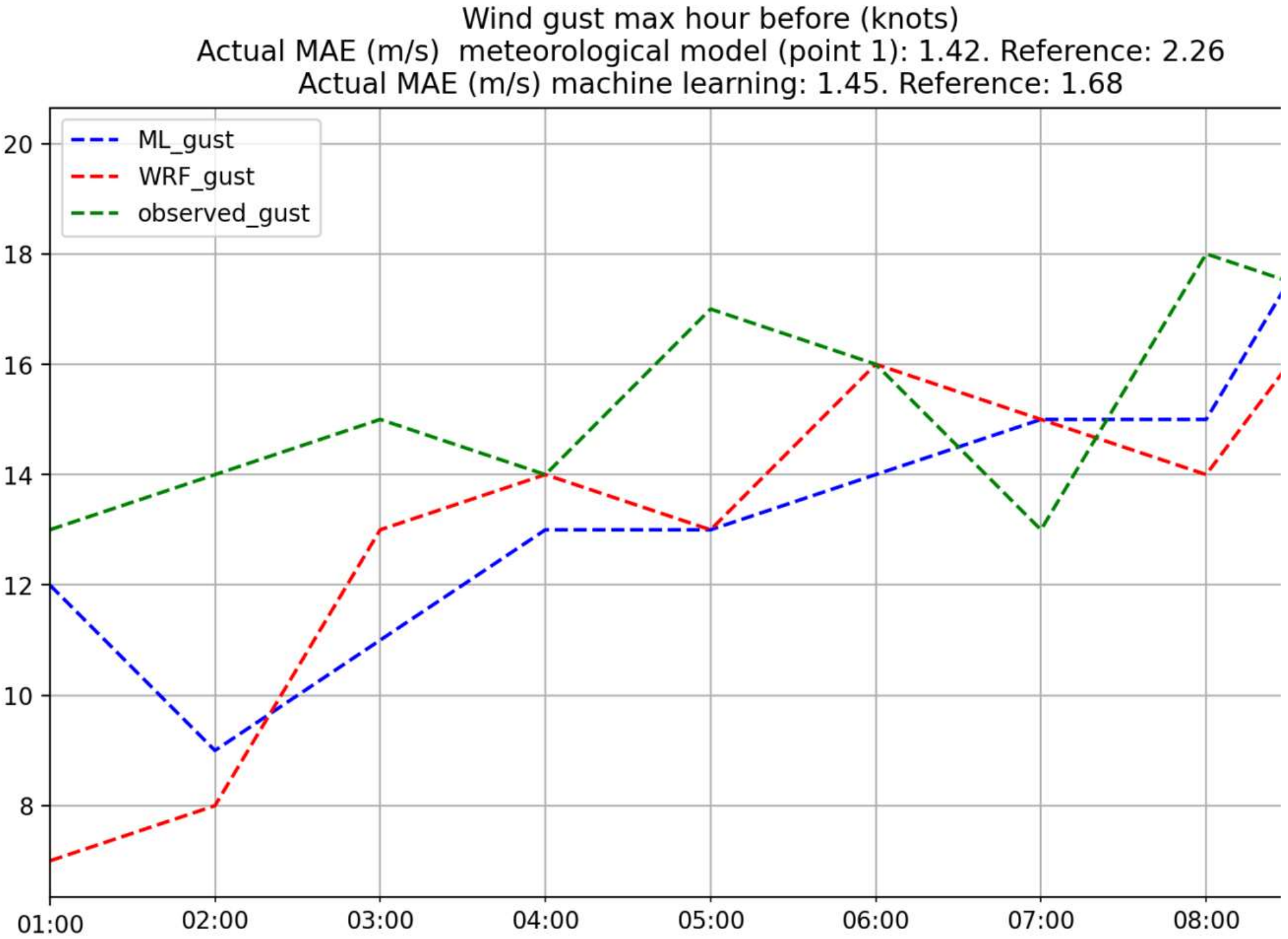
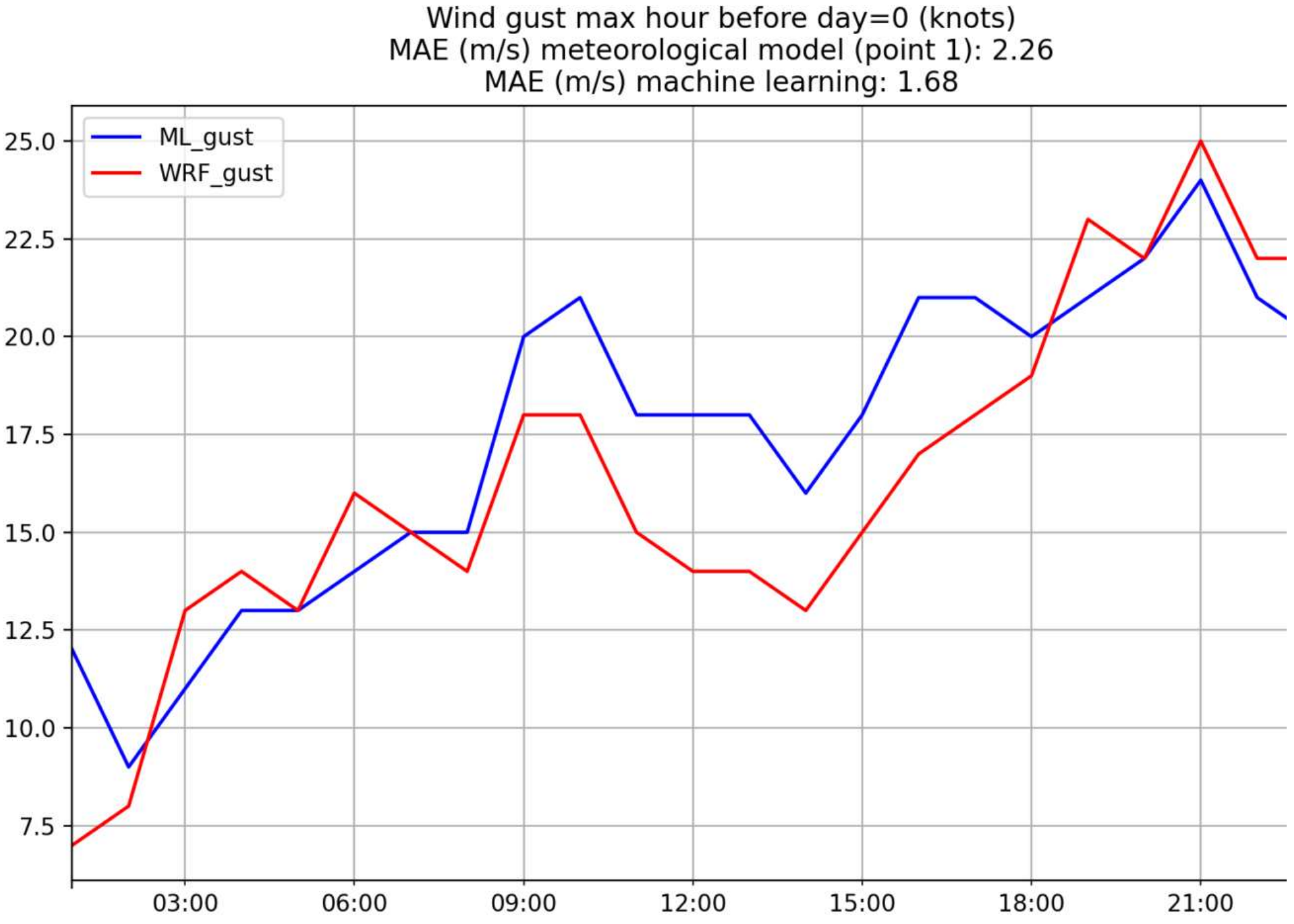
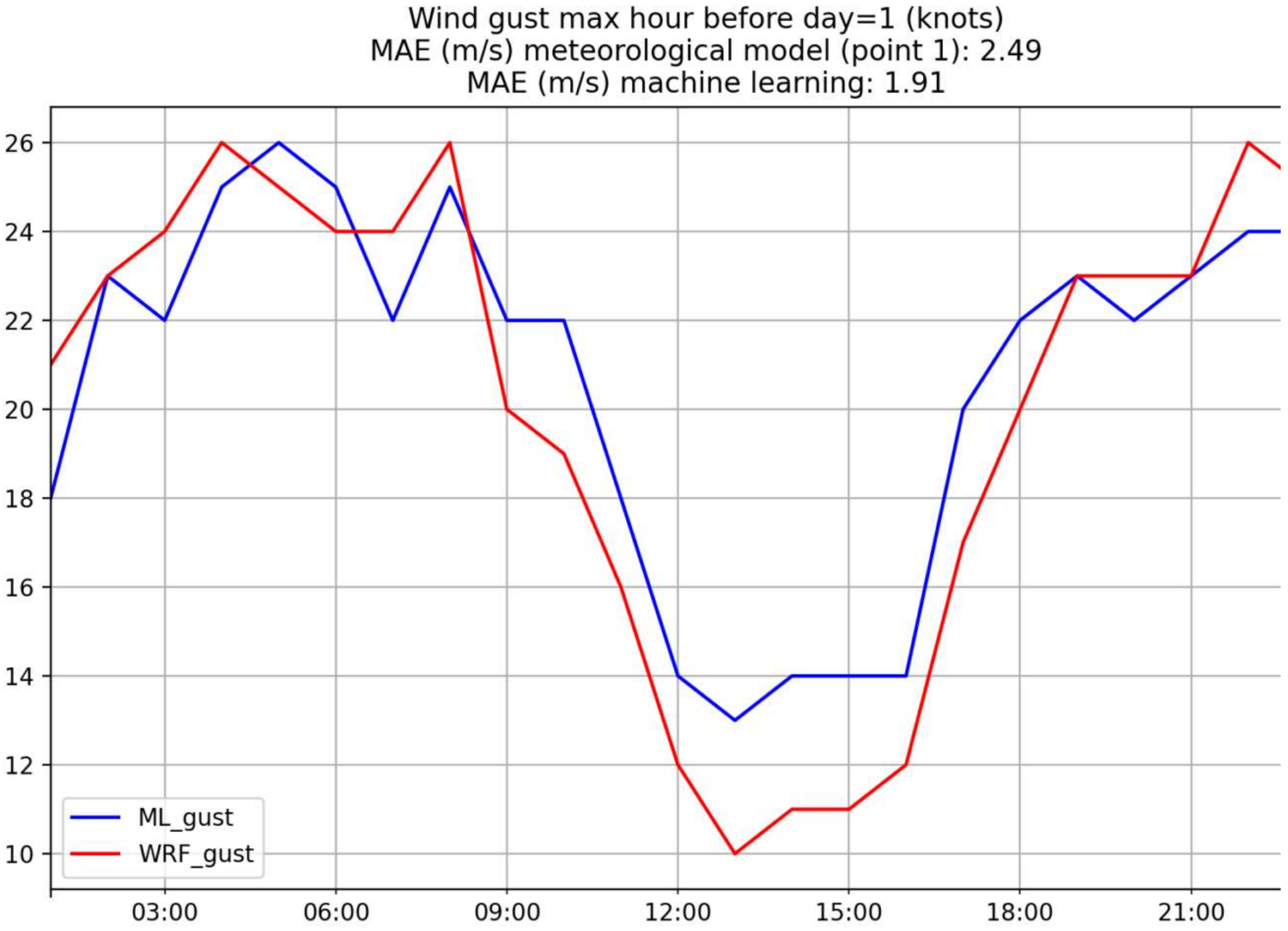
All times UTC

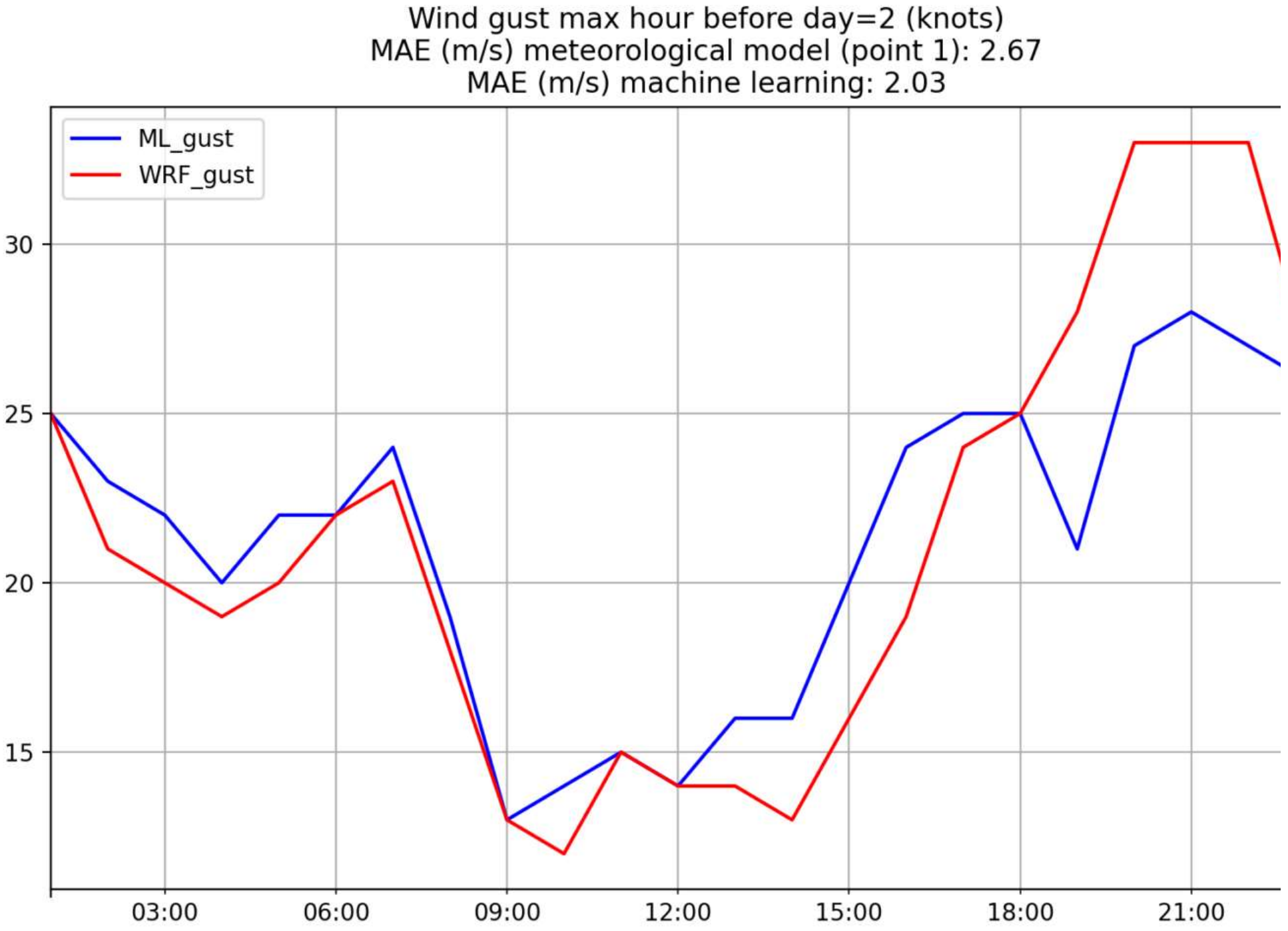

Wind gust max hour before (knots)
Actual MAE (m/s) meteorological model (point 1): 1.42. Reference: 2.26
Actual MAE (m/s) machine learning: 1.45. Reference: 1.68
ML_gust
WRF_gust
observed_gust
20
18
16
14
12
10
8
01:00
02:00
03:00
04:00
05:00
06:00
07:00
08:00


Wind gust max hour before day=0 (knots)
MAE (m/s) meteorological model (point 1): 2.26
MAE (m/s) machine learning: 1.68
ML_gust
WRF_gust
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
03:00
06:00
09:00
12:00
15:00
18:00
21:00

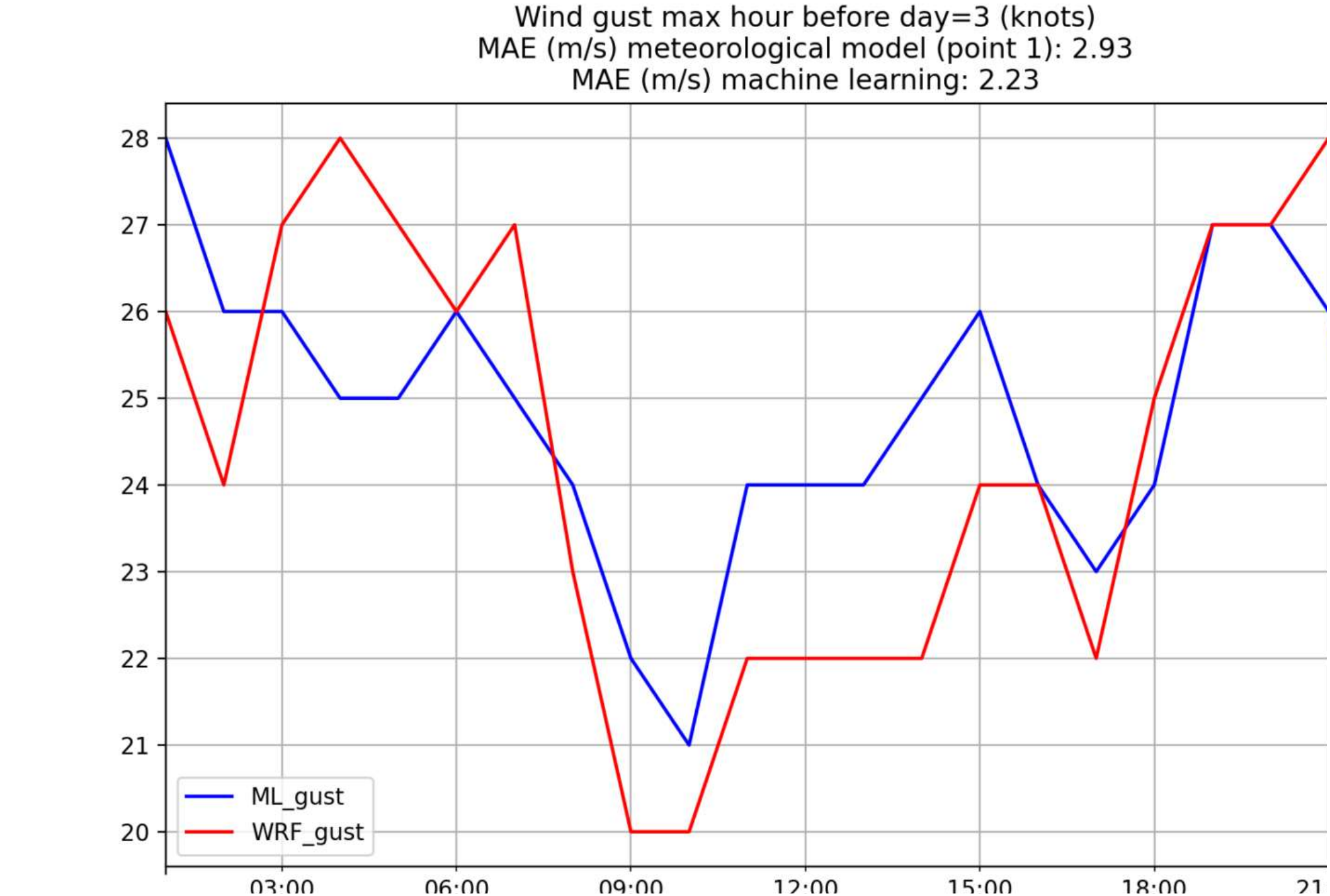
time

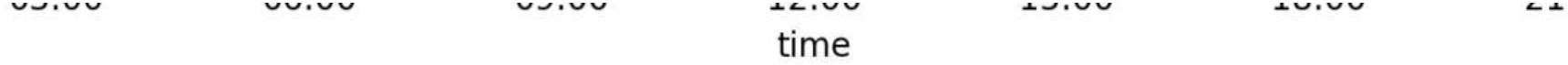

Wind gust max hour before day=1 (knots)
MAE (m/s) meteorological model (point 1): 2.49
MAE (m/s) machine learning: 1.91
26
24
22
20
18
16
14
12
10
ML_gust
WRF_gust
03:00
06:00
09:00
12:00
15:00
18:00
21:00

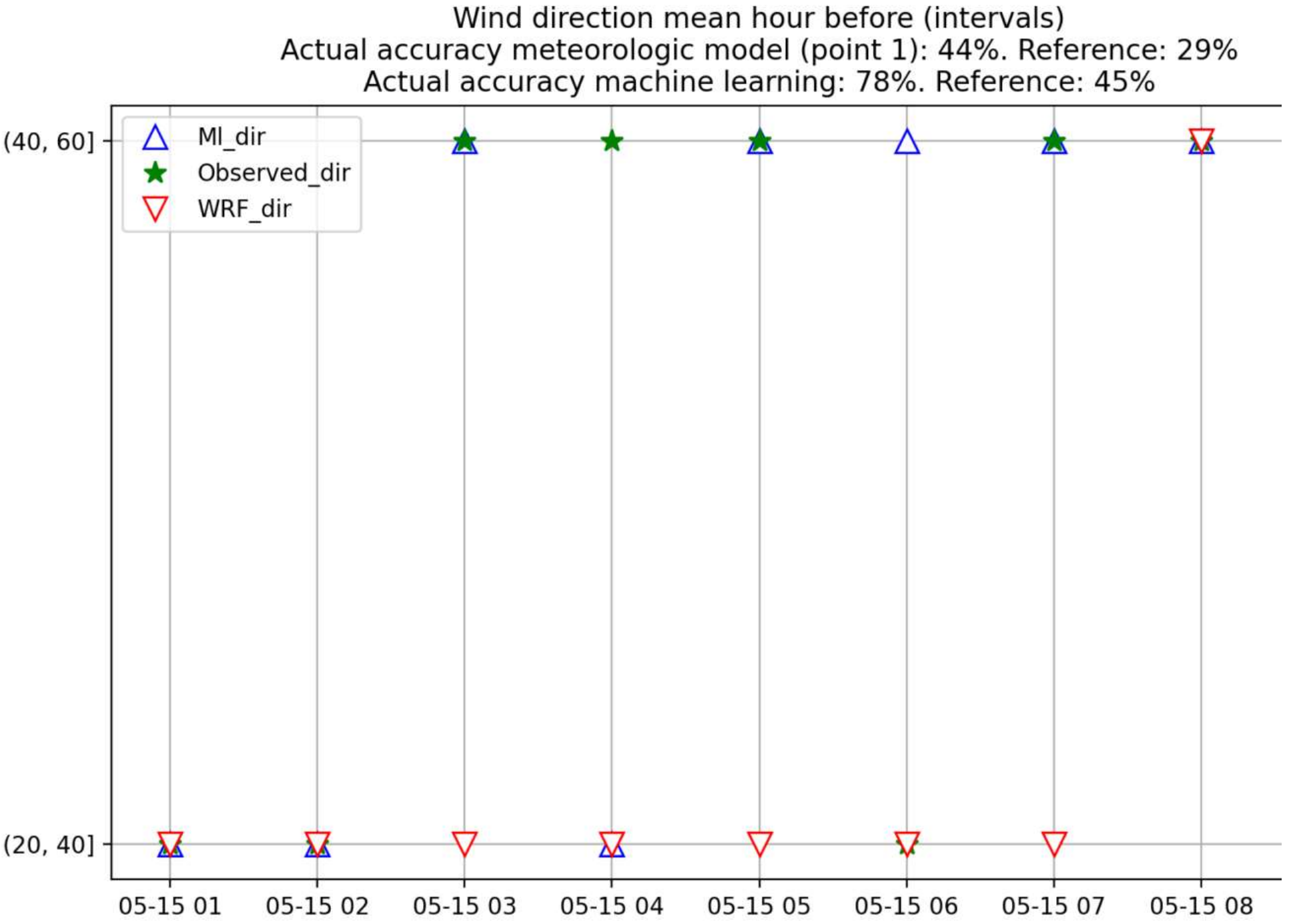
time

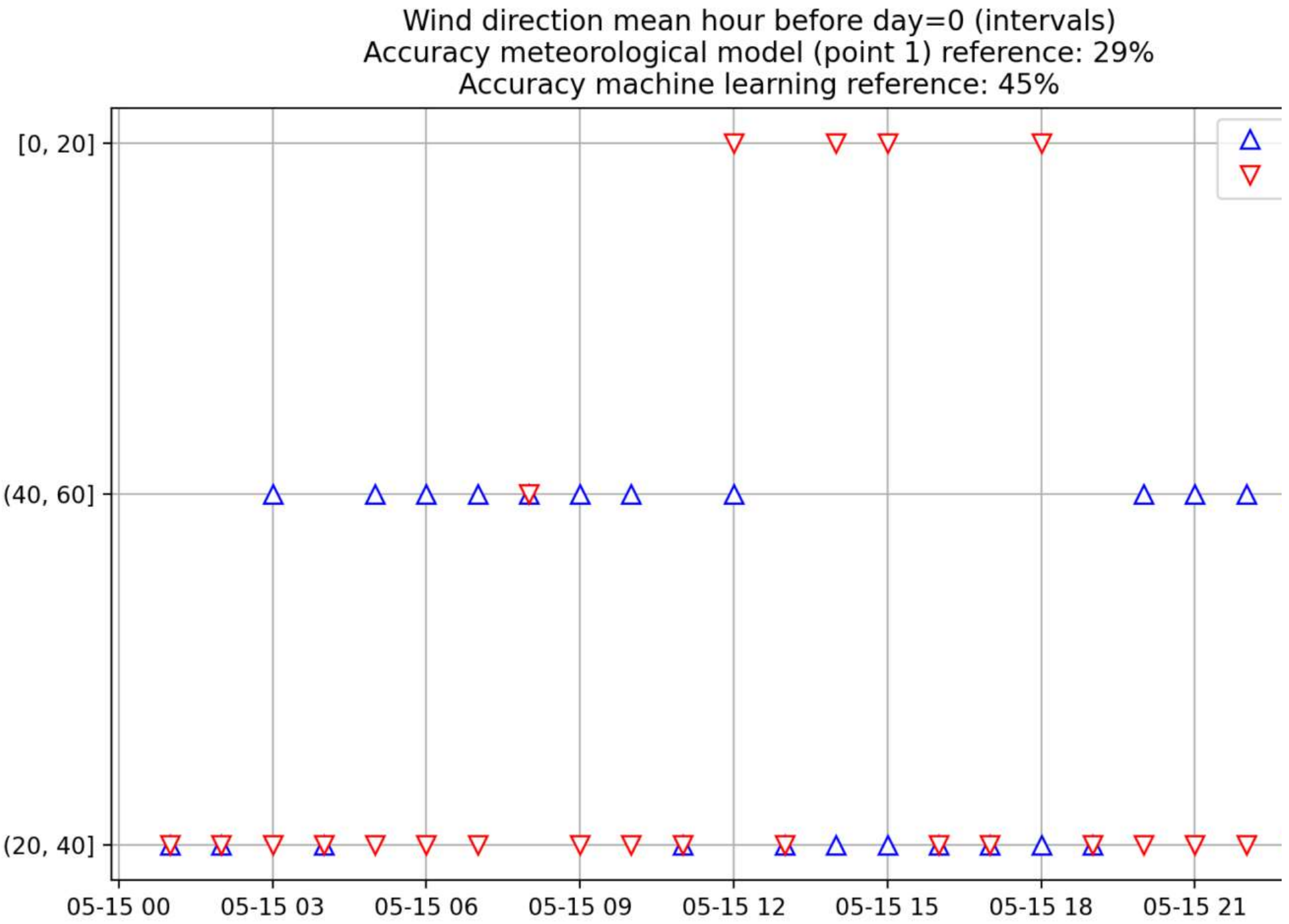

Wind gust max hour before day=2 (knots)
MAE (m/s) meteorological model (point 1): 2.67
MAE (m/s) machine learning: 2.03
ML_gust
WRF_gust
30
25
20
15
03:00
06:00
09:00
12:00
15:00
18:00
21:00

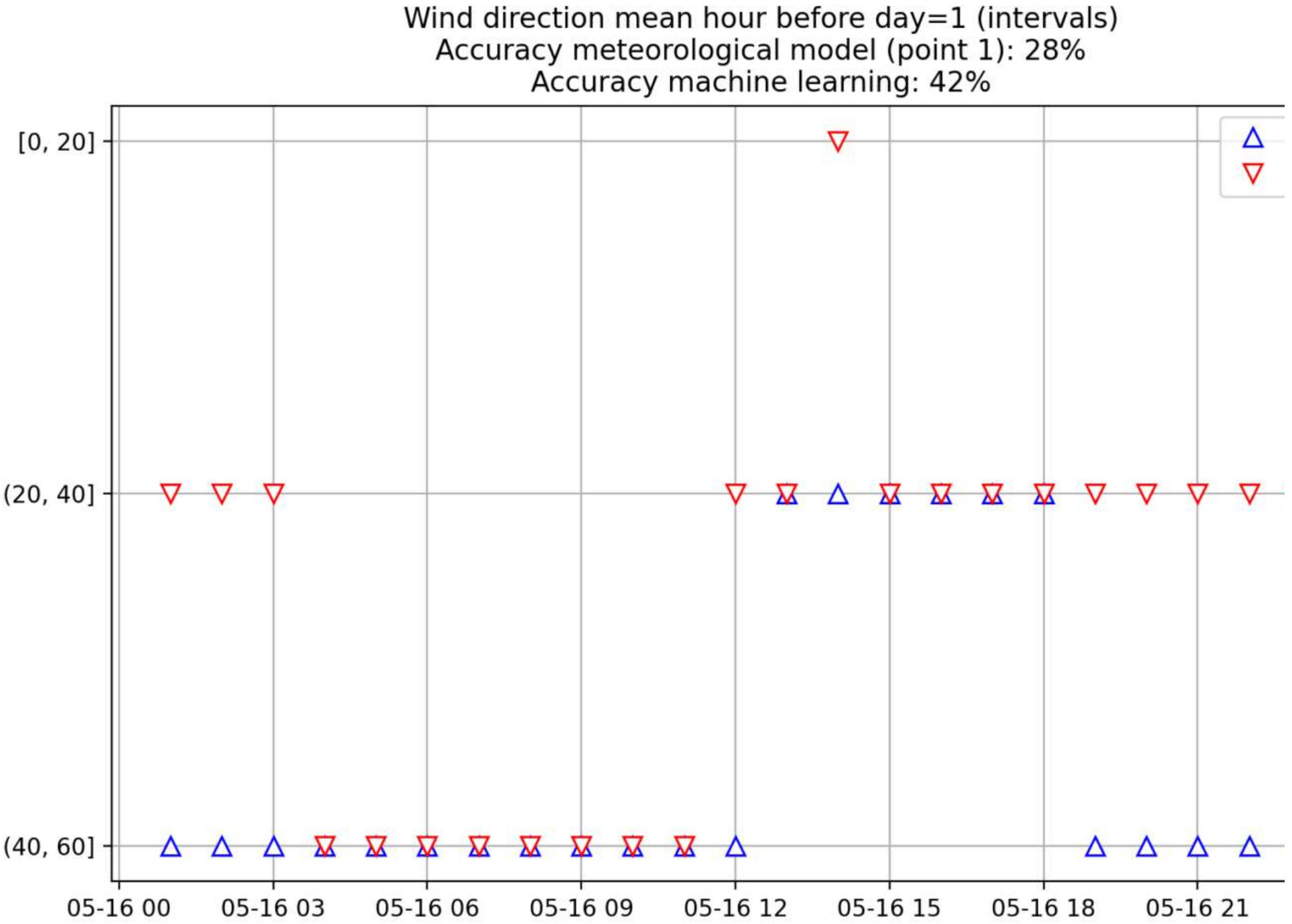
time

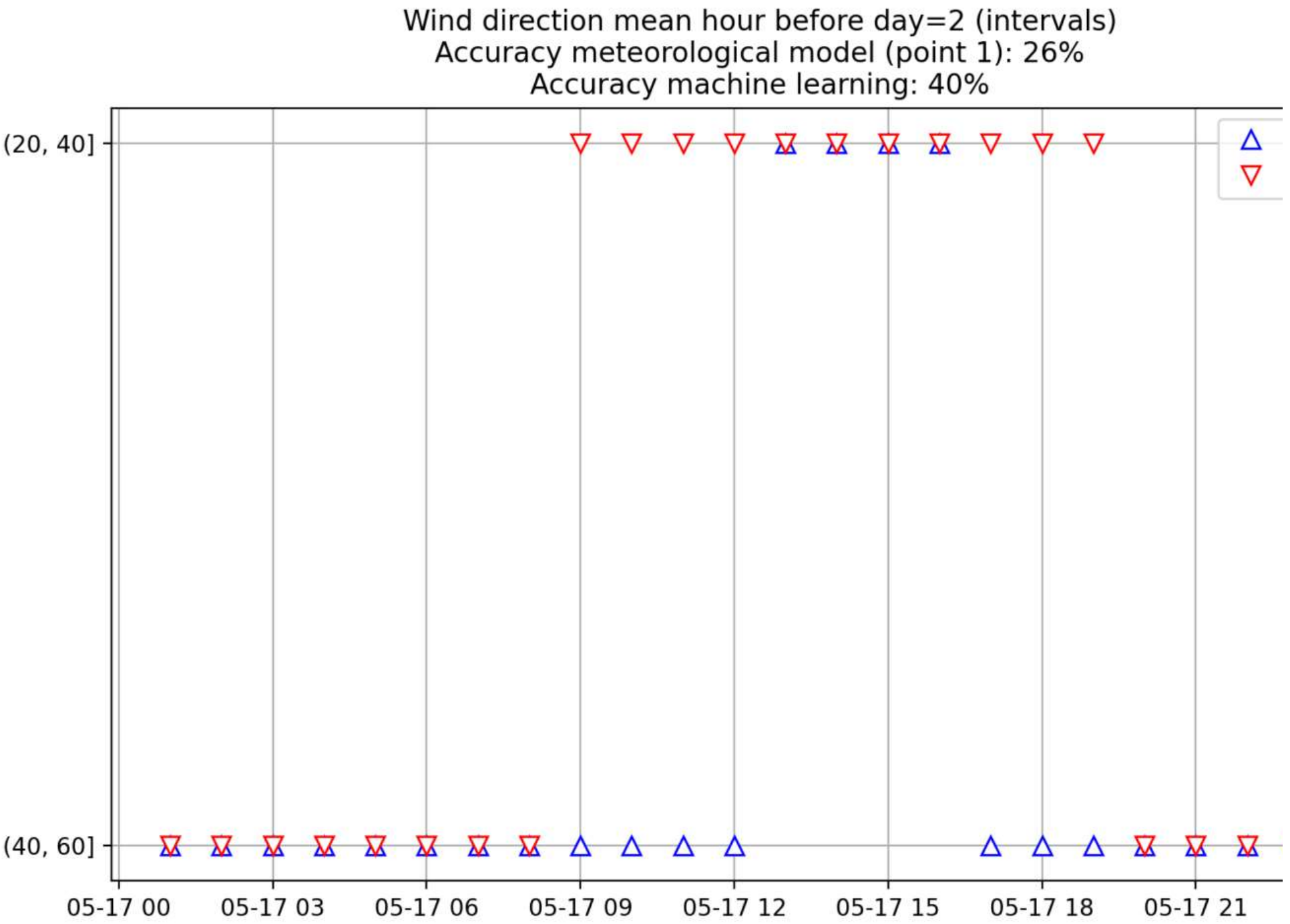

Wind gust max hour before day=3 (knots)
MAE (m/s) meteorological model (point 1): 2.93
MAE (m/s) machine learning: 2.23
28
27
26
25
24
23
22
21
20
ML_gust
WRF_gust
03:00
06:00
09:00
12:00
15:00
18:00
21

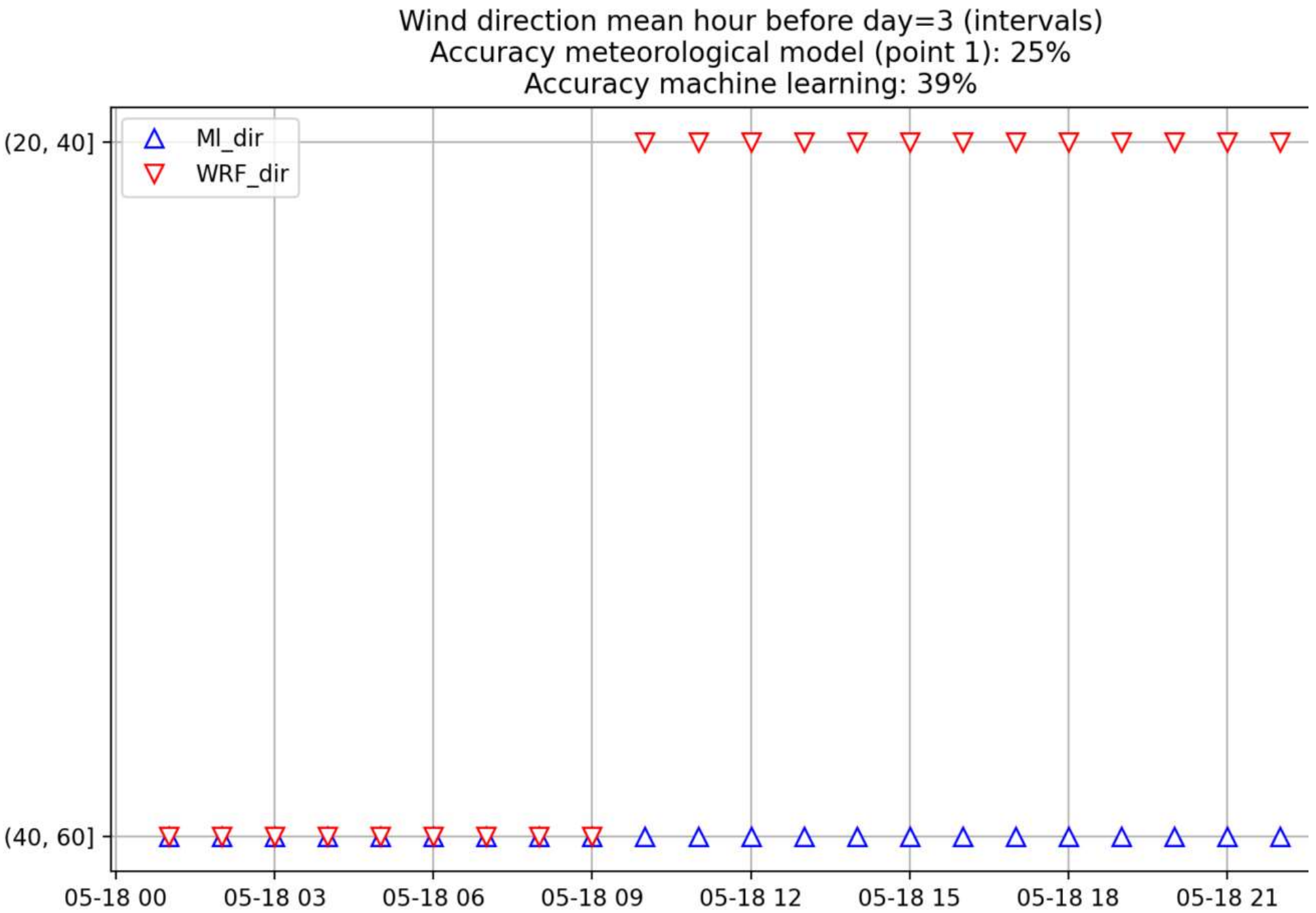

time


Wind direction mean hour before (intervals)
Actual accuracy meteorologic model (point 1): 44%. Reference: 29%
Actual accuracy machine learning: 78%. Reference: 45%
Ml_dir
Observed_dir
WRF_dir
(40, 60]
(20, 40]
05-15 01
05-15 02
05-15 03
05-15 04
05-15 05
05-15 06
05-15 07
05-15 08

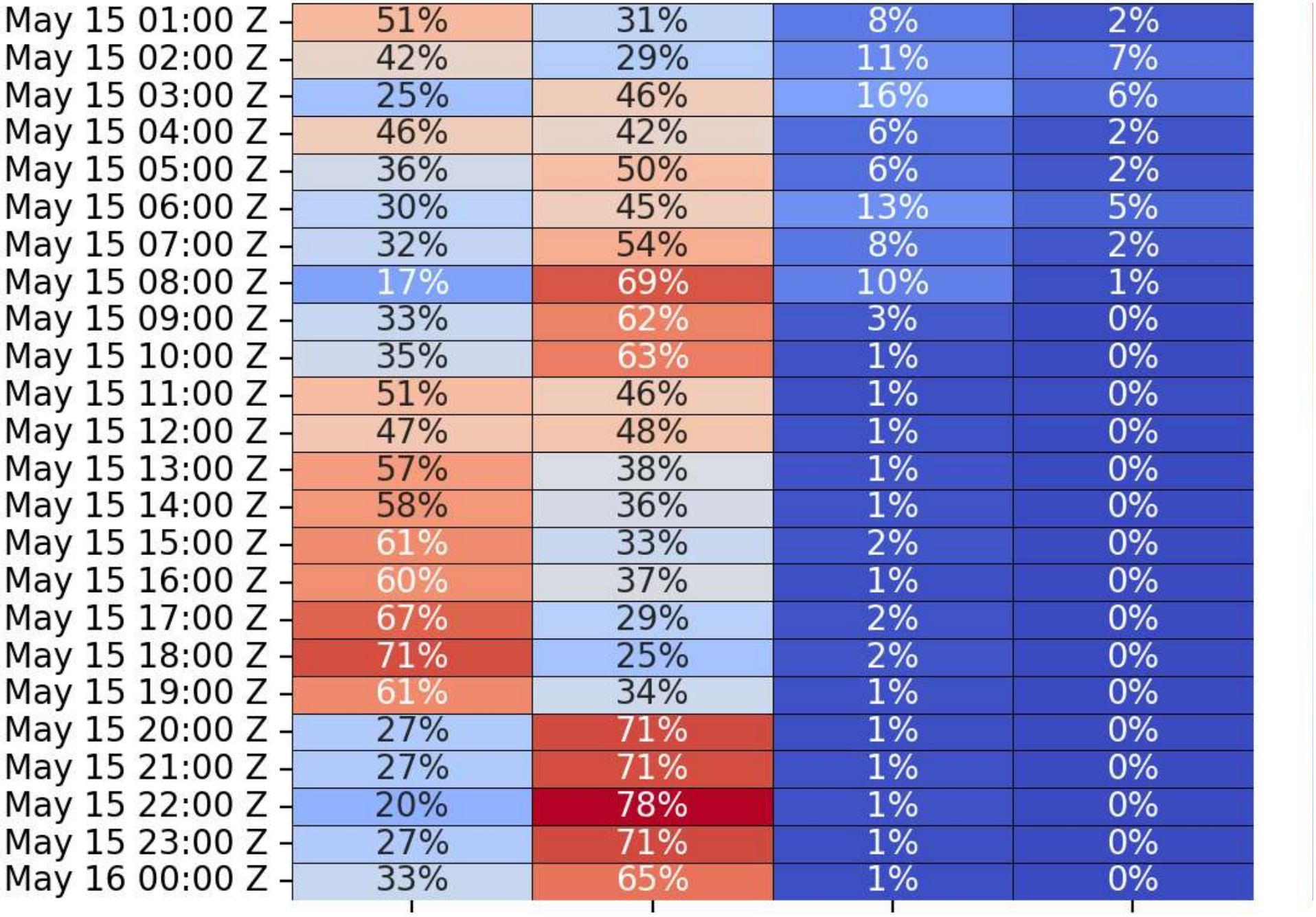

Wind direction mean hour before day=0 (intervals)
Accuracy meteorological model (point 1) reference: 29%
Accuracy machine learning reference: 45%
[0, 20]
(40, 60]
(20, 40]
05-15 00
05-15 03
05-15 06
05-15 09
05-15 12
05-15 15
05-15 18
05-15 21


Wind direction mean hour before day=1 (intervals)
Accuracy meteorological model (point 1): 28%
Accuracy machine learning: 42%
[0, 20]
(20, 40]
(40, 60]
05-16 00
05-16 03
05-16 06
05-16 09
05-16 12
05-16 15
05-16 18
05-16 21

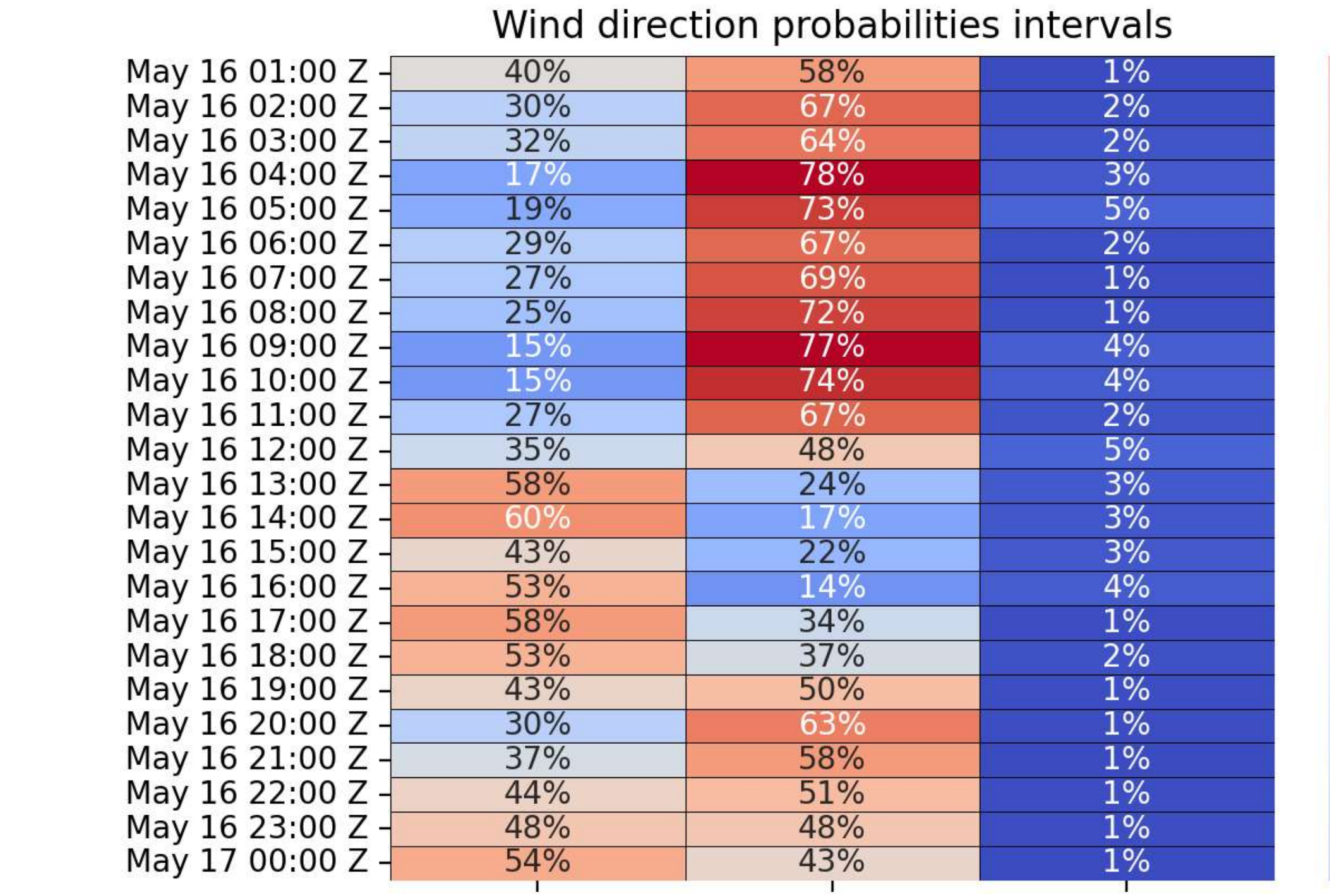

Wind direction mean hour before day=2 (intervals)
Accuracy meteorological model (point 1): 26%
Accuracy machine learning: 40%
(20, 40]
(40, 60]
05-17 00
05-17 03
05-17 06
05-17 09
05-17 12
05-17 15
05-17 18
05-17 21


Wind direction mean hour before day=3 (intervals)
Accuracy meteorological model (point 1): 25%
Accuracy machine learning: 39%
Ml_dir
WRF_dir
(20, 40]
(40, 60]
05-18 00
05-18 03
05-18 06
05-18 09
05-18 12
05-18 15
05-18 18
05-18 21

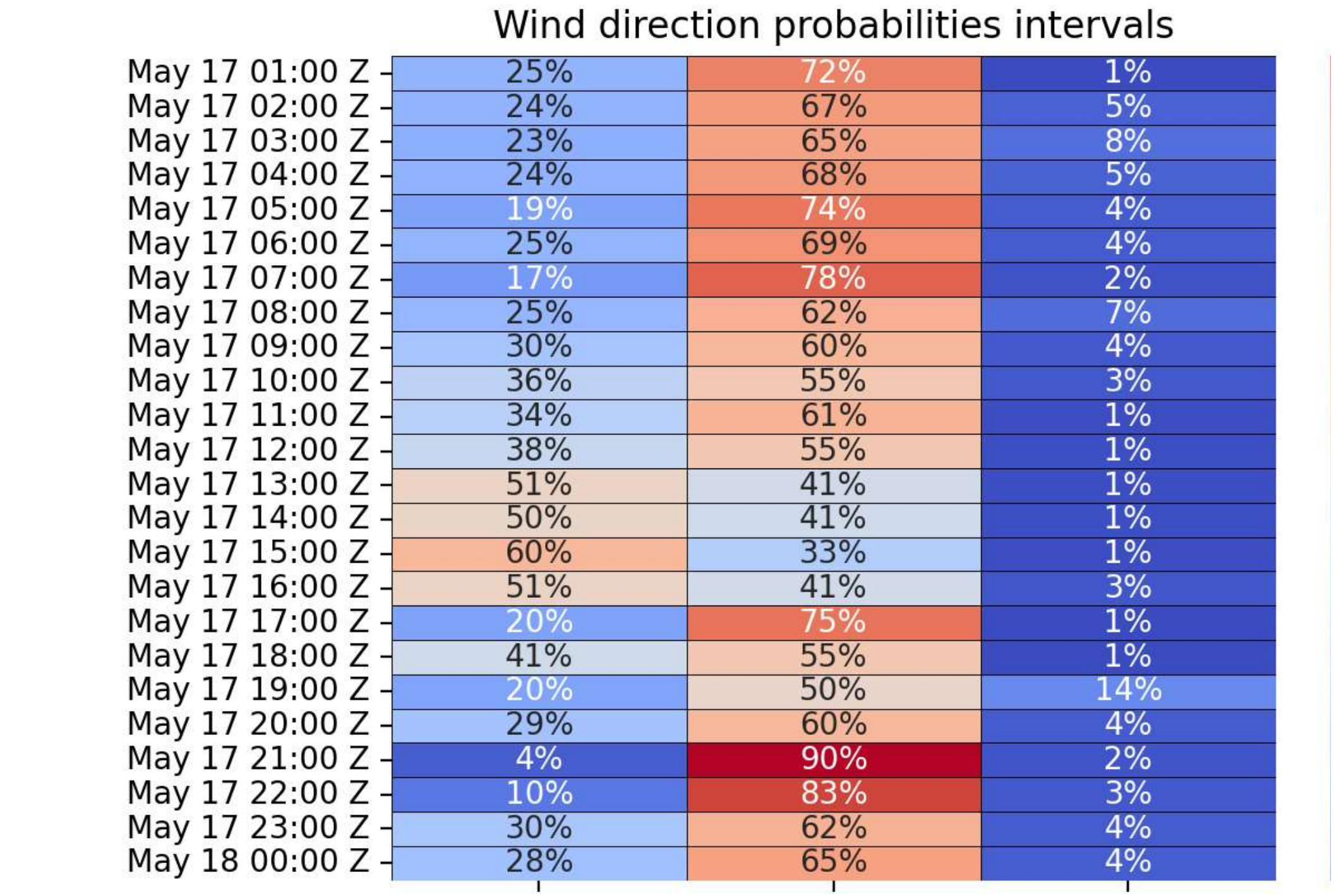
Wind direction probabilities intervals

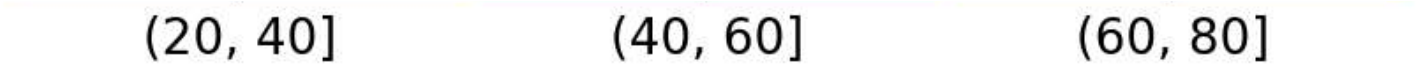


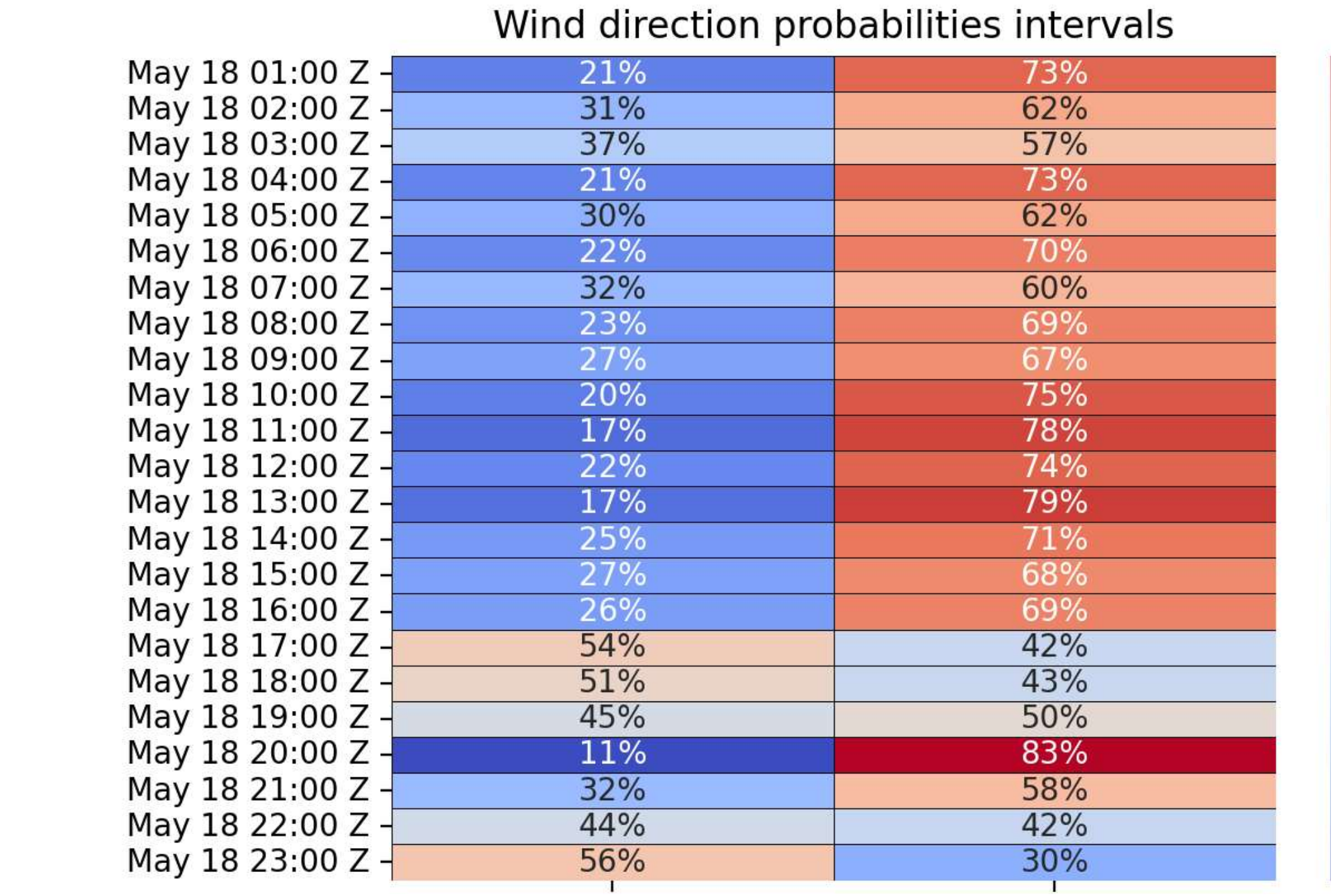
(20, 40]
(40, 60]
(60, 80]
(80, 100]


Wind direction probabilities intervals
May 16 01:00 Z 40% 58% 1%
May 16 02:00 Z 30% 67% 2%
May 16 03:00 Z 32% 64% 2%
May 16 04:00 Z 17% 78% 3%
May 16 05:00 Z 19% 73% 5%
May 16 06:00 Z 29% 67% 2%
May 16 07:00 Z 27% 69% 1%
May 16 08:00 Z 25% 72% 1%
May 16 09:00 Z 15% 77% 4%
May 16 10:00 Z 15% 74% 4%
May 16 11:00 Z 27% 67% 2%
May 16 12:00 Z 35% 48% 5%
May 16 13:00 Z 58% 24% 3%
May 16 14:00 Z 60% 17% 3%
May 16 15:00 Z 43% 22% 3%
May 16 16:00 Z 53% 14% 4%
May 16 17:00 Z 58% 34% 1%
May 16 18:00 Z 53% 37% 2%
May 16 19:00 Z 43% 50% 1%
May 16 20:00 Z 30% 63% 1%
May 16 21:00 Z 37% 58% 1%
May 16 22:00 Z 44% 51% 1%
May 16 23:00 Z 48% 48% 1%
May 17 00:00 Z 54% 43% 1%

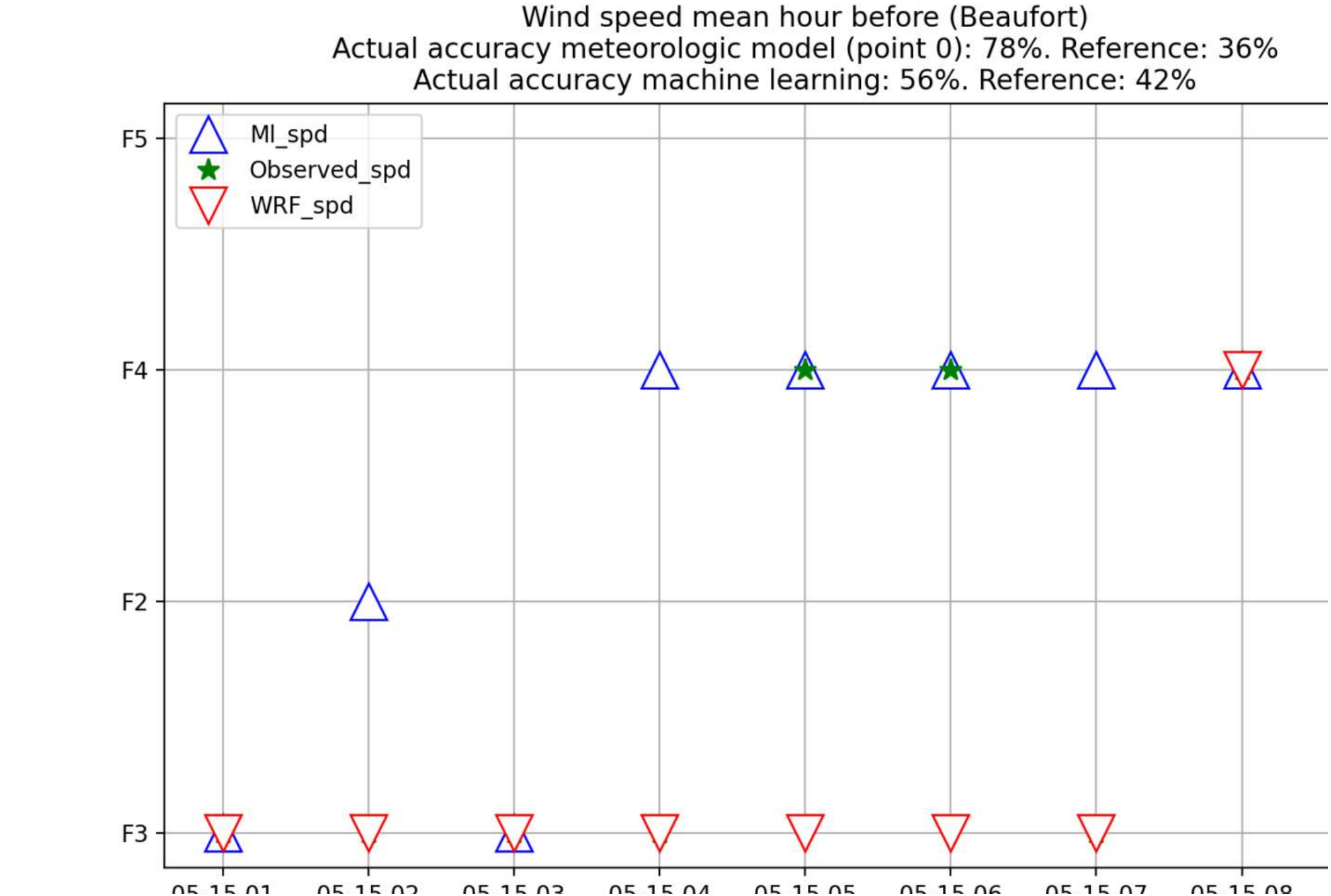
(20, 40]
(40, 60]
(60, 80]


Wind direction probabilities intervals
May 17 01:00 Z 25% 72% 1%
May 17 02:00 Z 24% 67% 5%
May 17 03:00 Z 23% 65% 8%
May 17 04:00 Z 24% 68% 5%
May 17 05:00 Z 19% 74% 4%
May 17 06:00 Z 25% 69% 4%
May 17 07:00 Z 17% 78% 2%
May 17 08:00 Z 25% 62% 7%
May 17 09:00 Z 30% 60% 4%
May 17 10:00 Z 36% 55% 3%
May 17 11:00 Z 34% 61% 1%
May 17 12:00 Z 38% 55% 1%
May 17 13:00 Z 51% 41% 1%
May 17 14:00 Z 50% 41% 1%
May 17 15:00 Z 60% 33% 1%
May 17 16:00 Z 51% 41% 3%
May 17 17:00 Z 20% 75% 1%
May 17 18:00 Z 41% 55% 1%
May 17 19:00 Z 20% 50% 14%
May 17 20:00 Z 29% 60% 4%
May 17 21:00 Z 4% 90% 2%
May 17 22:00 Z 10% 83% 3%
May 17 23:00 Z 30% 62% 4%
May 18 00:00 Z 28% 65% 4%

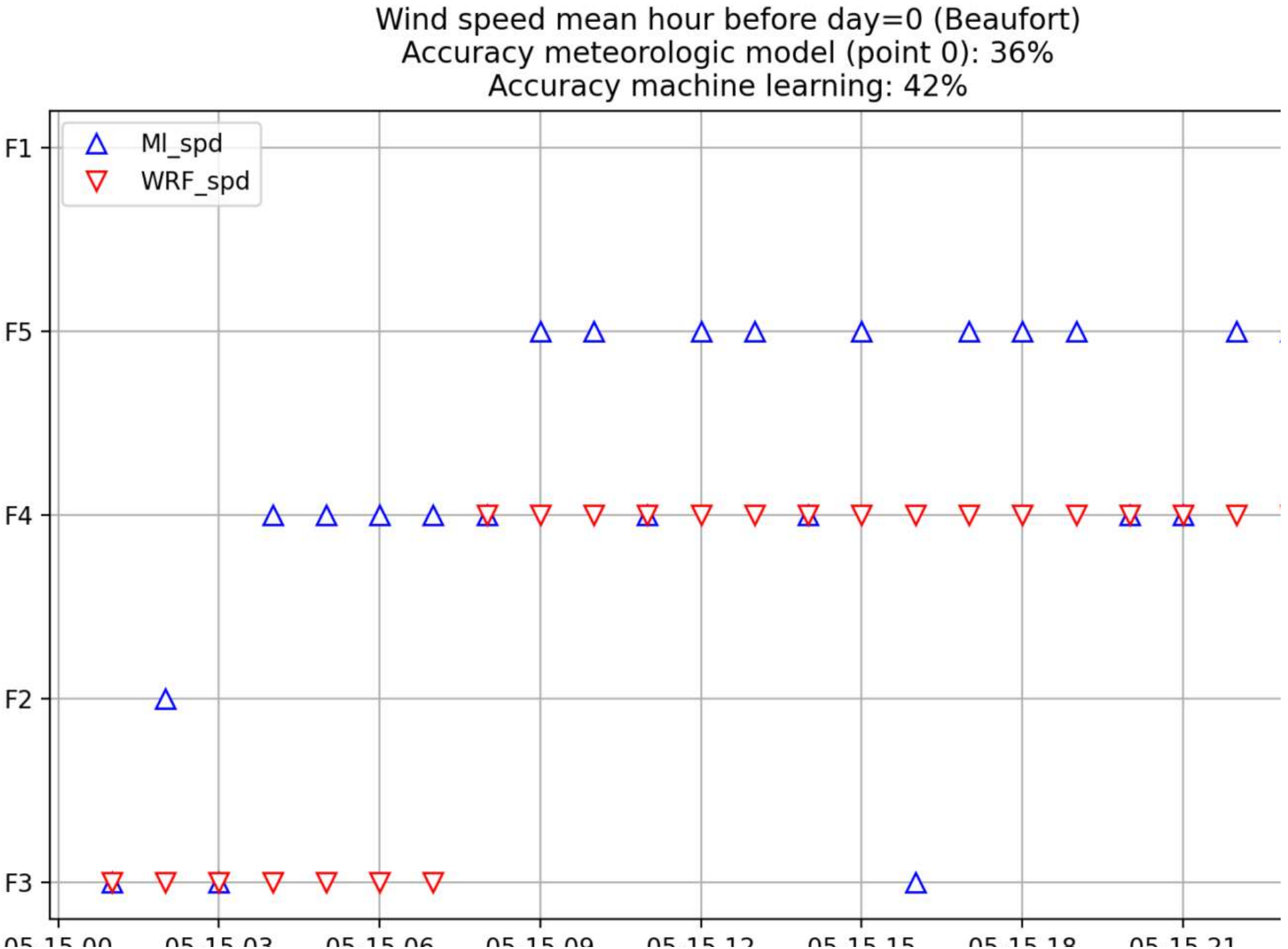

(20, 40]
(40, 60]
(60, 80]


Wind direction probabilities intervals
May 18 01:00 Z 21% 73%
May 18 02:00 Z 31% 62%
May 18 03:00 Z 37% 57%
May 18 04:00 Z 21% 73%
May 18 05:00 Z 30% 62%
May 18 06:00 Z 22% 70%
May 18 07:00 Z 32% 60%
May 18 08:00 Z 23% 69%
May 18 09:00 Z 27% 67%
May 18 10:00 Z 20% 75%
May 18 11:00 Z 17% 78%
May 18 12:00 Z 22% 74%
May 18 13:00 Z 17% 79%
May 18 14:00 Z 25% 71%
May 18 15:00 Z 27% 68%
May 18 16:00 Z 26% 69%
May 18 17:00 Z 54% 42%
May 18 18:00 Z 51% 43%
May 18 19:00 Z 45% 50%
May 18 20:00 Z 11% 83%
May 18 21:00 Z 32% 58%
May 18 22:00 Z 44% 42%
May 18 23:00 Z 56% 30%

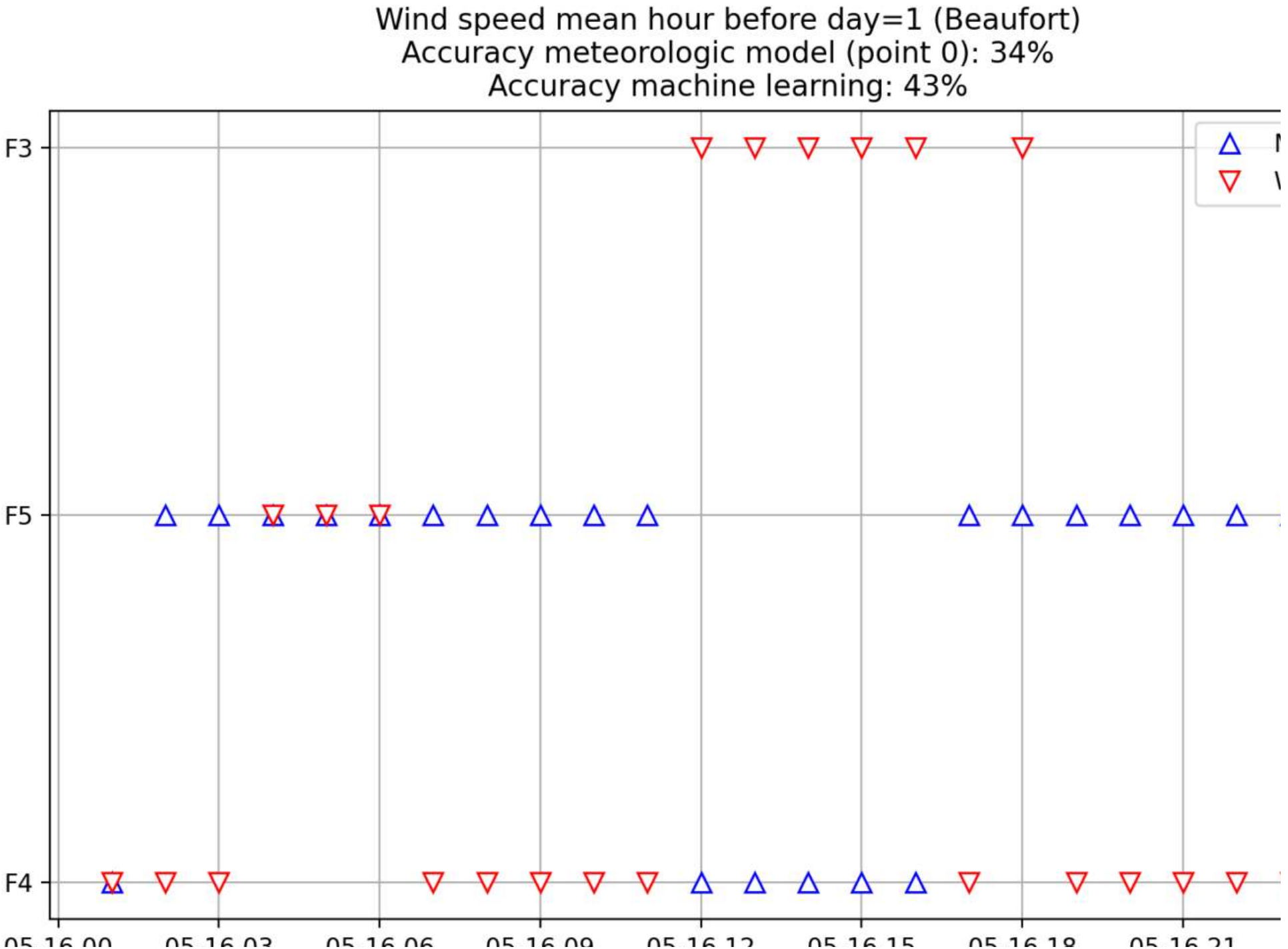
(20, 40]
(40, 60]


Wind speed mean hour before (Beaufort)
Actual accuracy meteorologic model (point 0): 78%. Reference: 36%
Actual accuracy machine learning: 56%. Reference: 42%
Ml_spd
Observed_spd
WRF_spd
F5
F4
F2
F3

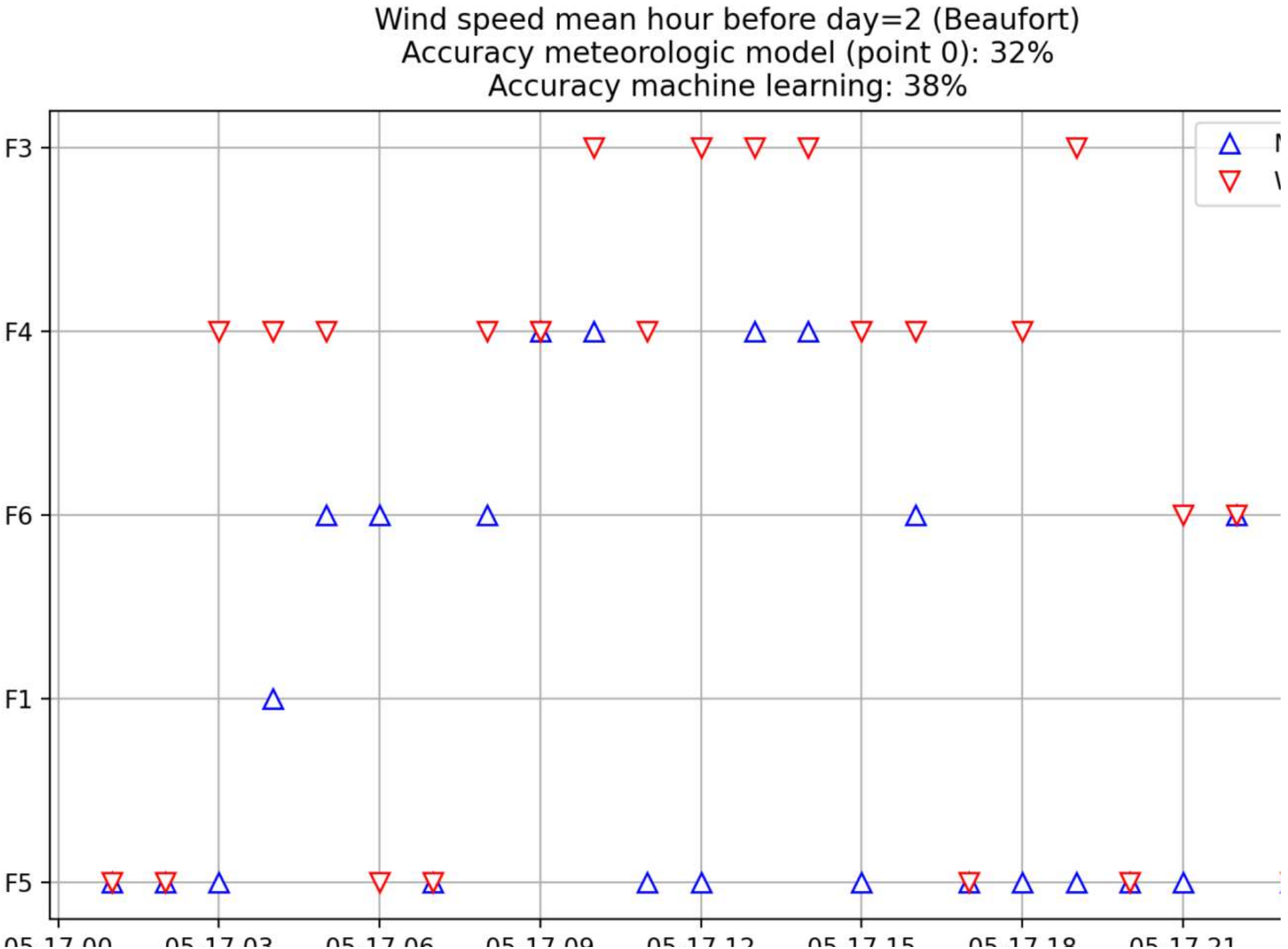
05-13 01 05-13 02 05-13 03 05-13 04 05-13 05 05-13 06 05-13 07 05-13 08


Wind speed mean hour before day=0 (Beaufort)
Accuracy meteorologic model (point 0): 36%
Accuracy machine learning: 42%
Ml_spd
WRF_spd
F1
F5
F4
F2
F3

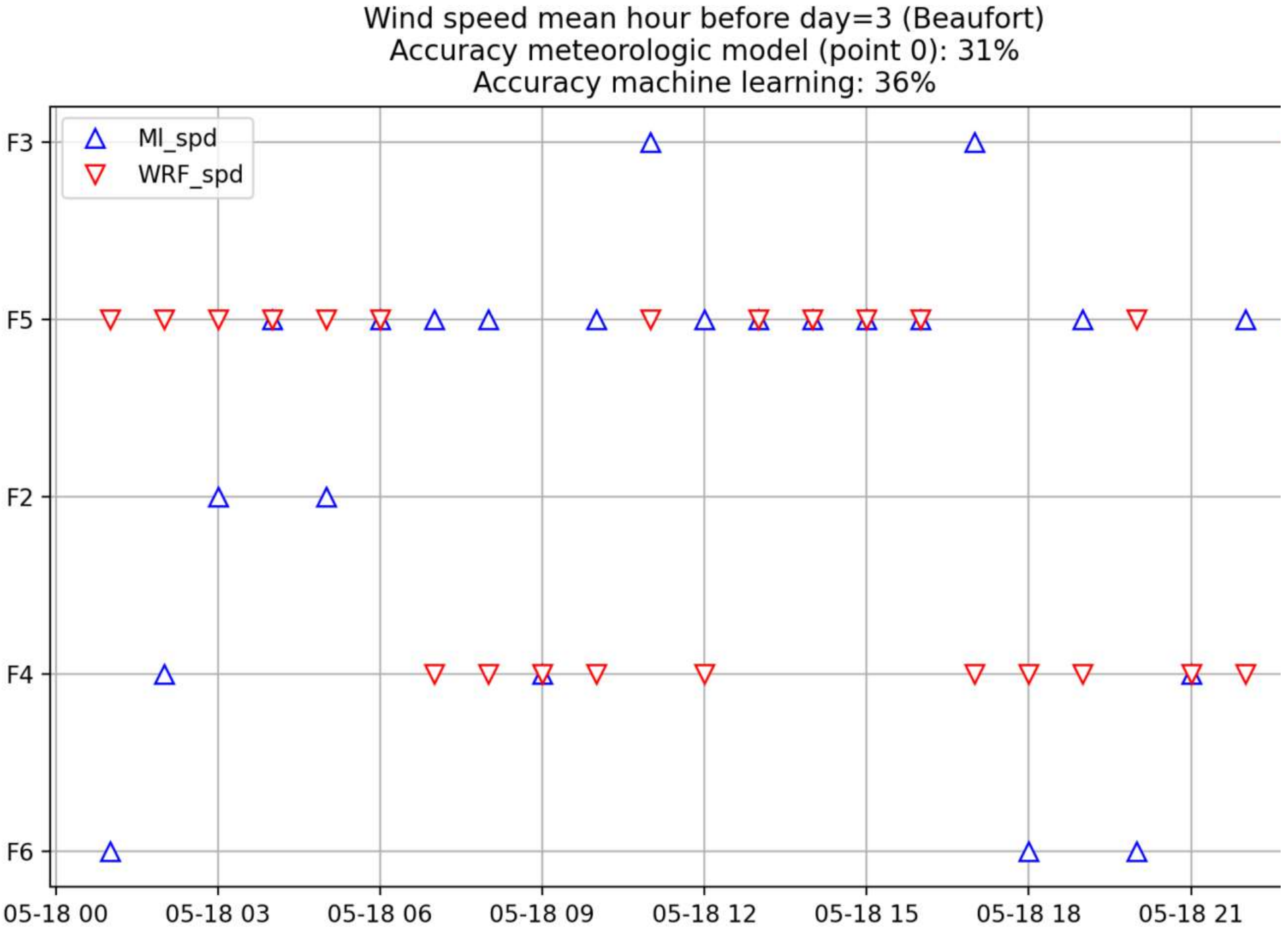
05-13 00
05-13 03
05-13 06
05-13 09
05-13 12
05-13 15
05-13 18
05-13 21

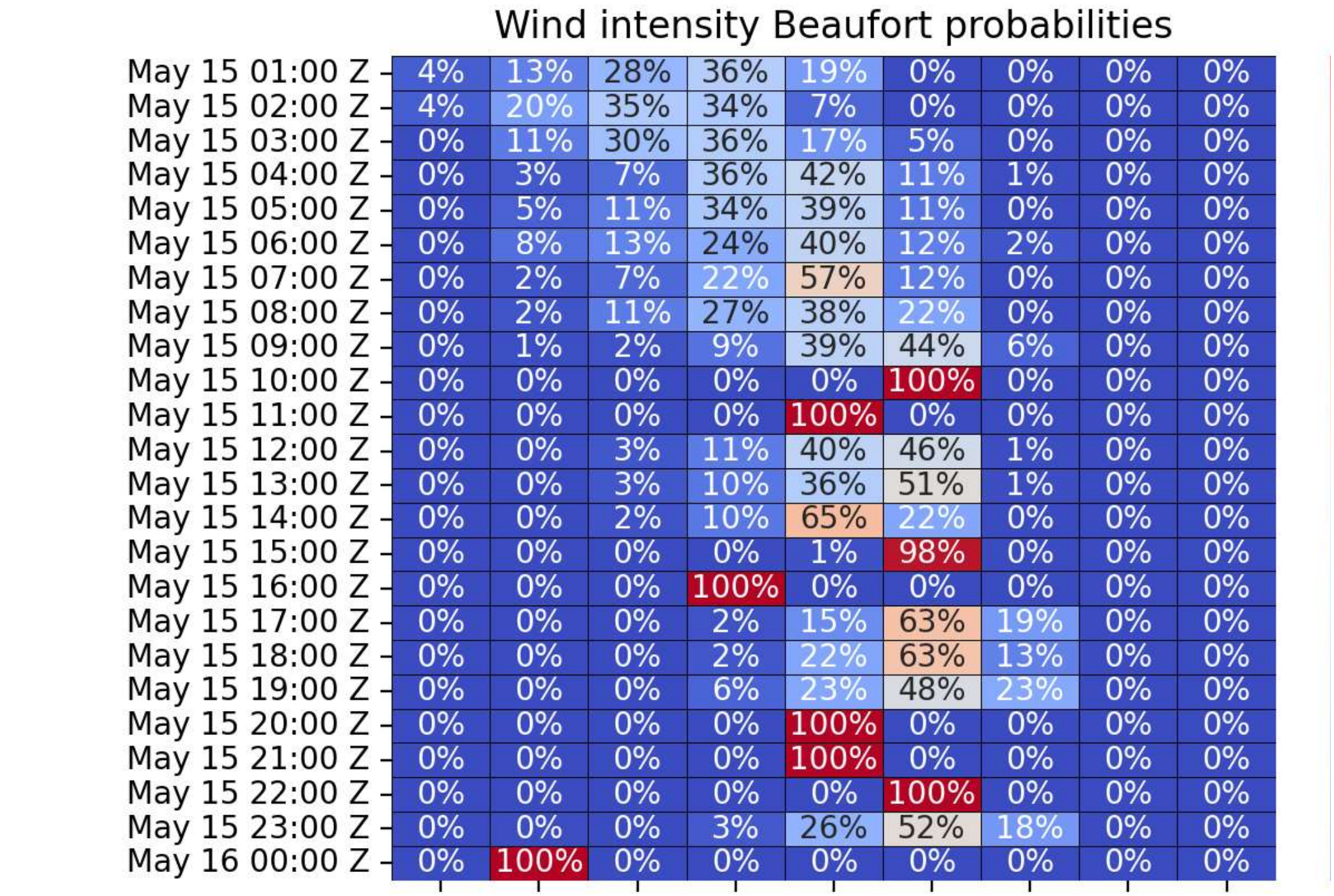

Wind speed mean hour before day=1 (Beaufort)
Accuracy meteorologic model (point 0): 34%
Accuracy machine learning: 43%
F3
F5
F4

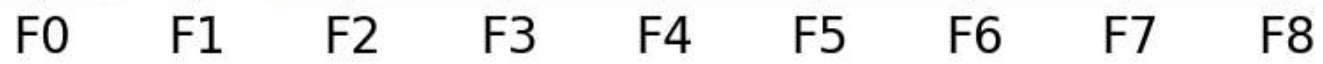
05-16 00
05-16 03
05-16 06
05-16 09
05-16 12
05-16 15
05-16 18
05-16 21

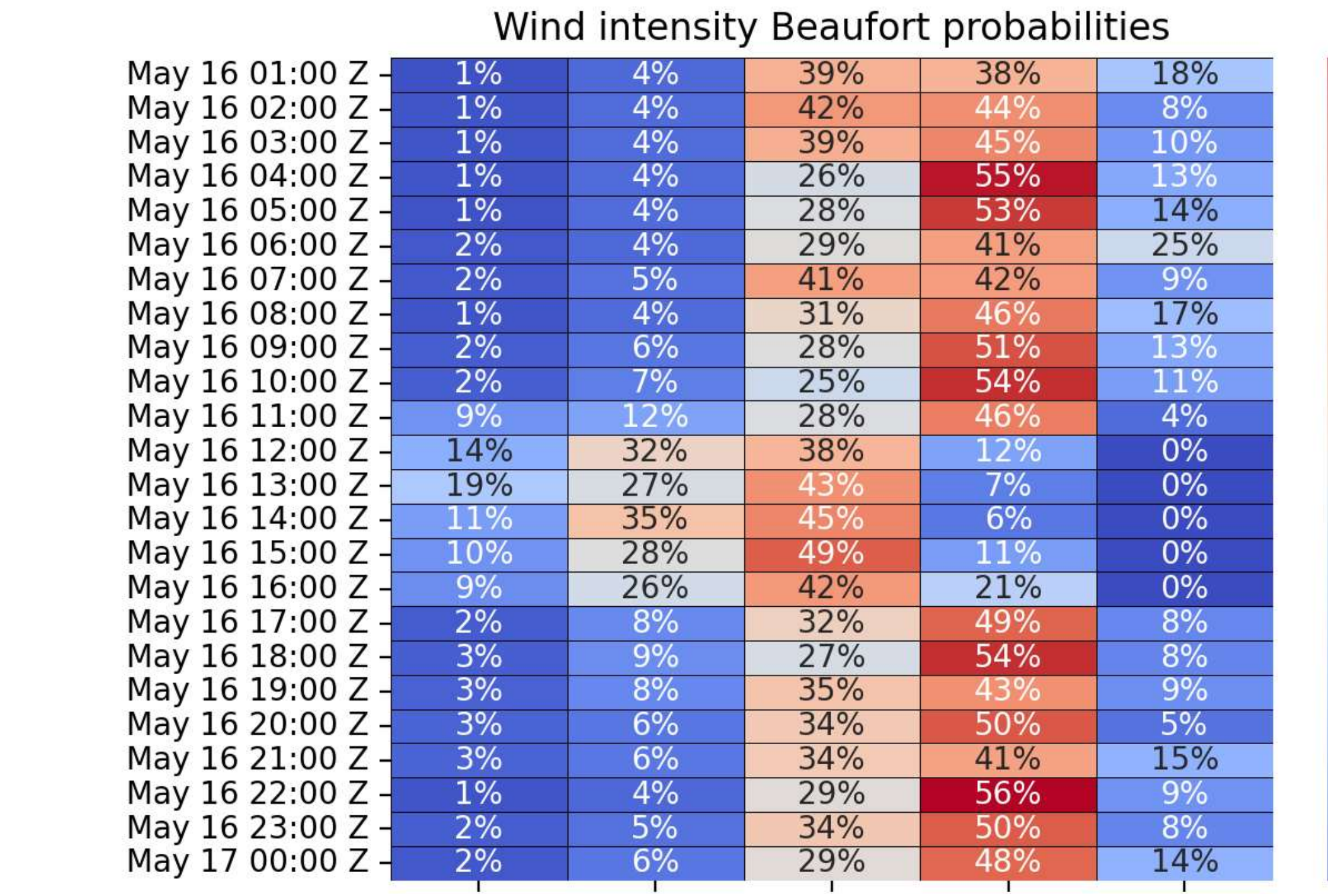

Wind speed mean hour before day=2 (Beaufort)
Accuracy meteorologic model (point 0): 32%
Accuracy machine learning: 38%
F3
F4
F6
F1
F5

05-17 00
05-17 03
05-17 06
05-17 09
05-17 12
05-17 15
05-17 18
05-17 21

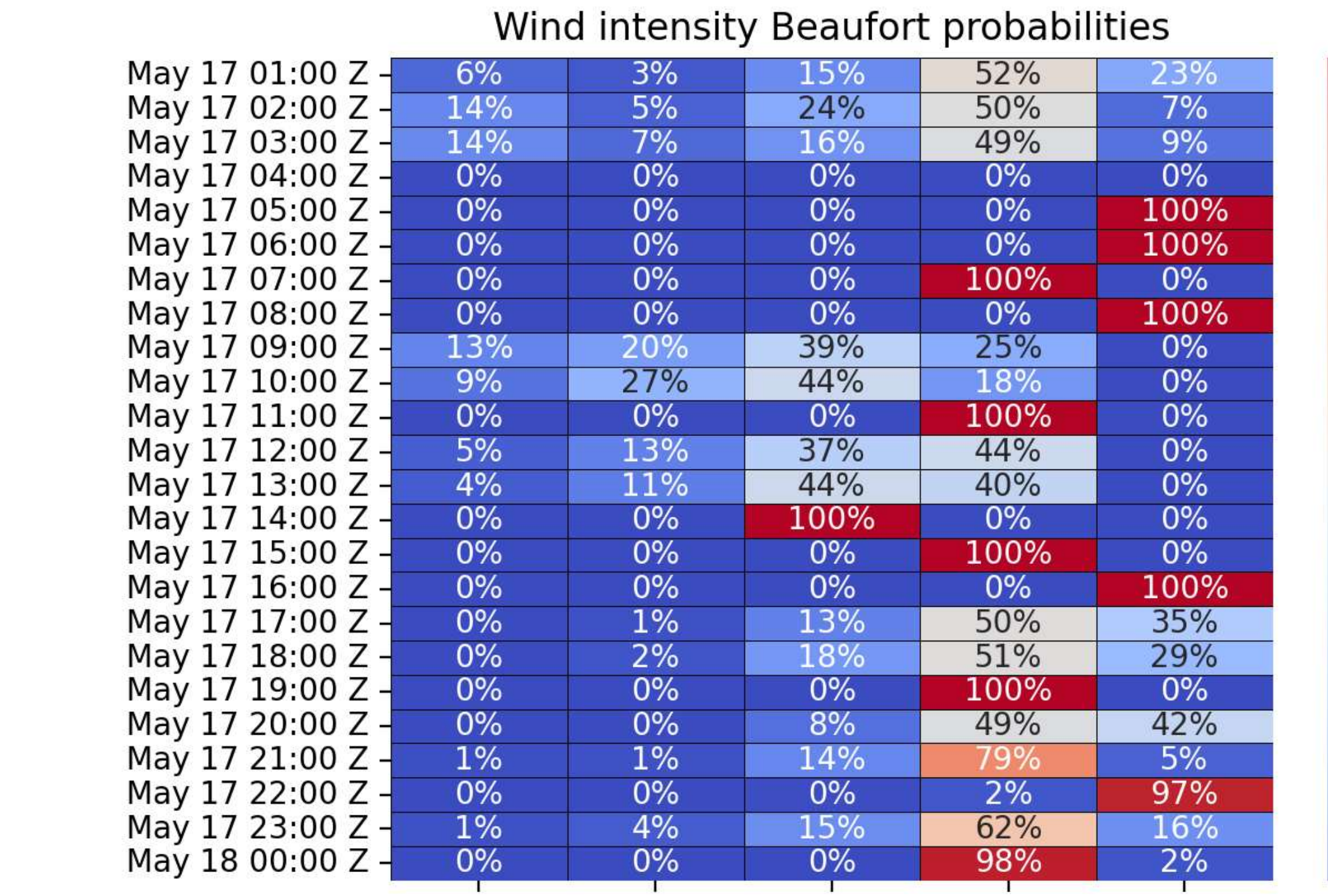

Wind speed mean hour before day=3 (Beaufort)
Accuracy meteorologic model (point 0): 31%
Accuracy machine learning: 36%
Ml_spd
WRF_spd
F3
F5
F2
F4
F6
05-18 00
05-18 03
05-18 06
05-18 09
05-18 12
05-18 15
05-18 18
05-18 21


Wind intensity Beaufort probabilities
May 15 01:00 Z 4% 13% 28% 36% 19% 0% 0% 0% 0%
May 15 02:00 Z 4% 20% 35% 34% 7% 0% 0% 0% 0%
May 15 03:00 Z 0% 11% 30% 36% 17% 5% 0% 0% 0%
May 15 04:00 Z 0% 3% 7% 36% 42% 11% 1% 0% 0%
May 15 05:00 Z 0% 5% 11% 34% 39% 11% 0% 0% 0%
May 15 06:00 Z 0% 8% 13% 24% 40% 12% 2% 0% 0%
May 15 07:00 Z 0% 2% 7% 22% 57% 12% 0% 0% 0%
May 15 08:00 Z 0% 2% 11% 27% 38% 22% 0% 0% 0%
May 15 09:00 Z 0% 1% 2% 9% 39% 44% 6% 0% 0%
May 15 10:00 Z 0% 0% 0% 0% 0% 100% 0% 0% 0%
May 15 11:00 Z 0% 0% 0% 0% 100% 0% 0% 0% 0%
May 15 12:00 Z 0% 0% 3% 11% 40% 46% 1% 0% 0%
May 15 13:00 Z 0% 0% 3% 10% 36% 51% 1% 0% 0%
May 15 14:00 Z 0% 0% 2% 10% 65% 22% 0% 0% 0%
May 15 15:00 Z 0% 0% 0% 0% 1% 98% 0% 0% 0%
May 15 16:00 Z 0% 0% 0% 100% 0% 0% 0% 0% 0%
May 15 17:00 Z 0% 0% 0% 2% 15% 63% 19% 0% 0%
May 15 18:00 Z 0% 0% 0% 2% 22% 63% 13% 0% 0%
May 15 19:00 Z 0% 0% 0% 6% 23% 48% 23% 0% 0%
May 15 20:00 Z 0% 0% 0% 0% 100% 0% 0% 0% 0%
May 15 21:00 Z 0% 0% 0% 0% 100% 0% 0% 0% 0%
May 15 22:00 Z 0% 0% 0% 0% 0% 100% 0% 0% 0%
May 15 23:00 Z 0% 0% 0% 3% 26% 52% 18% 0% 0%
May 16 00:00 Z 0% 100% 0% 0% 0% 0% 0% 0% 0%

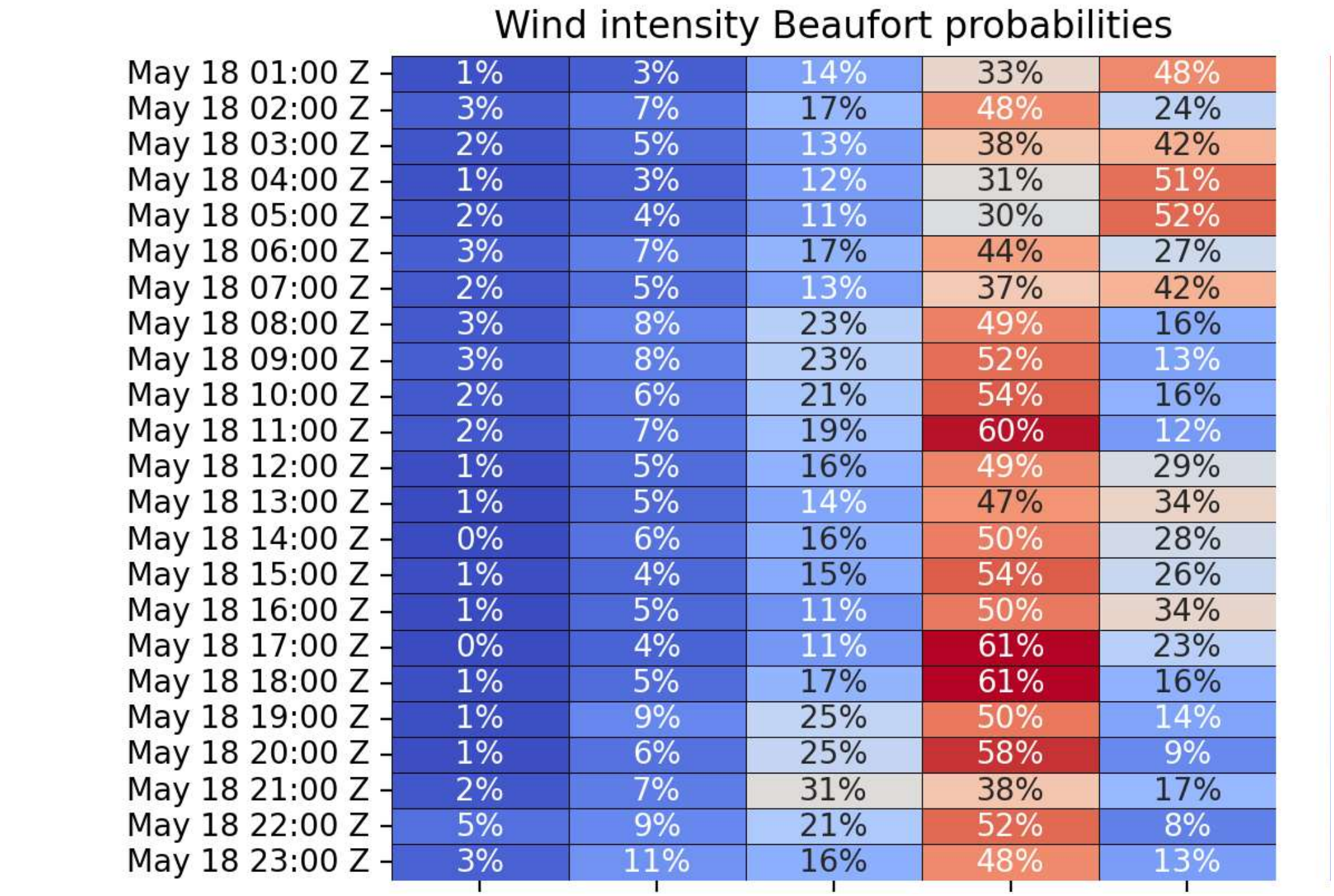

F0
F1
F2
F3
F4
F5
F6
F7
F8


Wind intensity Beaufort probabilities
May 16 01:00 Z 1% 4% 39% 38% 18%
May 16 02:00 Z 1% 4% 42% 44% 8%
May 16 03:00 Z 1% 4% 39% 45% 10%
May 16 04:00 Z 1% 4% 26% 55% 13%
May 16 05:00 Z 1% 4% 28% 53% 14%
May 16 06:00 Z 2% 4% 29% 41% 25%
May 16 07:00 Z 2% 5% 41% 42% 9%
May 16 08:00 Z 1% 4% 31% 46% 17%
May 16 09:00 Z 2% 6% 28% 51% 13%
May 16 10:00 Z 2% 7% 25% 54% 11%
May 16 11:00 Z 9% 12% 28% 46% 4%
May 16 12:00 Z 14% 32% 38% 12% 0%
May 16 13:00 Z 19% 27% 43% 7% 0%
May 16 14:00 Z 11% 35% 45% 6% 0%
May 16 15:00 Z 10% 28% 49% 11% 0%
May 16 16:00 Z 9% 26% 42% 21% 0%
May 16 17:00 Z 2% 8% 32% 49% 8%
May 16 18:00 Z 3% 9% 27% 54% 8%
May 16 19:00 Z 3% 8% 35% 43% 9%
May 16 20:00 Z 3% 6% 34% 50% 5%
May 16 21:00 Z 3% 6% 34% 41% 15%
May 16 22:00 Z 1% 4% 29% 56% 9%
May 16 23:00 Z 2% 5% 34% 50% 8%
May 17 00:00 Z 2% 6% 29% 48% 14%

F2
F3
F4
F5
F6

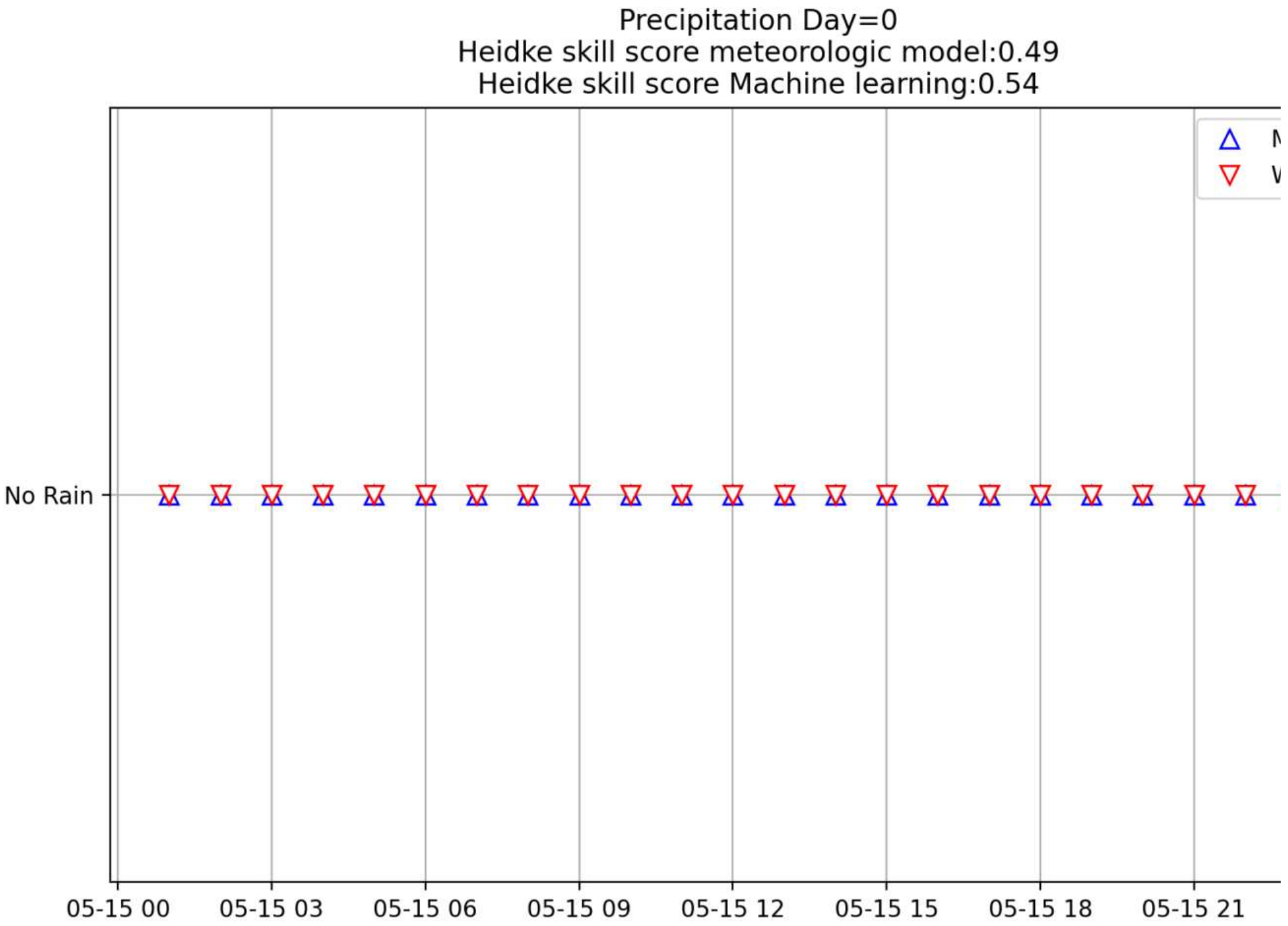

Wind intensity Beaufort probabilities
May 17 01:00 Z 6% 3% 15% 52% 23%
May 17 02:00 Z 14% 5% 24% 50% 7%
May 17 03:00 Z 14% 7% 16% 49% 9%
May 17 04:00 Z 0% 0% 0% 0% 0%
May 17 05:00 Z 0% 0% 0% 0% 100%
May 17 06:00 Z 0% 0% 0% 0% 100%
May 17 07:00 Z 0% 0% 0% 100% 0%
May 17 08:00 Z 0% 0% 0% 0% 100%
May 17 09:00 Z 13% 20% 39% 25% 0%
May 17 10:00 Z 9% 27% 44% 18% 0%
May 17 11:00 Z 0% 0% 0% 100% 0%
May 17 12:00 Z 5% 13% 37% 44% 0%
May 17 13:00 Z 4% 11% 44% 40% 0%
May 17 14:00 Z 0% 0% 100% 0% 0%
May 17 15:00 Z 0% 0% 0% 100% 0%
May 17 16:00 Z 0% 0% 0% 0% 100%
May 17 17:00 Z 0% 1% 13% 50% 35%
May 17 18:00 Z 0% 2% 18% 51% 29%
May 17 19:00 Z 0% 0% 0% 100% 0%
May 17 20:00 Z 0% 0% 8% 49% 42%
May 17 21:00 Z 1% 1% 14% 79% 5%
May 17 22:00 Z 0% 0% 0% 2% 97%
May 17 23:00 Z 1% 4% 15% 62% 16%
May 18 00:00 Z 0% 0% 0% 98% 2%

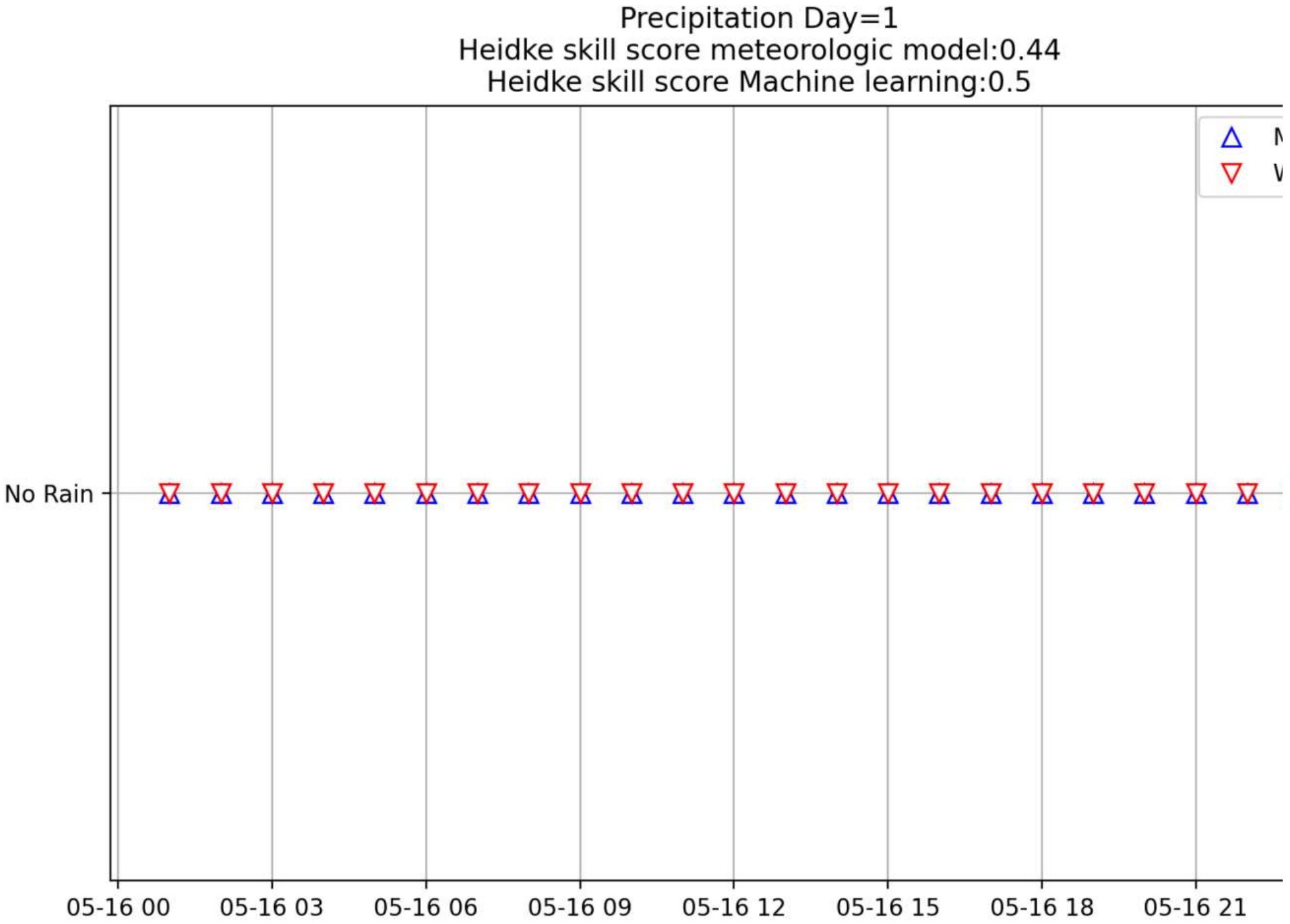
F2
F3
F4
F5
F6

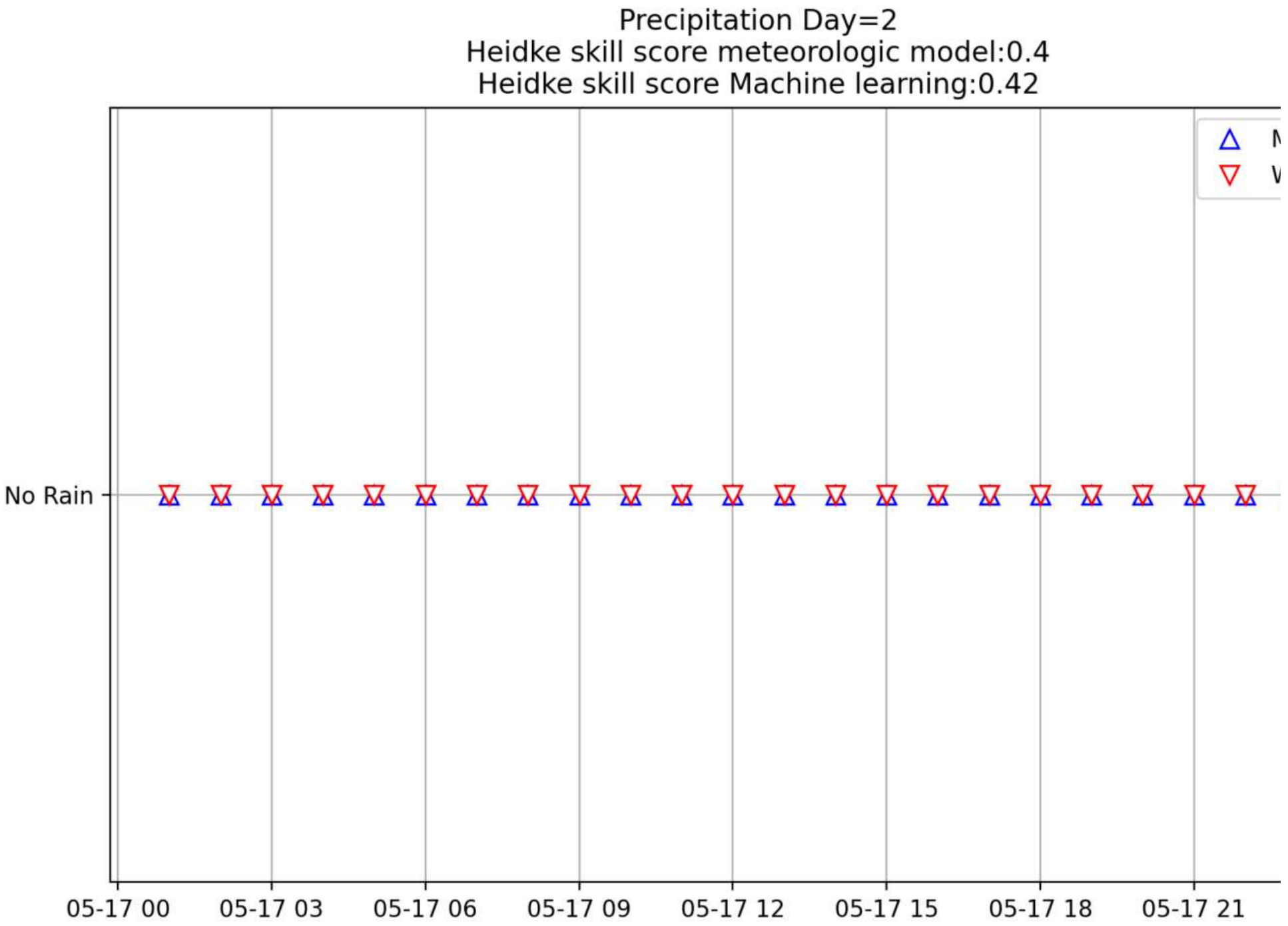

Wind intensity Beaufort probabilities
May 18 01:00 Z 1% 3% 14% 33% 48%
May 18 02:00 Z 3% 7% 17% 48% 24%
May 18 03:00 Z 2% 5% 13% 38% 42%
May 18 04:00 Z 1% 3% 12% 31% 51%
May 18 05:00 Z 2% 4% 11% 30% 52%
May 18 06:00 Z 3% 7% 17% 44% 27%
May 18 07:00 Z 2% 5% 13% 37% 42%
May 18 08:00 Z 3% 8% 23% 49% 16%
May 18 09:00 Z 3% 8% 23% 52% 13%
May 18 10:00 Z 2% 6% 21% 54% 16%
May 18 11:00 Z 2% 7% 19% 60% 12%
May 18 12:00 Z 1% 5% 16% 49% 29%
May 18 13:00 Z 1% 5% 14% 47% 34%
May 18 14:00 Z 0% 6% 16% 50% 28%
May 18 15:00 Z 1% 4% 15% 54% 26%
May 18 16:00 Z 1% 5% 11% 50% 34%
May 18 17:00 Z 0% 4% 11% 61% 23%
May 18 18:00 Z 1% 5% 17% 61% 16%
May 18 19:00 Z 1% 9% 25% 50% 14%
May 18 20:00 Z 1% 6% 25% 58% 9%
May 18 21:00 Z 2% 7% 31% 38% 17%
May 18 22:00 Z 5% 9% 21% 52% 8%
May 18 23:00 Z 3% 11% 16% 48% 13%

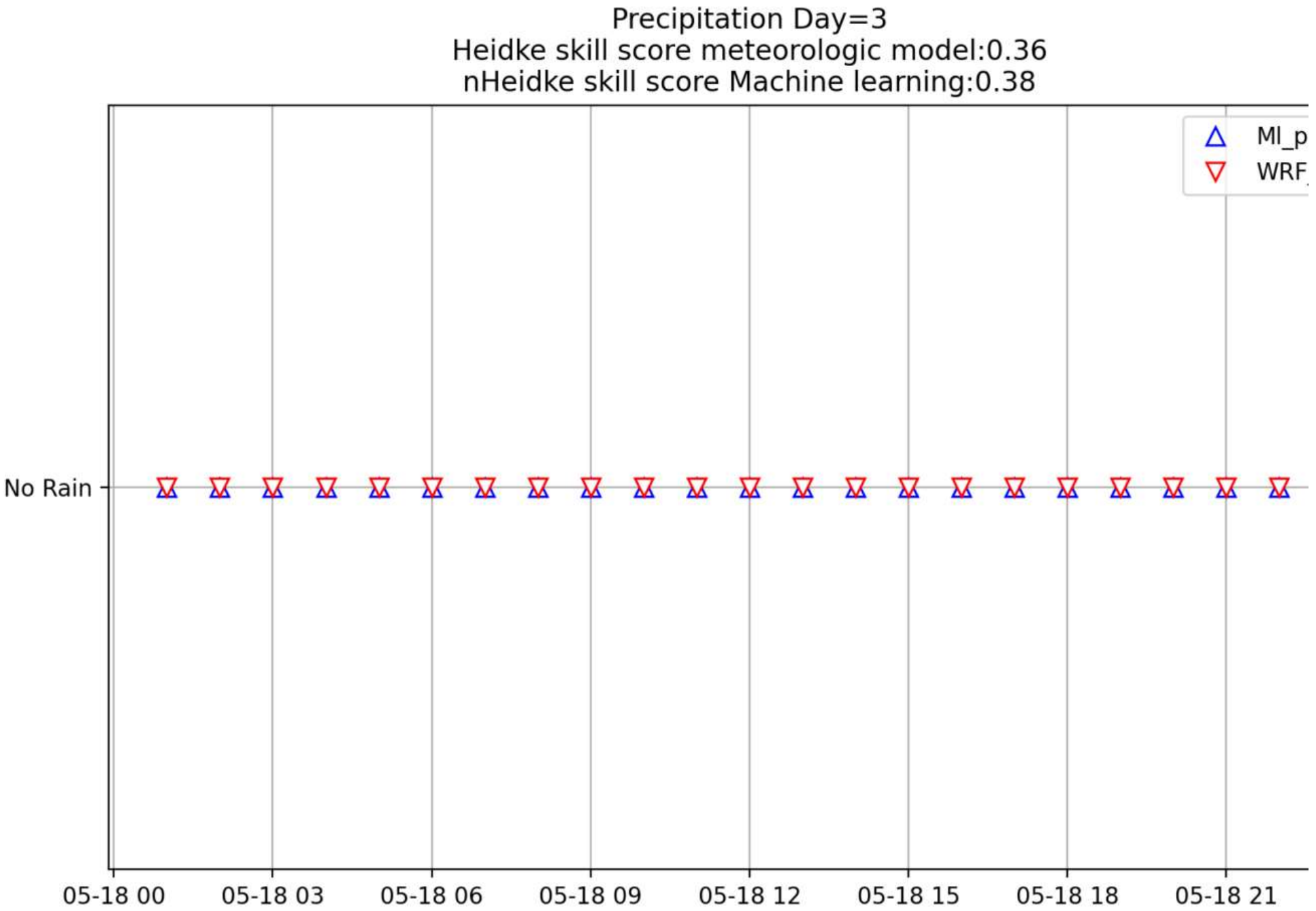
F2
F3
F4
F5
F6

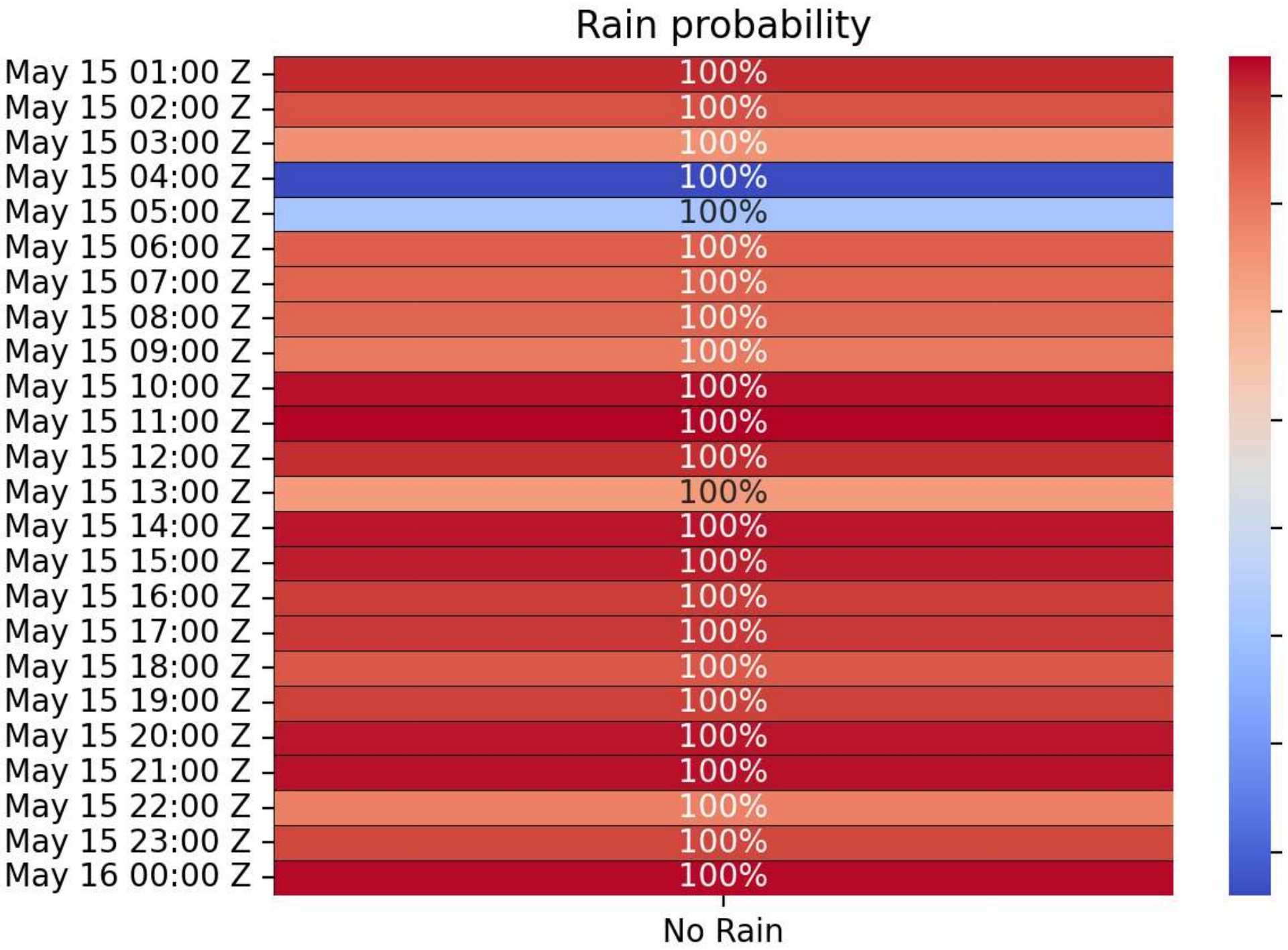
Precipitation hour before
Actual Heidke skill score meteorologic model: 0. Reference: 0.49
Actual Heidke skill score machine learning: 0. Reference: 0.54
Ml_dir
Obser
WRF_
No Rain
05-15 01
05-15 02
05-15 03
05-15 04
05-15 05
05-15 06
05-15 07
05-15 08

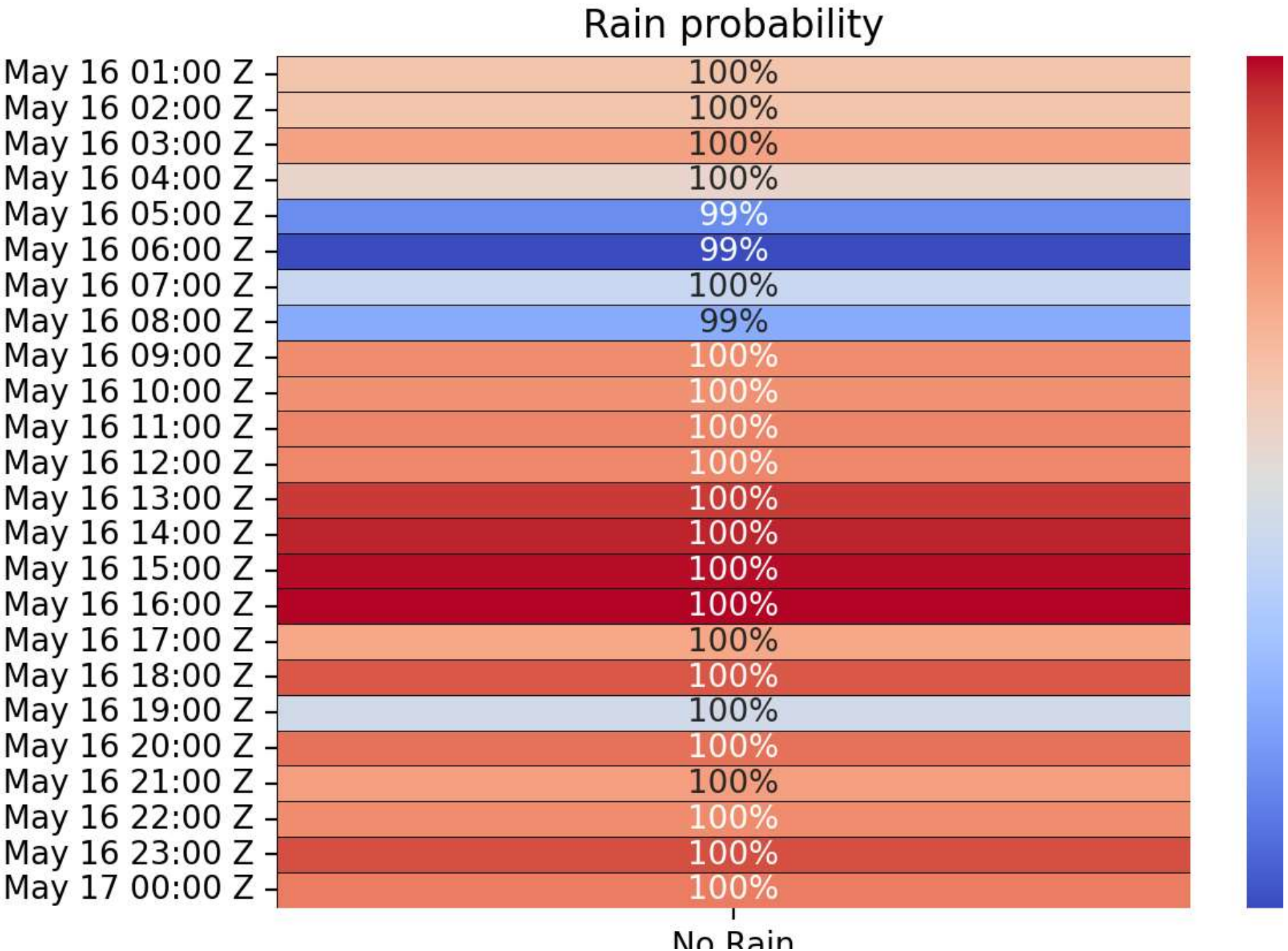

Precipitation Day=0
Heidke skill score meteorologic model:0.49
Heidke skill score Machine learning:0.54
No Rain
05-15 00
05-15 03
05-15 06
05-15 09
05-15 12
05-15 15
05-15 18
05-15 21

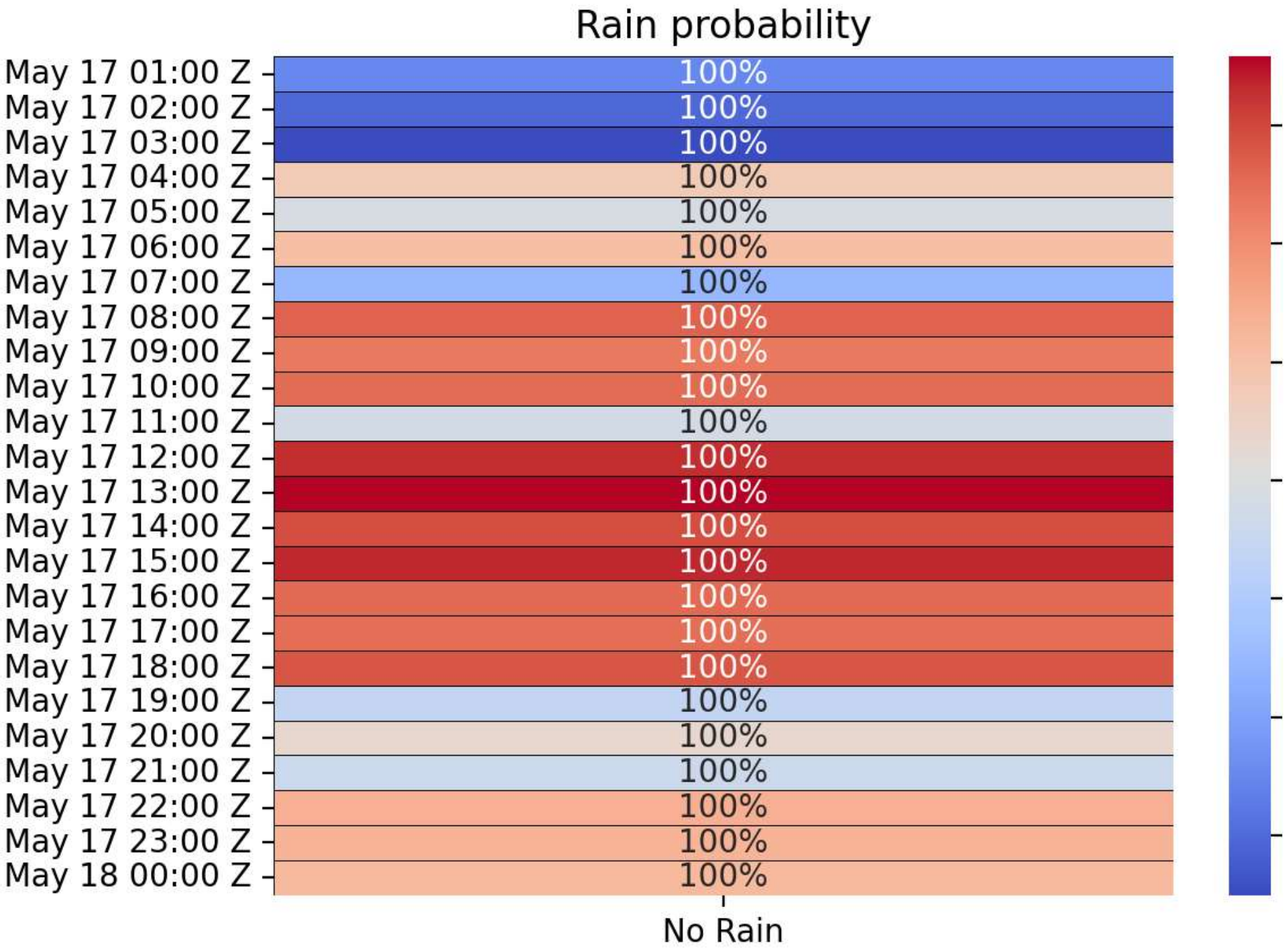

Precipitation Day=1
Heidke skill score meteorologic model:0.44
Heidke skill score Machine learning:0.5
No Rain
05-16 00
05-16 03
05-16 06
05-16 09
05-16 12
05-16 15
05-16 18
05-16 21

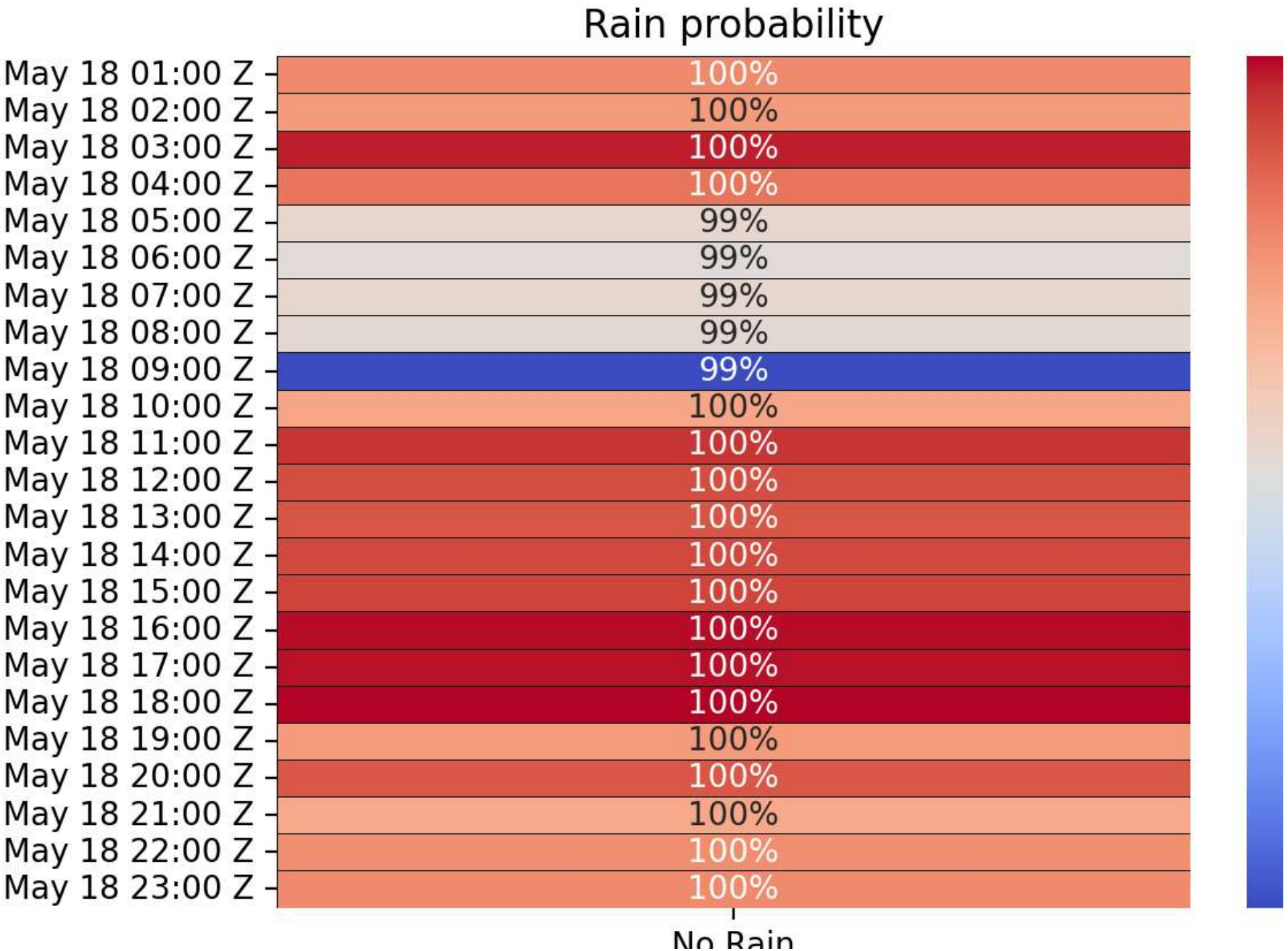

Precipitation Day=2
Heidke skill score meteorologic model:0.4
Heidke skill score Machine learning:0.42
No Rain
05-17 00
05-17 03
05-17 06
05-17 09
05-17 12
05-17 15
05-17 18
05-17 21


Precipitation Day=3
Heidke skill score meteorologic model:0.36
nHeidke skill score Machine learning:0.38
Ml_p
WRF
No Rain
05-18 00
05-18 03
05-18 06
05-18 09
05-18 12
05-18 15
05-18 18
05-18 21


Rain probability
May 15 01:00 Z
May 15 02:00 Z
May 15 03:00 Z
May 15 04:00 Z
May 15 05:00 Z
May 15 06:00 Z
May 15 07:00 Z
May 15 08:00 Z
May 15 09:00 Z
May 15 10:00 Z
May 15 11:00 Z
May 15 12:00 Z
May 15 13:00 Z
May 15 14:00 Z
May 15 15:00 Z
May 15 16:00 Z
May 15 17:00 Z
May 15 18:00 Z
May 15 19:00 Z
May 15 20:00 Z
May 15 21:00 Z
May 15 22:00 Z
May 15 23:00 Z
May 16 00:00 Z
100%
No Rain


Rain probability
May 16 01:00 Z 100%
May 16 02:00 Z 100%
May 16 03:00 Z 100%
May 16 04:00 Z 100%
May 16 05:00 Z 99%
May 16 06:00 Z 99%
May 16 07:00 Z 100%
May 16 08:00 Z 99%
May 16 09:00 Z 100%
May 16 10:00 Z 100%
May 16 11:00 Z 100%
May 16 12:00 Z 100%
May 16 13:00 Z 100%
May 16 14:00 Z 100%
May 16 15:00 Z 100%
May 16 16:00 Z 100%
May 16 17:00 Z 100%
May 16 18:00 Z 100%
May 16 19:00 Z 100%
May 16 20:00 Z 100%
May 16 21:00 Z 100%
May 16 22:00 Z 100%
May 16 23:00 Z 100%
May 17 00:00 Z 100%
No Rain


Rain probability
May 17 01:00 Z
May 17 02:00 Z
May 17 03:00 Z
May 17 04:00 Z
May 17 05:00 Z
May 17 06:00 Z
May 17 07:00 Z
May 17 08:00 Z
May 17 09:00 Z
May 17 10:00 Z
May 17 11:00 Z
May 17 12:00 Z
May 17 13:00 Z
May 17 14:00 Z
May 17 15:00 Z
May 17 16:00 Z
May 17 17:00 Z
May 17 18:00 Z
May 17 19:00 Z
May 17 20:00 Z
May 17 21:00 Z
May 17 22:00 Z
May 17 23:00 Z
May 18 00:00 Z
100%
No Rain


Rain probability
May 18 01:00 Z
May 18 02:00 Z
May 18 03:00 Z
May 18 04:00 Z
May 18 05:00 Z
May 18 06:00 Z
May 18 07:00 Z
May 18 08:00 Z
May 18 09:00 Z
May 18 10:00 Z
May 18 11:00 Z
May 18 12:00 Z
May 18 13:00 Z
May 18 14:00 Z
May 18 15:00 Z
May 18 16:00 Z
May 18 17:00 Z
May 18 18:00 Z
May 18 19:00 Z
May 18 20:00 Z
May 18 21:00 Z
May 18 22:00 Z
May 18 23:00 Z
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100%
100%
100%
No Rain

Global results

Better meteorological model outcome: 2

Better machine learning outcome: 1

Project link

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