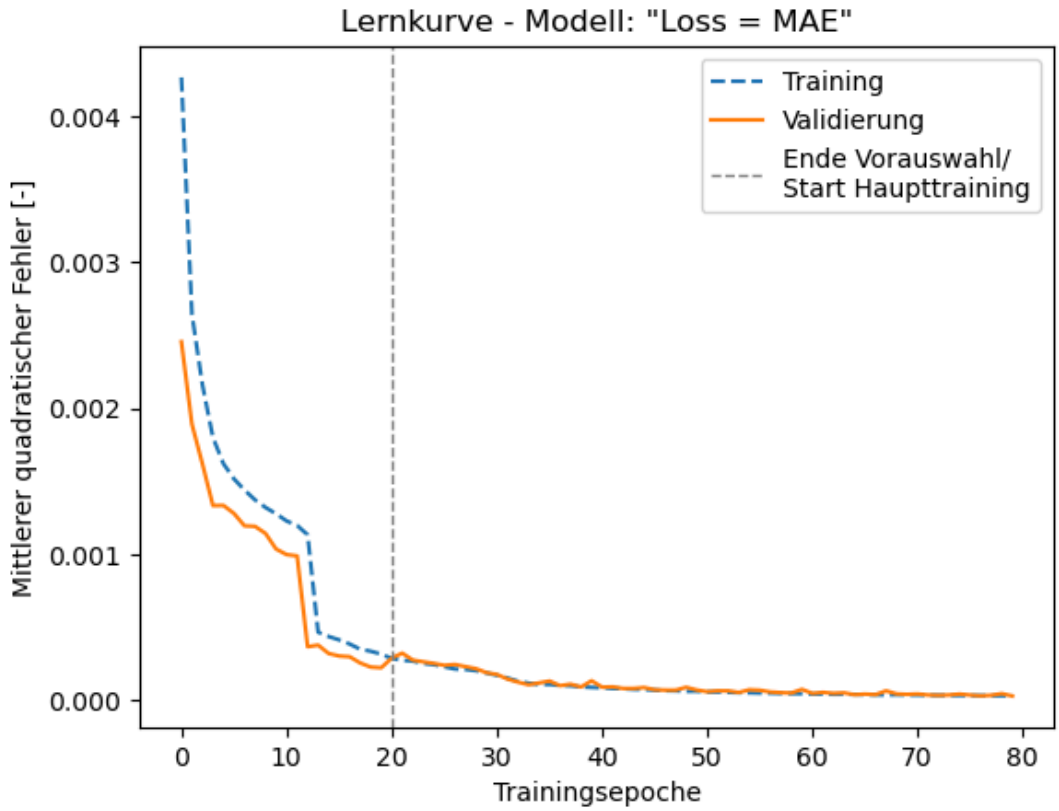
Durchschnittlicher MSE:

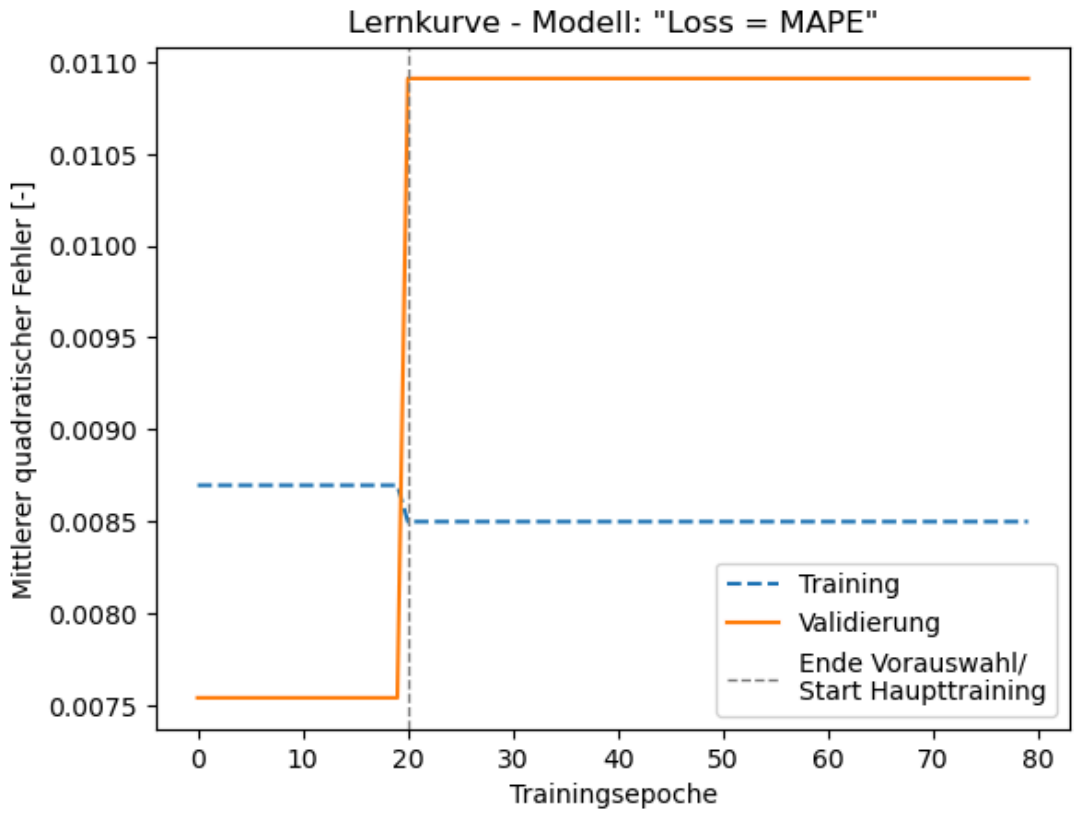
Modell	Training	Validierung
"Loss = MSE"	0.00164	0.00163
"Loss = MAE"	0.0059	0.0061


Durchschnittl. MSE der Kreuzvalidierung
Mittlere Fehlerquadratsumme - MSE [-]
0.000
0.001
0.002
0.003
0.004
0.005
0.006
Training
Validierung
Modellvariante
"Loss = MSE"
"Loss = MAE"

Lernkurven

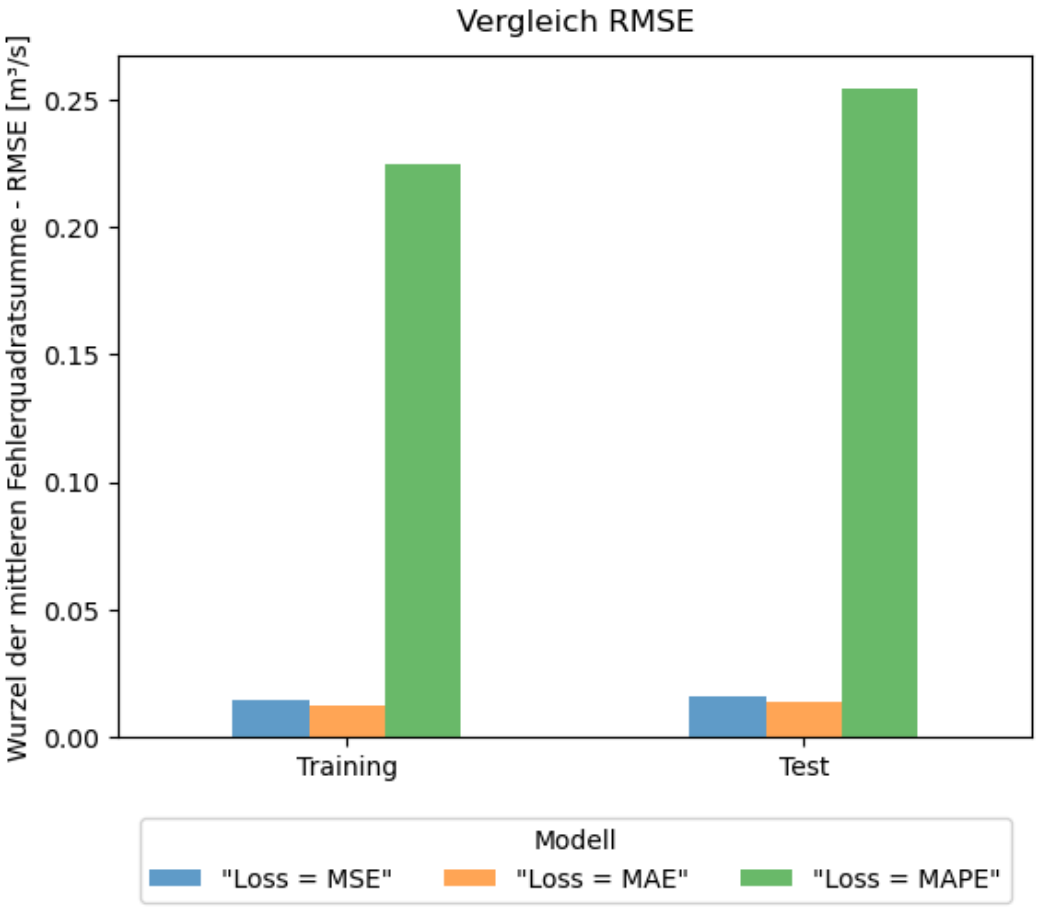

Lernkurve - Modell: "Loss = MSE"
Mittlerer quadratischer Fehler [-]
0.000
0.001
0.002
0.003
0.004
0
10
20
30
40
50
60
70
80
Trainingsepoche
Training
Validierung
Ende Vorauswahl/
Start Haupttraining





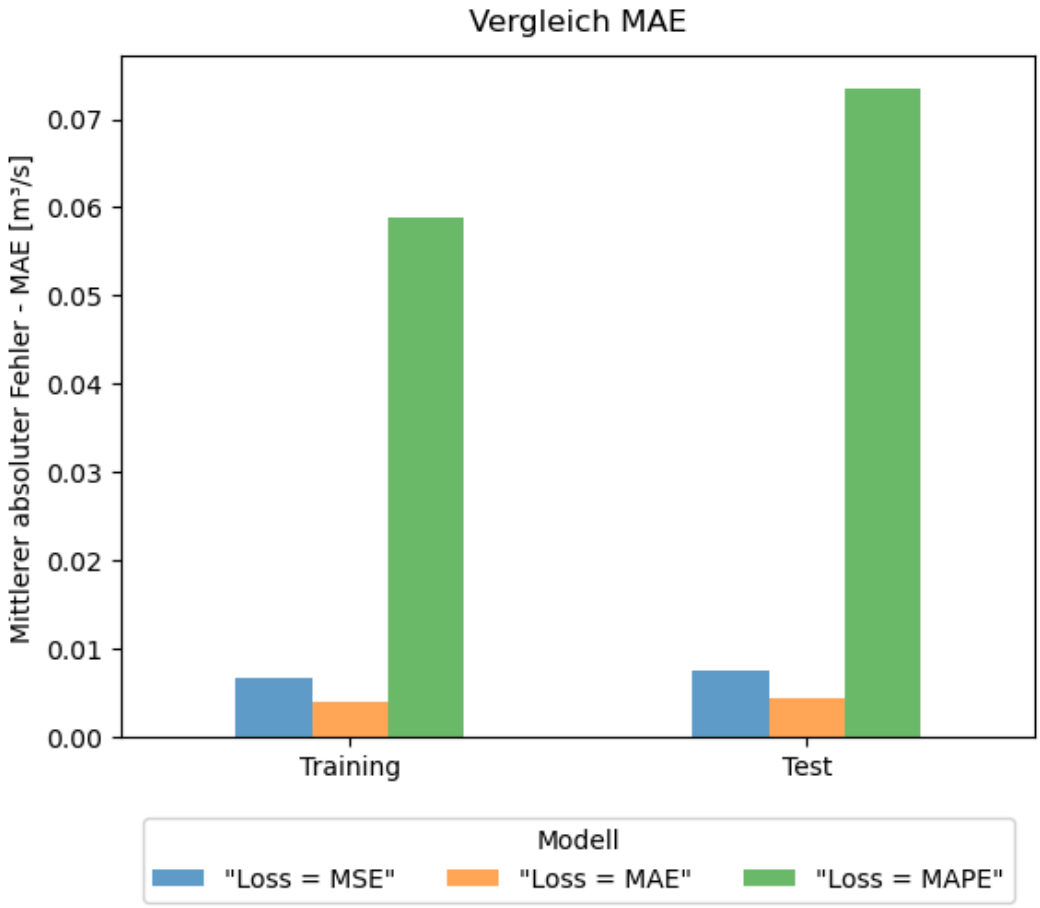
Auswertung nach RMSE

Modell	Training	Test
"Loss = MSE"	0.0147	0.0159
"Loss = MAE"	0.0124	0.0135
"Loss = MAPE"	0.2242	0.2541



Auswertung nach MAE

Modell	Training	Test
"Loss = MSE"	0.0067	0.0076
"Loss = MAE"	0.0039	0.0044
"Loss = MAPE"	0.0589	0.0734



Modellauswertung nach Größenklassen der Ausgabewerte

Modell: "Loss = MSE"

Bin	MSE	RMSE	MAE	MAPE	start	end	False_0	n
0	0.0003	0.0173	0.0133	25.86	0.0	0.24	265	8715
1	0.0018	0.043	0.0305	9.15	0.24	0.49	0	519
2	0.0023	0.0481	0.0372	6.17	0.49	0.73	0	184
3	0.0025	0.0499	0.0349	4.24	0.73	0.97	0	85
4	0.0025	0.0501	0.0374	3.35	0.97	1.22	0	107
5	0.0025	0.0498	0.0368	2.8	1.22	1.46	0	43
6	0.0026	0.0512	0.0411	2.67	1.46	1.7	0	26
7	0.0022	0.0467	0.0345	1.91	1.7	1.95	0	54
8	0.0039	0.0627	0.0467	2.24	1.95	2.19	0	63
9	0.0036	0.0603	0.0465	2.01	2.19	2.43	0	79

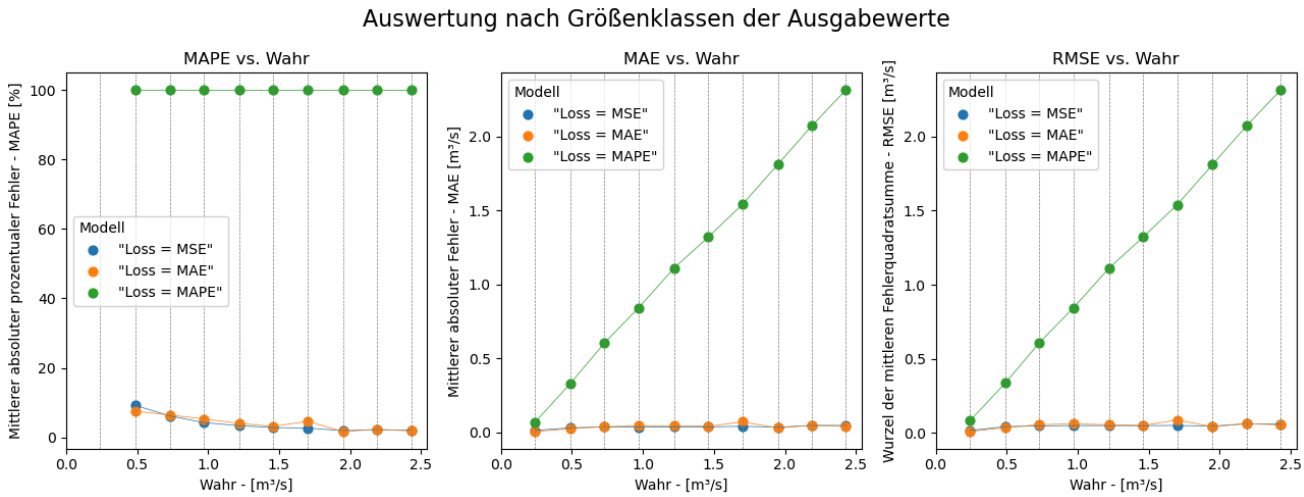
Modell: "Loss = MAE"

Bin	MSE	RMSE	MAE	MAPE	start	end	False_0	n
0	0.0001	0.0099	0.0053	9.37	0.0	0.24	79	8715
1	0.0014	0.0368	0.0247	7.52	0.24	0.49	0	519
2	0.0033	0.057	0.0383	6.43	0.49	0.73	0	184
3	0.0038	0.0617	0.0439	5.3	0.73	0.97	0	85
4	0.0031	0.0558	0.0444	4.01	0.97	1.22	0	107
5	0.0026	0.0511	0.041	3.15	1.22	1.46	0	43
6	0.0077	0.0879	0.0707	4.62	1.46	1.7	0	26
7	0.0018	0.0427	0.03	1.66	1.7	1.95	0	54
8	0.0039	0.0627	0.0476	2.29	1.95	2.19	0	63
9	0.003	0.055	0.0428	1.83	2.19	2.43	0	79

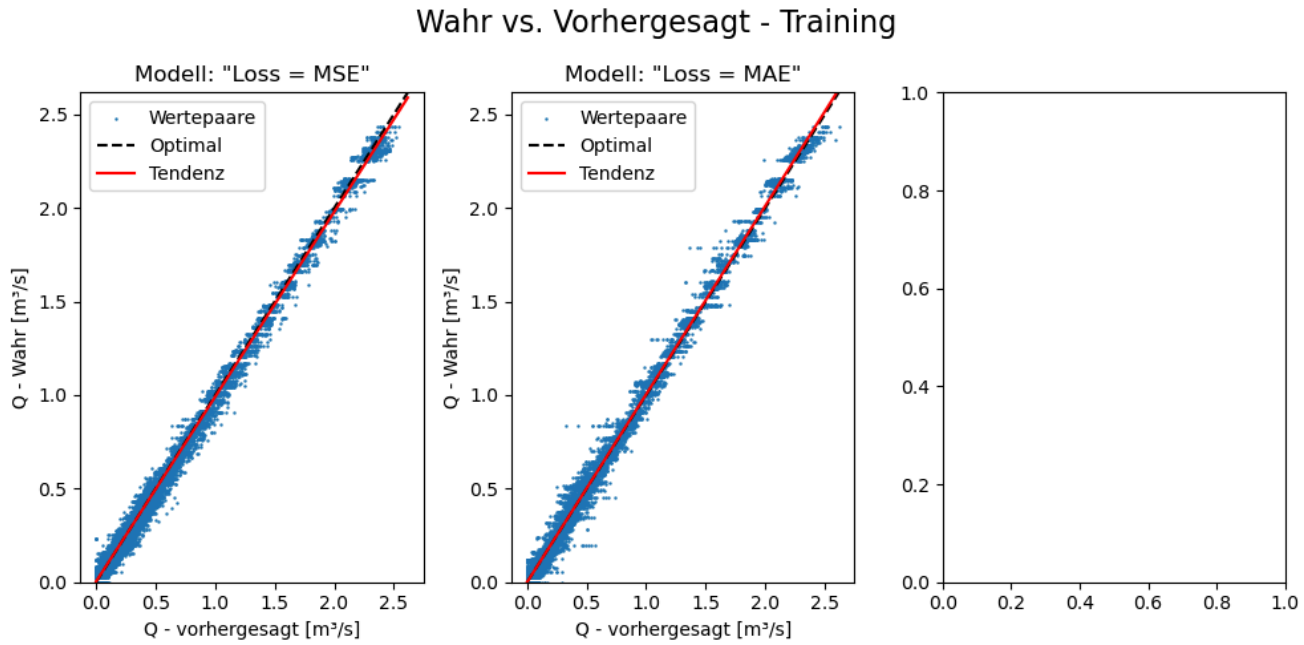
Modell: "Loss = MAPE"

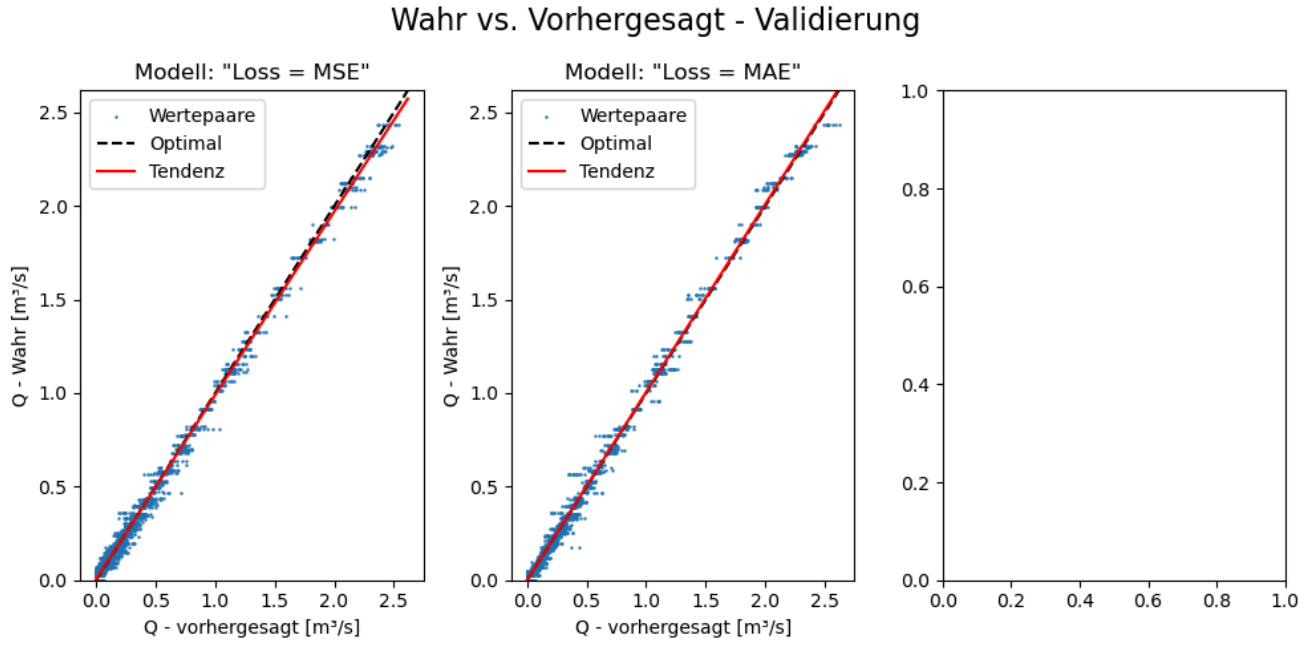
Bin	MSE	RMSE	MAE	MAPE	start	end	False_0	n
0	0.0067	0.0821	0.0683	100.0	0.0	0.24	8715	8715
1	0.1134	0.3368	0.3306	100.0	0.24	0.49	519	519
2	0.3705	0.6087	0.6043	100.0	0.49	0.73	184	184
3	0.7126	0.8441	0.8419	100.0	0.73	0.97	85	85
4	1.2343	1.111	1.1101	100.0	0.97	1.22	107	107
5	1.7433	1.3203	1.3187	100.0	1.22	1.46	43	43
6	2.3686	1.539	1.5388	100.0	1.46	1.7	26	26
7	3.2757	1.8099	1.8092	100.0	1.7	1.95	54	54
8	4.2927	2.0719	2.0709	100.0	1.95	2.19	63	63
9	5.3529	2.3136	2.3131	100.0	2.19	2.43	79	79

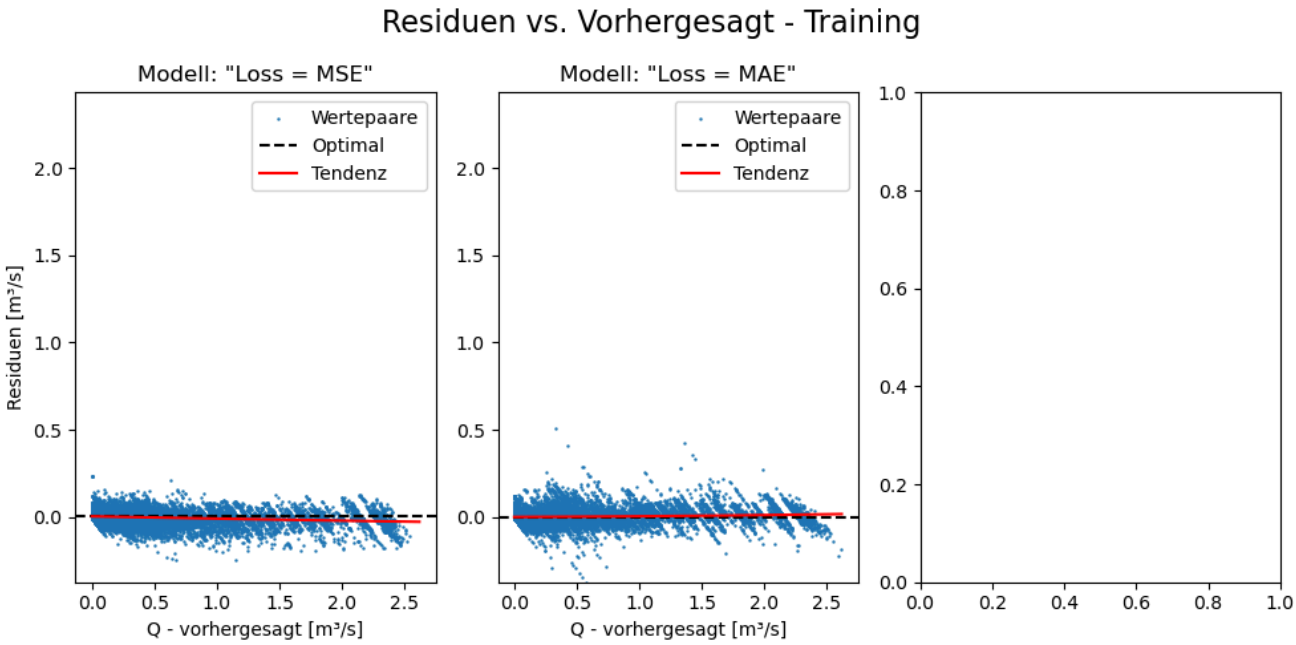
```
C:\Users\fl-al\AppData\Local\Temp\ipykernel_25476\4241526601.py:59: FutureWarning: The behavior of
DataFrame concatenation with empty or all-NA entries is deprecated. In a future version, this will
no longer exclude empty or all-NA columns when determining the result dtypes. To retain the old be
havior, exclude the relevant entries before the concat operation.
  metrics = pd.concat([metrics,new_row], ignore_index=True)
C:\Users\fl-al\AppData\Local\Temp\ipykernel_25476\4241526601.py:59: FutureWarning: The behavior of
DataFrame concatenation with empty or all-NA entries is deprecated. In a future version, this will
no longer exclude empty or all-NA columns when determining the result dtypes. To retain the old be
havior, exclude the relevant entries before the concat operation.
  metrics = pd.concat([metrics,new_row], ignore_index=True)
C:\Users\fl-al\AppData\Local\Temp\ipykernel_25476\4241526601.py:59: FutureWarning: The behavior of
DataFrame concatenation with empty or all-NA entries is deprecated. In a future version, this will
no longer exclude empty or all-NA columns when determining the result dtypes. To retain the old be
havior, exclude the relevant entries before the concat operation.
  metrics = pd.concat([metrics,new_row], ignore_index=True)
```

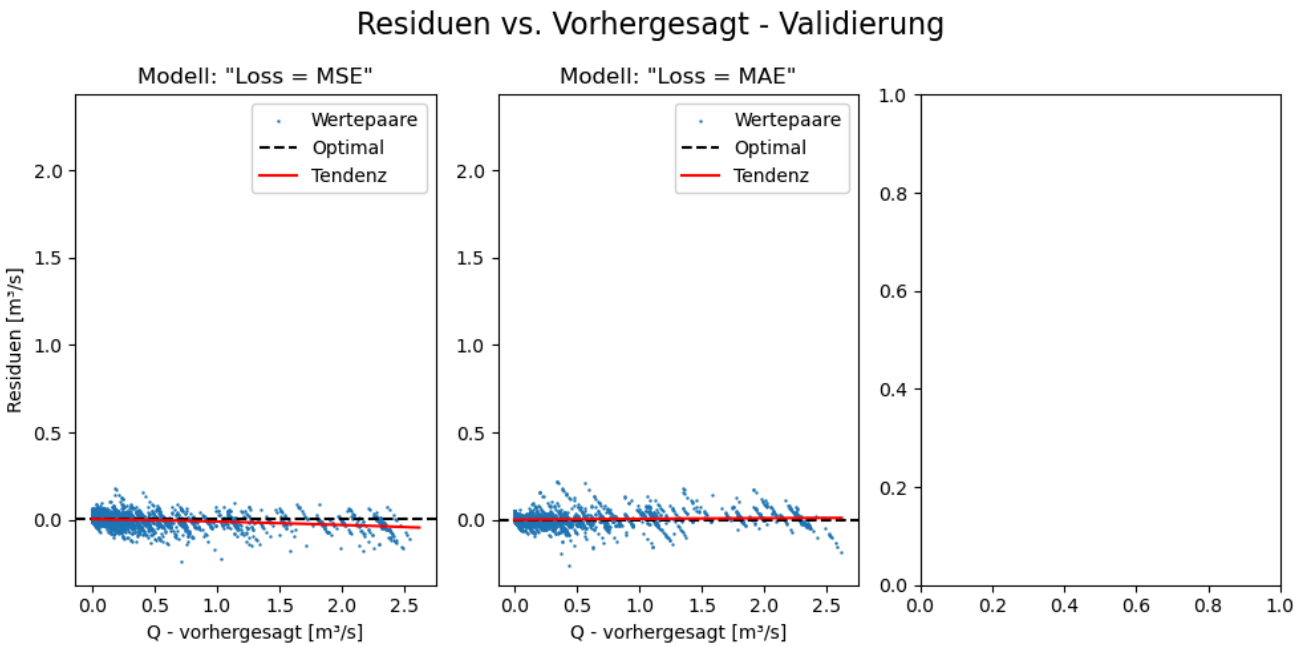


Darstellung aller Vorhersagen und Residuen



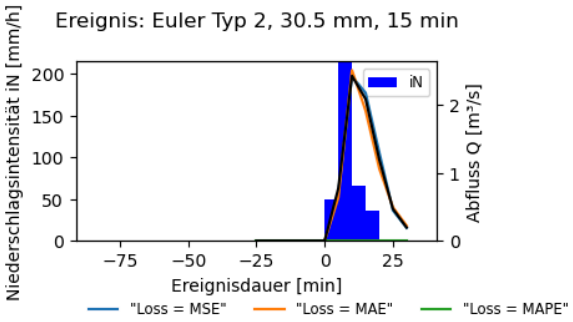


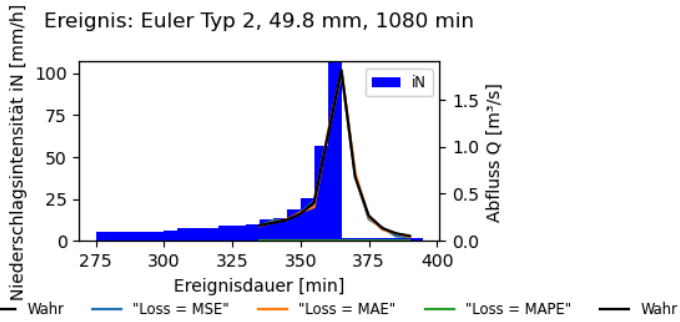


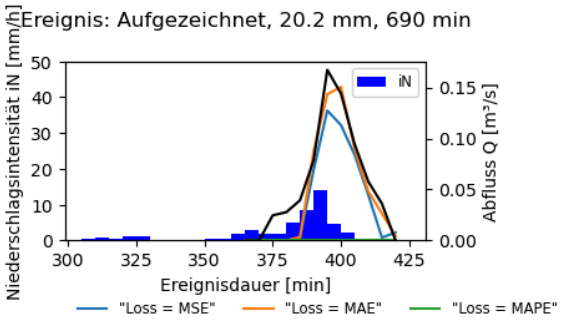


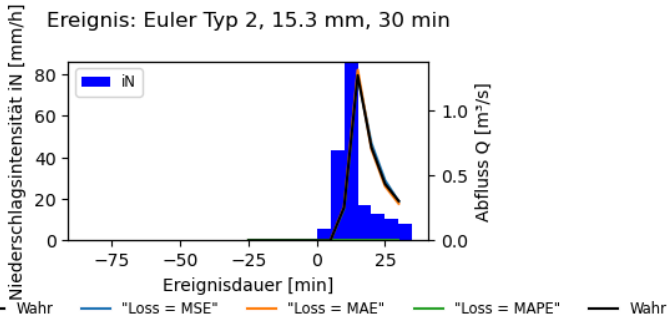
Auswertung der Extremwertabweichung im Testdatensatz

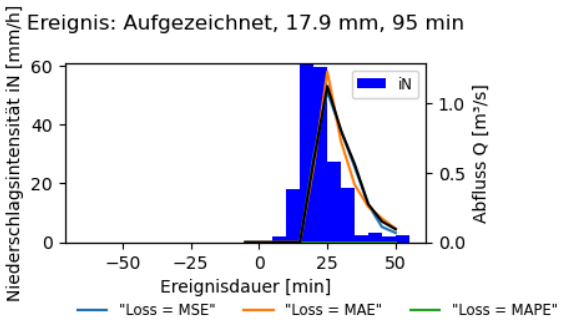
Modell	MAE [-]	RMSE [-]	MAPE [%]
"Loss = MSE"	0.0275946	0.040348	6.98174
"Loss = MAE"	0.0360091	0.0460625	5.4461
"Loss = MAPE"	1.26587	1.58058	100

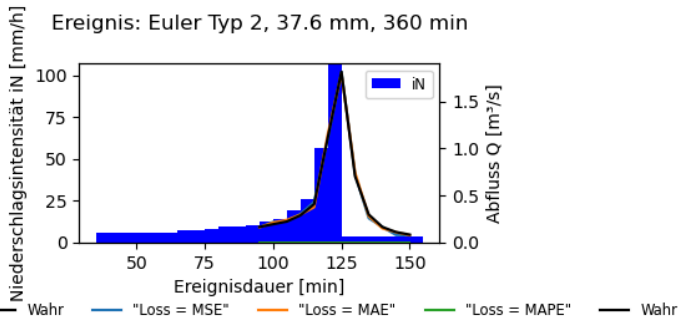

Ereignis: Euler Typ 2, 30.5 mm, 15 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

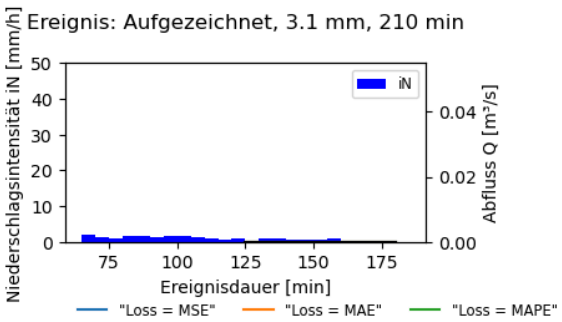

Ereignis: Euler Typ 2, 49.8 mm, 1080 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
Wahr
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

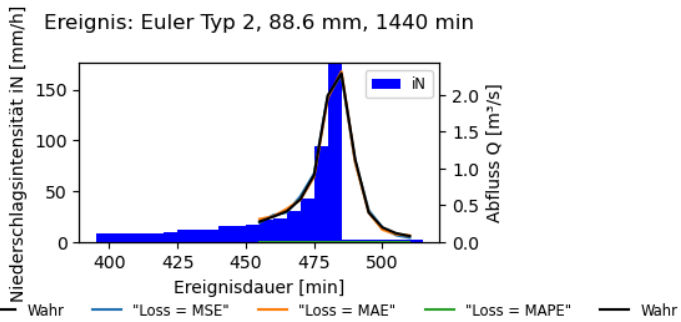

Ereignis: Aufgezeichnet, 20.2 mm, 690 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

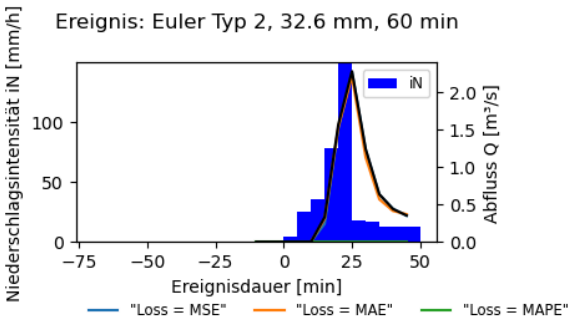

Ereignis: Euler Typ 2, 15.3 mm, 30 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
Wahr
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

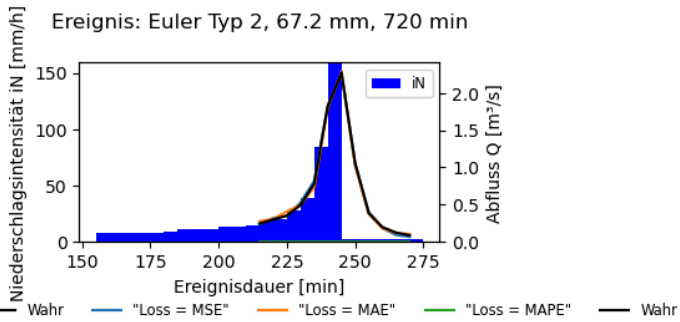

Ereignis: Aufgezeichnet, 17.9 mm, 95 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

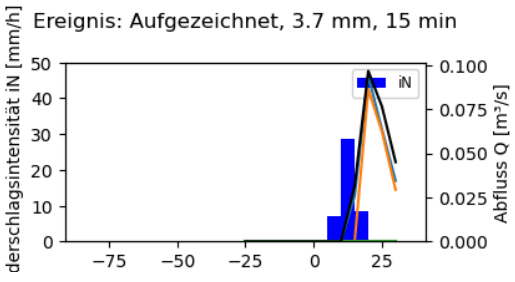

Ereignis: Euler Typ 2, 37.6 mm, 360 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
Wahr
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

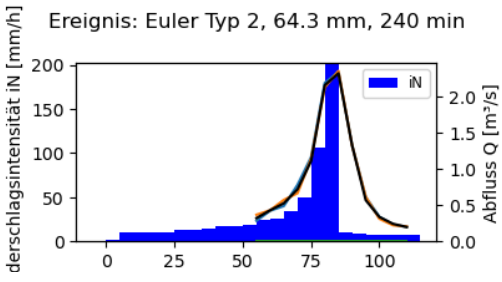

Ereignis: Aufgezeichnet, 3.1 mm, 210 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"


Ereignis: Euler Typ 2, 88.6 mm, 1440 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
Wahr
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

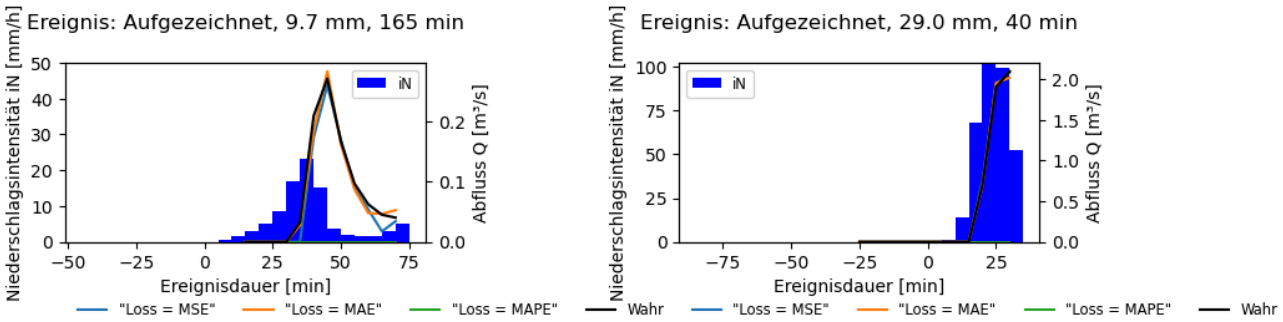

Ereignis: Euler Typ 2, 32.6 mm, 60 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

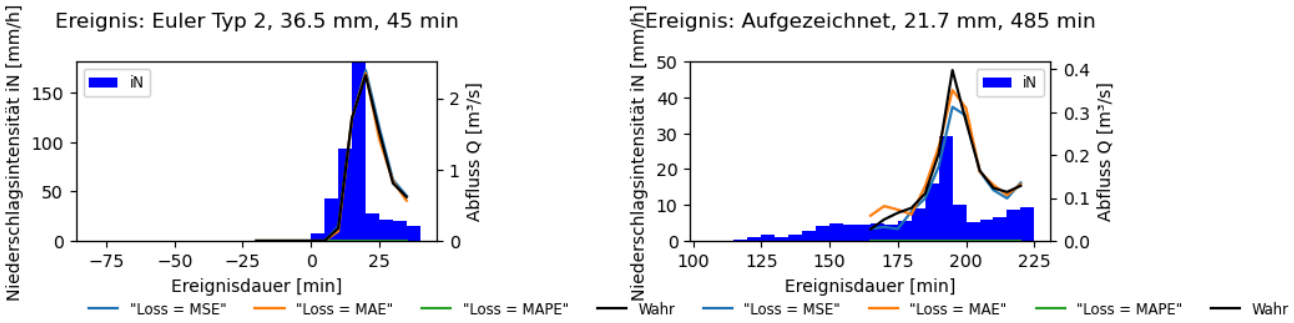

Ereignis: Euler Typ 2, 67.2 mm, 720 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
Wahr
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"

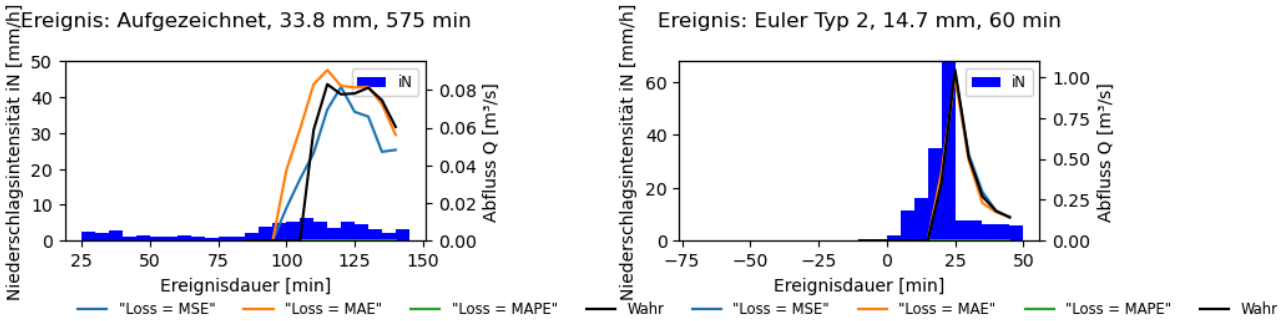

Ereignis: Aufgezeichnet, 3.7 mm, 15 min
derschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN

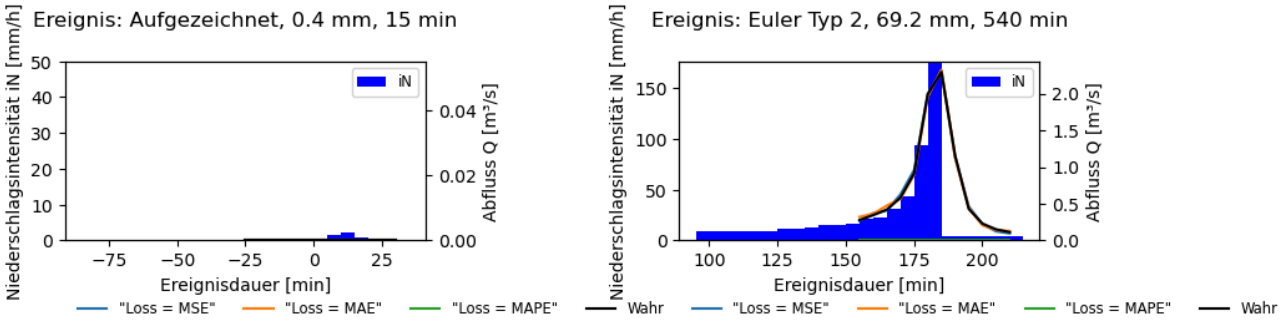

Ereignis: Euler Typ 2, 64.3 mm, 240 min
derschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN

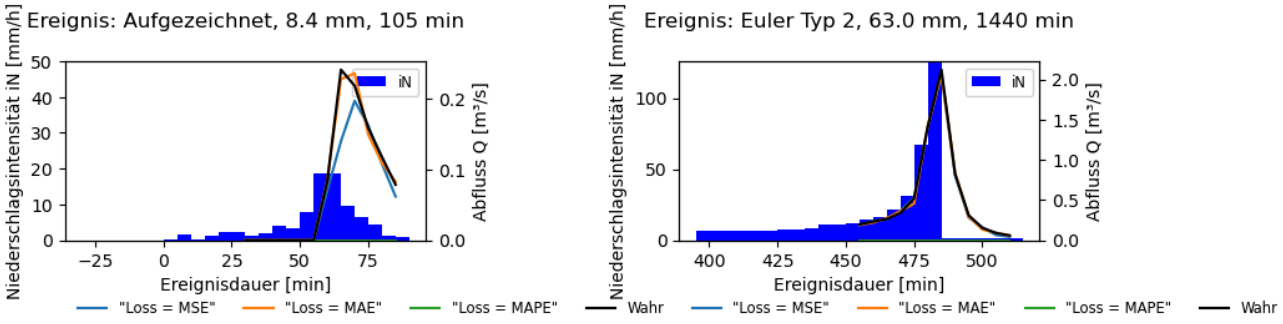

Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"
Wahr

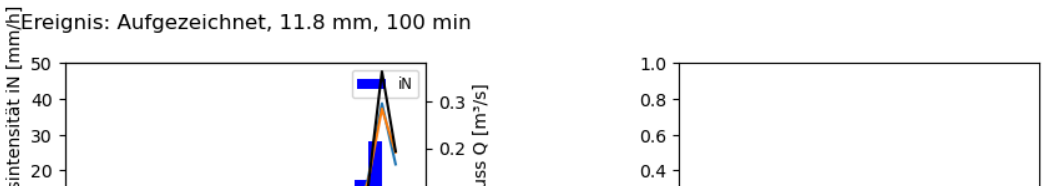

Ereignis: Aufgezeichnet, 9.7 mm, 165 min
Ereignis: Aufgezeichnet, 29.0 mm, 40 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"
Wahr

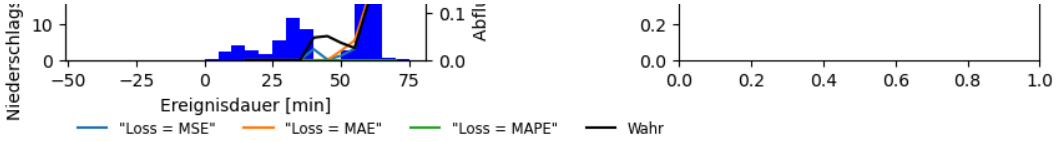

Ereignis: Euler Typ 2, 36.5 mm, 45 min
Ereignis: Aufgezeichnet, 21.7 mm, 485 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"
Wahr


Ereignis: Aufgezeichnet, 33.8 mm, 575 min
Ereignis: Euler Typ 2, 14.7 mm, 60 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"
Wahr


Ereignis: Aufgezeichnet, 0.4 mm, 15 min
Ereignis: Euler Typ 2, 69.2 mm, 540 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"
Wahr


Ereignis: Aufgezeichnet, 8.4 mm, 105 min
Ereignis: Euler Typ 2, 63.0 mm, 1440 min
Niederschlagsintensität iN [mm/h]
Abfluss Q [m³/s]
iN
Ereignisdauer [min]
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"
Wahr


Ereignis: Aufgezeichnet, 11.8 mm, 100 min
Niederschlagsintensität iN [mm/h]
iN


Niederschlags
10
0
−50
−25
0
25
50
75
Ereignisdauer [min]
0.1
0.0
Abfl
0.2
0.0
0.0
0.2
0.4
0.6
0.8
1.0
"Loss = MSE"
"Loss = MAE"
"Loss = MAPE"
Wahr