

"CMA CGM BIANCA"

Monday 11th October, 2021

Vessel Basic Info:

IMO: 9436367

Vessel Type: Container

Deadweight:

Beam:

Length:

Min Draft: 9.0 m

Max Draft: 15.0 m

Max Speed: Sea speed Ballast 21.9. Laden 20.3

Dates of last two propeller cleanings:

Dates of last two dry docks:

Voyages the vessel most commonly Performs:

1 Models Performance Overview

Table 1: Neural Net

Total Actual FOC (MT), Total Predicted FOC (MT), Percentage Difference(Actual / Predicted), Mean STW (knt), Mean Draft (m) for each leg

Neural Net	Info per leg				
	Total Act FOC (MT)	Total Pred FOC (MT)	FOC Perc Diff	Mean STW (kt)	Mean Draft (m)
PORT KELANG - SINGAPORE	0.57	0.61	6.78 %	12.98	11.38
TIANJIN - QINGDAO	42.42	45.54	7.09 %	13.80	11.71
QINGDAO - SHANGHAI	0.09	0.09	0.00 %	13.73	11.16
SHANGHAI - NINGBO	4.04	3.87	4.30 %	14.28	10.60
NINGBO - NANSHA	71.97	73.85	2.58 %	14.31	11.03
NANSHA - TANJUNG PELEPAS	126.89	153.93	19.26 %	14.90	13.46
SINGAPORE - CAPE TOWN	855.06	849.76	0.62 %	14.50	14.53
CAPE TOWN - POINTE NOIRE	338.89	319.53	5.88 %	17.06	12.79
POINTE NOIRE - LUANDA	38.88	38.14	1.92 %	14.01	11.35
LUANDA - CAPE TOWN	231.25	228.83	1.05 %	15.02	9.75
CAPE TOWN - PORT KELANG	746.00	748.69	0.36 %	13.72	11.14
SINGAPORE - PUSAN	345.70	344.61	0.32 %	13.82	10.03
PUSAN - TIANJIN	98.60	95.68	3.01 %	14.41	10.42
Total	2,900.36	2,903.13	0.10 %	14.3 (Avg)	11.5 (Avg)

Table 2: Neural DT

Total Actual FOC (MT), Total Predicted FOC (MT), Percentage Difference(Actual / Predicted), Mean STW (knt), Mean Draft (m) for each leg

Neural DT	Info per leg				
	Total Act FOC (MT)	Total Pred FOC (MT)	FOC Perc Diff	Mean STW (kt)	Mean Draft (m)
PORT KELANG - SINGAPORE	0.57	0.52	9.17 %	12.98	11.38
TIANJIN - QINGDAO	42.42	39.72	6.57 %	13.80	11.71
QINGDAO - SHANGHAI	0.09	0.08	11.76 %	13.73	11.16
SHANGHAI - NINGBO	4.04	3.77	6.91 %	14.28	10.60
NINGBO - NANSHA	71.97	69.51	3.48 %	14.31	11.03
NANSHA - TANJUNG PELEPAS	126.75	150.75	17.30 %	14.91	13.46
SINGAPORE - CAPE TOWN	855.06	784.66	8.59 %	14.50	14.53
CAPE TOWN - POINTE NOIRE	338.89	327.13	3.53 %	17.06	12.79
POINTE NOIRE - LUANDA	38.88	34.19	12.84 %	14.01	11.35
LUANDA - CAPE TOWN	231.25	234.99	1.60 %	15.02	9.75
CAPE TOWN - PORT KELANG	746.00	672.96	10.29 %	13.72	11.14
SINGAPORE - PUSAN	345.69	305.45	12.36 %	13.82	10.03
PUSAN - TIANJIN	98.60	85.10	14.70 %	14.41	10.42
Total	2,900.21	2,708.83	6.82 %	14.3 (Avg)	11.5 (Avg)

Overall Accuracy

Legs Summary Info

- Total records: **81,518 instances**
- Total Sailing Time: **1,479 hours**
- Total Distance Travelled: **18,880.69 n mi**

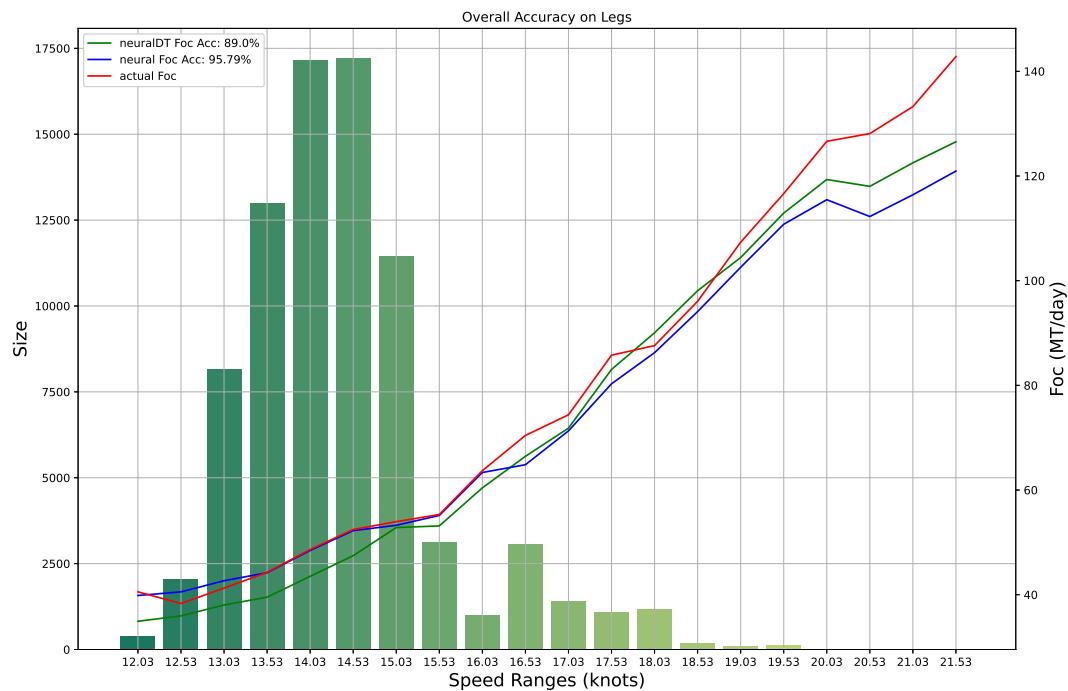


Figure 1: FOC Actual vs Predicted / Speed Ranges, Overall on Legs

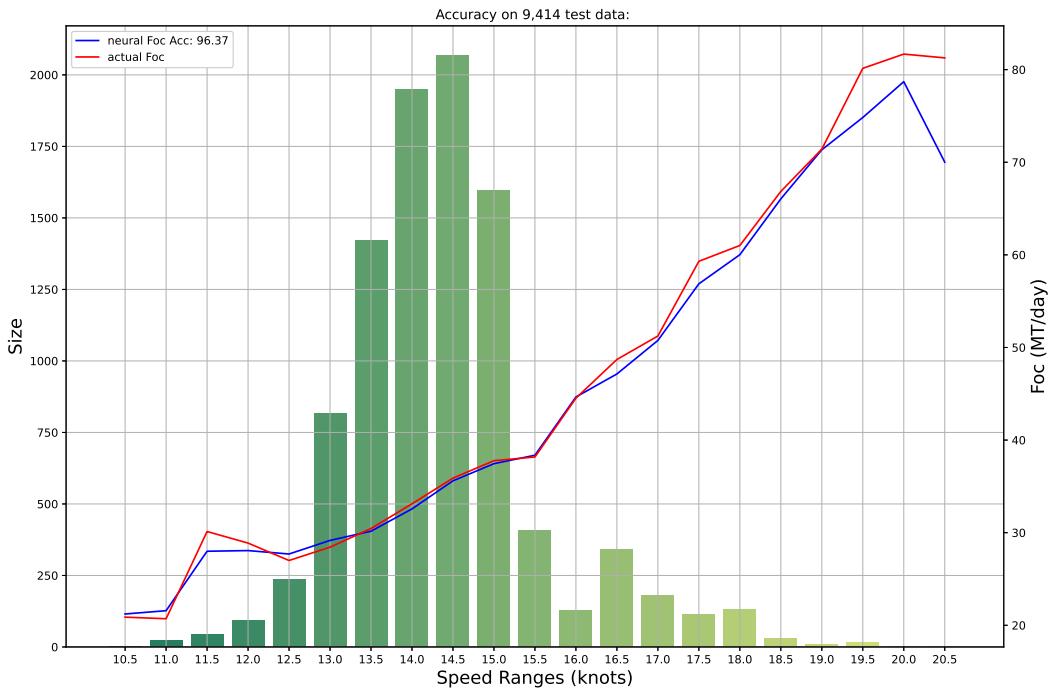


Figure 2: FOC Actual vs Predicted / Speed Ranges, Overall on Legs Test Data

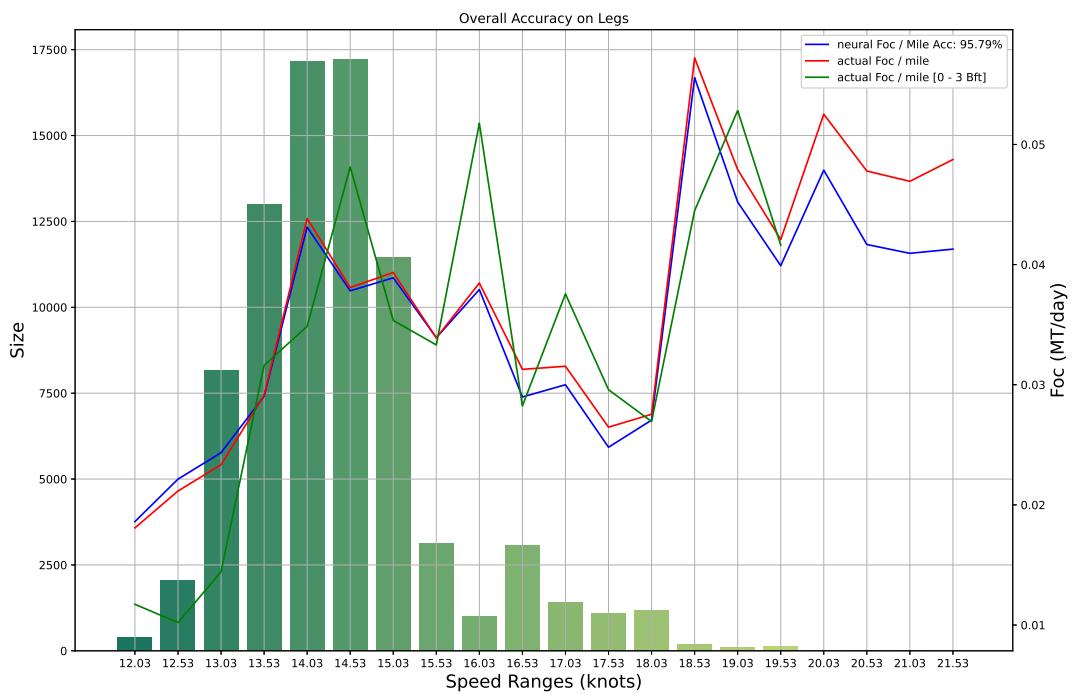


Figure 3: FOC/mile Actual vs Predicted / Speed Ranges, Overall on Legs

2 FOC estimation models performance on legs

Leg 1 # Basic INFO:

- Total Actual FOC : **0.57 MT**
 - Total Predicted FOC ([Neural Net](#)): **0.61 MT**
 - Total Predicted FOC ([Neural DT](#)): **0.52 MT**
 - FOC Perc Diff ([Neural Net](#)): **6.78 %**
 - FOC Perc Diff ([Neural DT](#)): **9.17 %**
- Departure Port : **PORT KELANG / 2019-09-19 03:48:00**
- Arrival Port : **SINGAPORE / 2019-09-19 05:59:00**
- Total Sailing Time: **2 hours**
- Distance Travelled: **26.05 n mi**
- Draft: **11.4 m**

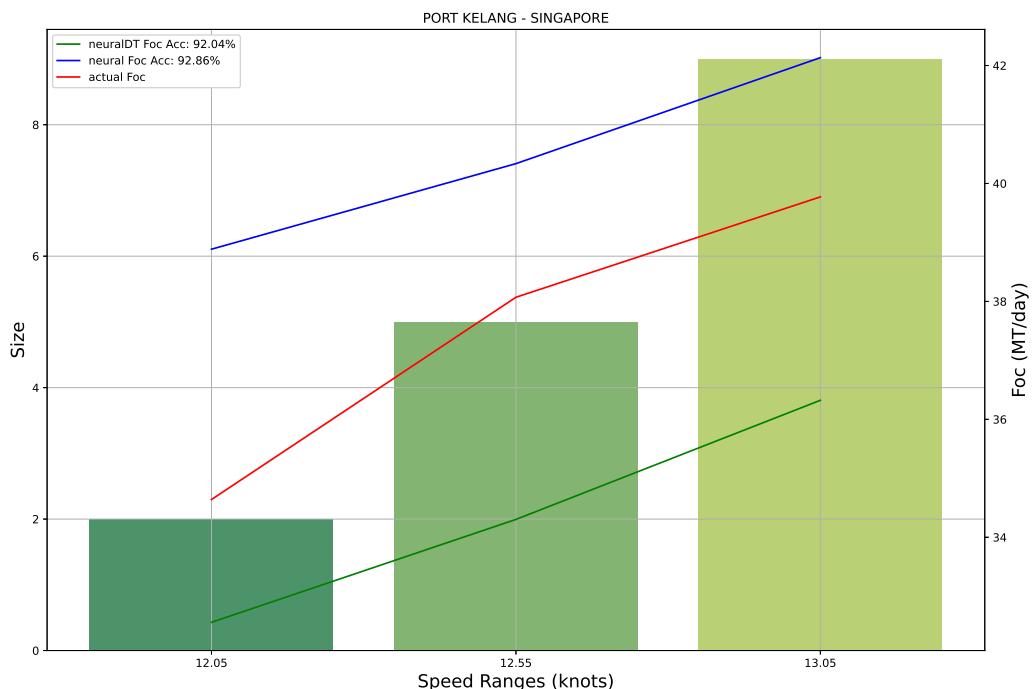


Figure 4: FOC Actual vs Predicted / Speed Ranges, PORT KELANG - SINGAPORE

Weather Comparison - Sensor / Weather Service (NOA)

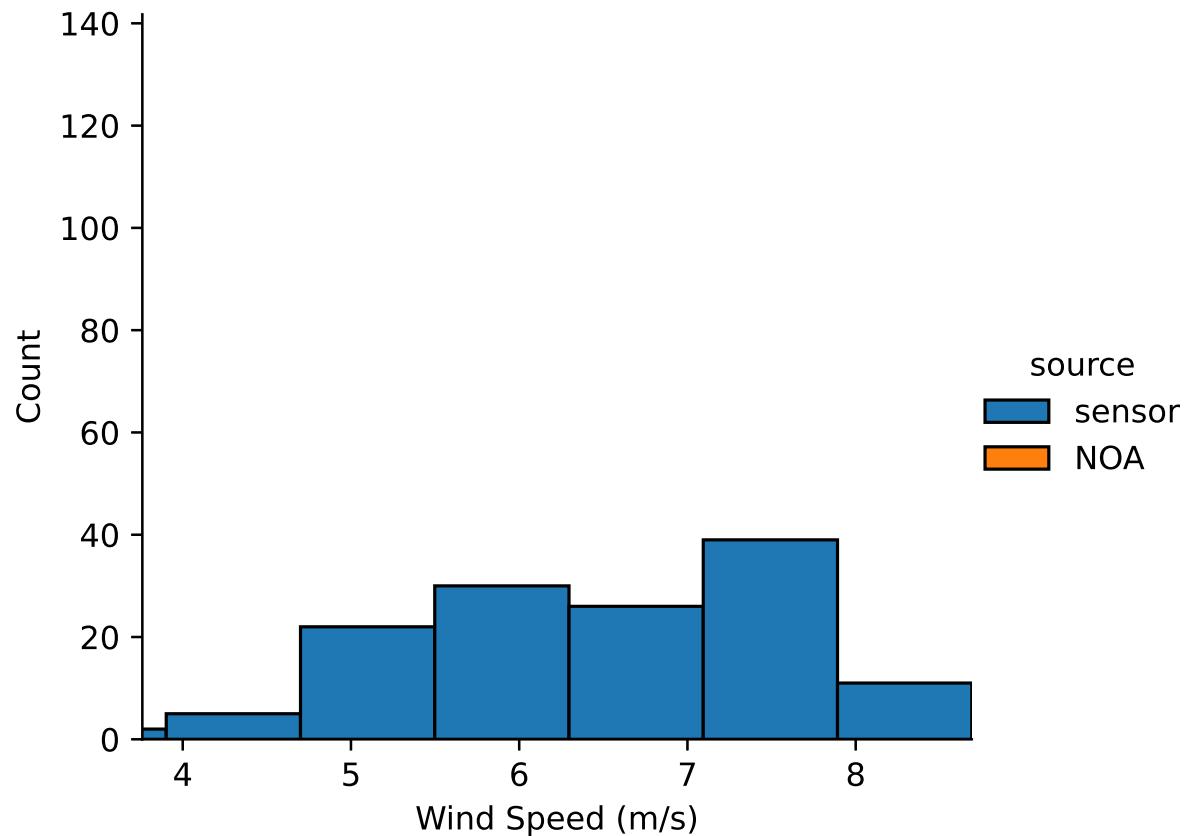


Figure 5: Wind Speed Sensor VS NOA Distributions comparison

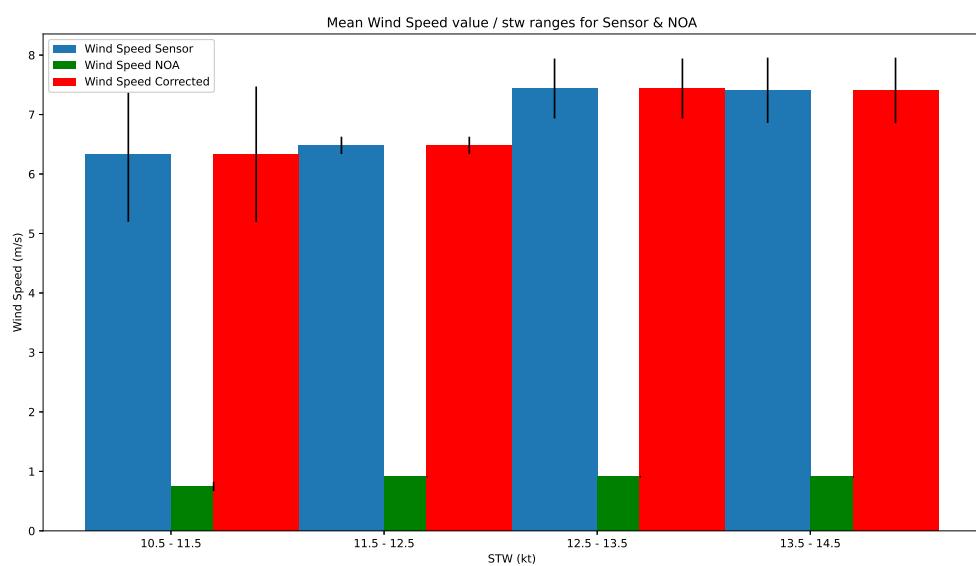


Figure 6: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

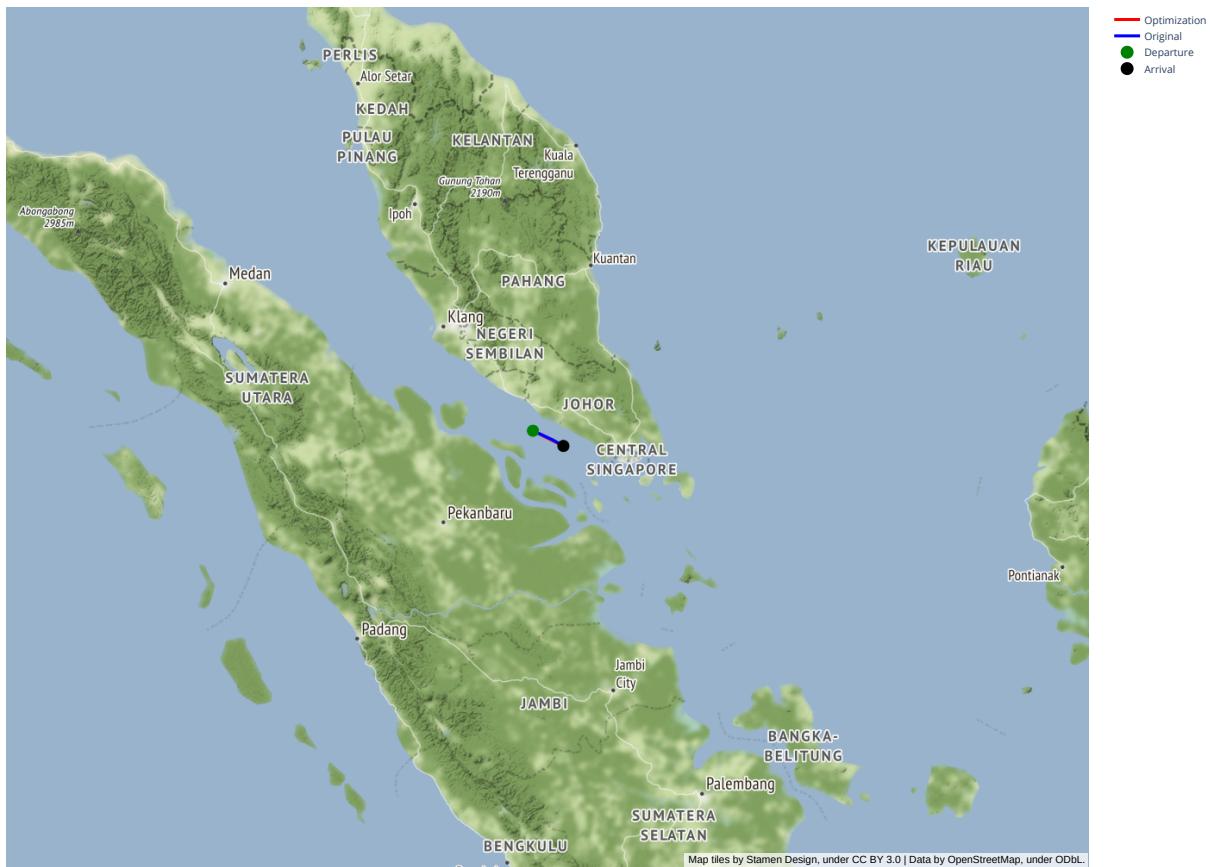


Figure 7: Initial / Optimized Route, PORT KELANG - SINGAPORE

Voyage	Date	Latitude	Longitude
Departure	2019-09-19 03:48:00	1.0° 42.0' N	102.0° 35.0' E
Arrival	2019-09-19 05:59:00	1.0° 30.0' S	102.0° 58.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	13.77	28.30	14.76
Time (hours)	1.12	2.18	1.30
Avg Speed (kt)	12.30	12.98	11.30
Total FOC (MT)	1.41	0.61	1.56

Weather comparison optimization / initial:

- **RestrictETA = True**

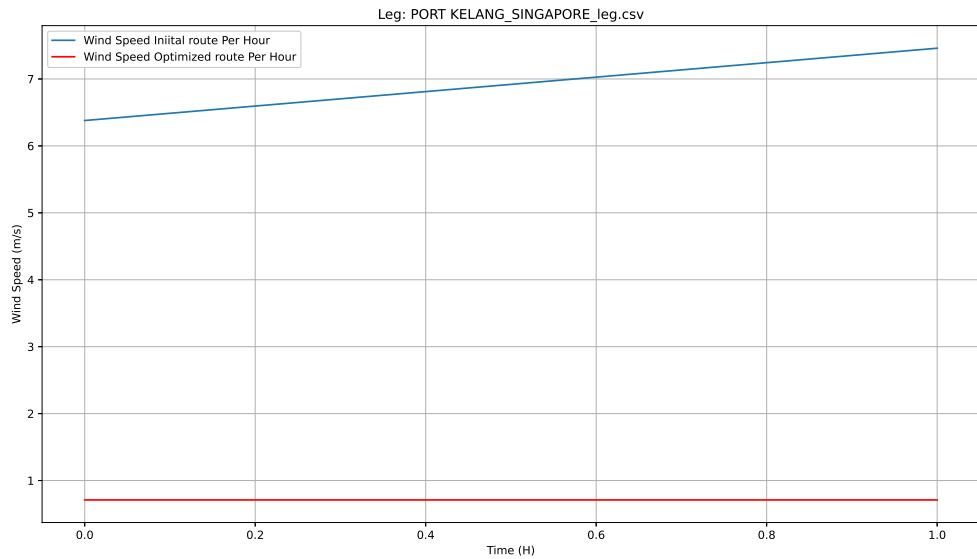


Figure 8: Wind Speed comparison Initial / Optimized Route, PORT KELANG - SINGAPORE

- **RestrictETA = False**

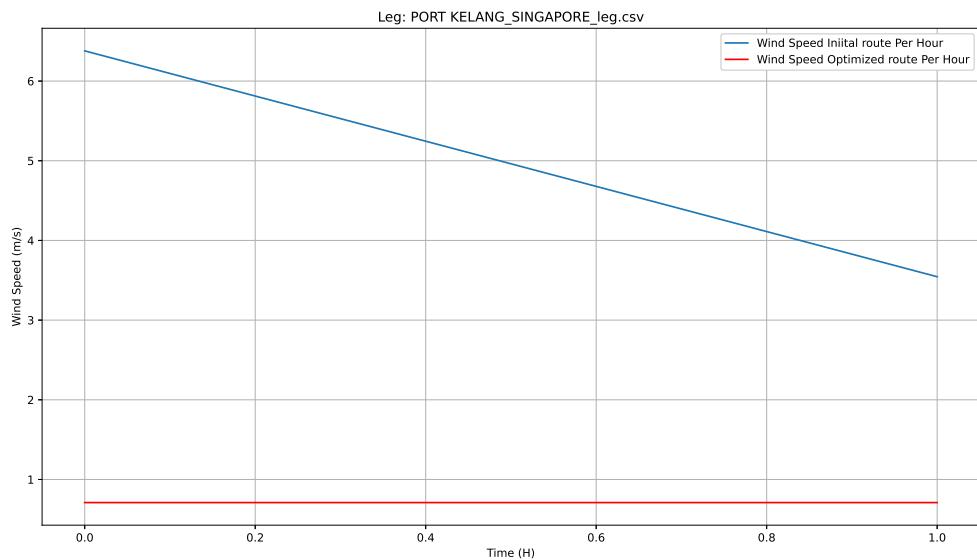


Figure 9: Wind Speed comparison Initial / Optimized Route, PORT KELANG - SINGAPORE

Leg 2 # Basic INFO:

- Total Actual FOC : **42.42 MT**
 - Total Predicted FOC (Neural Net): **45.54 MT**
 - Total Predicted FOC (Neural DT): **39.72 MT**
 - FOC Perc Diff (Neural Net): **7.09 %**
 - FOC Perc Diff (Neural DT): **6.57 %**
- Departure Port : **TIANJIN / 2019-10-03 23:59:00**
- Arrival Port : **QINGDAO / 2019-10-05 01:42:00**
- Total Sailing Time: **26 hours**
- Distance Travelled: **207.81 n mi**
- Draft: **11.7 m**

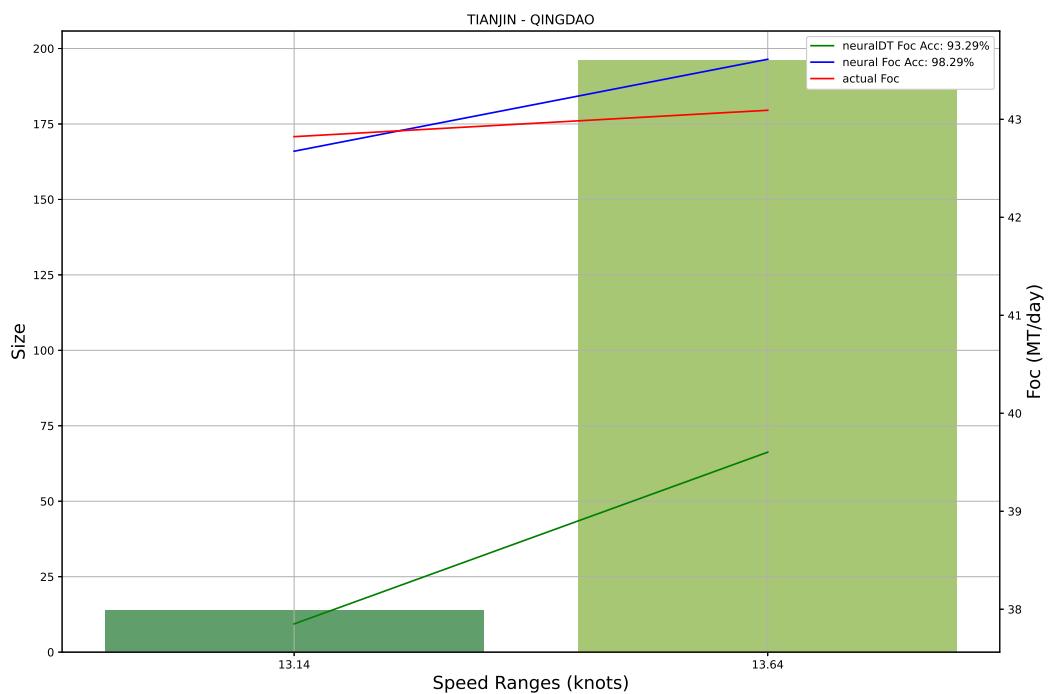


Figure 10: FOC Actual vs Predicted / Speed Ranges, TIANJIN - QINGDAO

Weather Comparison - Sensor / Weather Service (NOA)

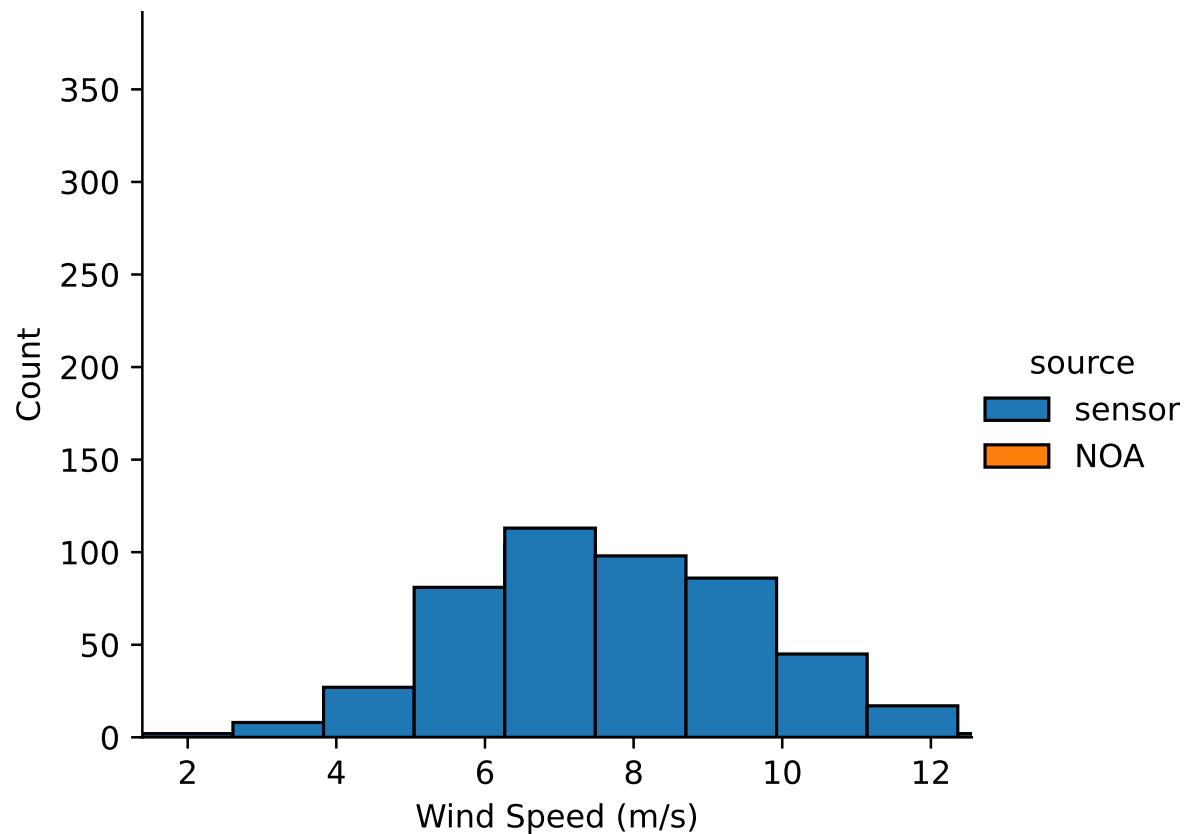


Figure 11: Wind Speed Sensor VS NOA Distributions comparison

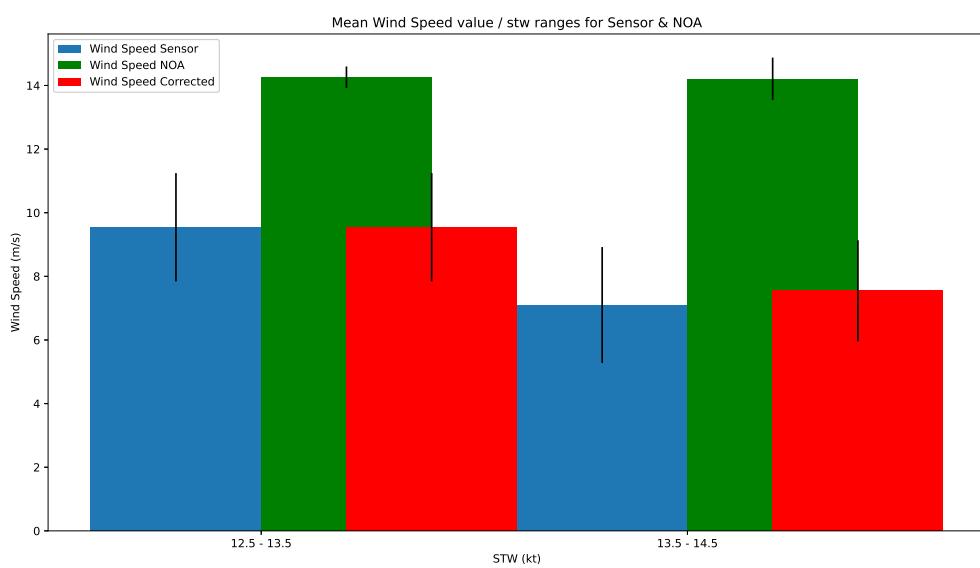


Figure 12: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

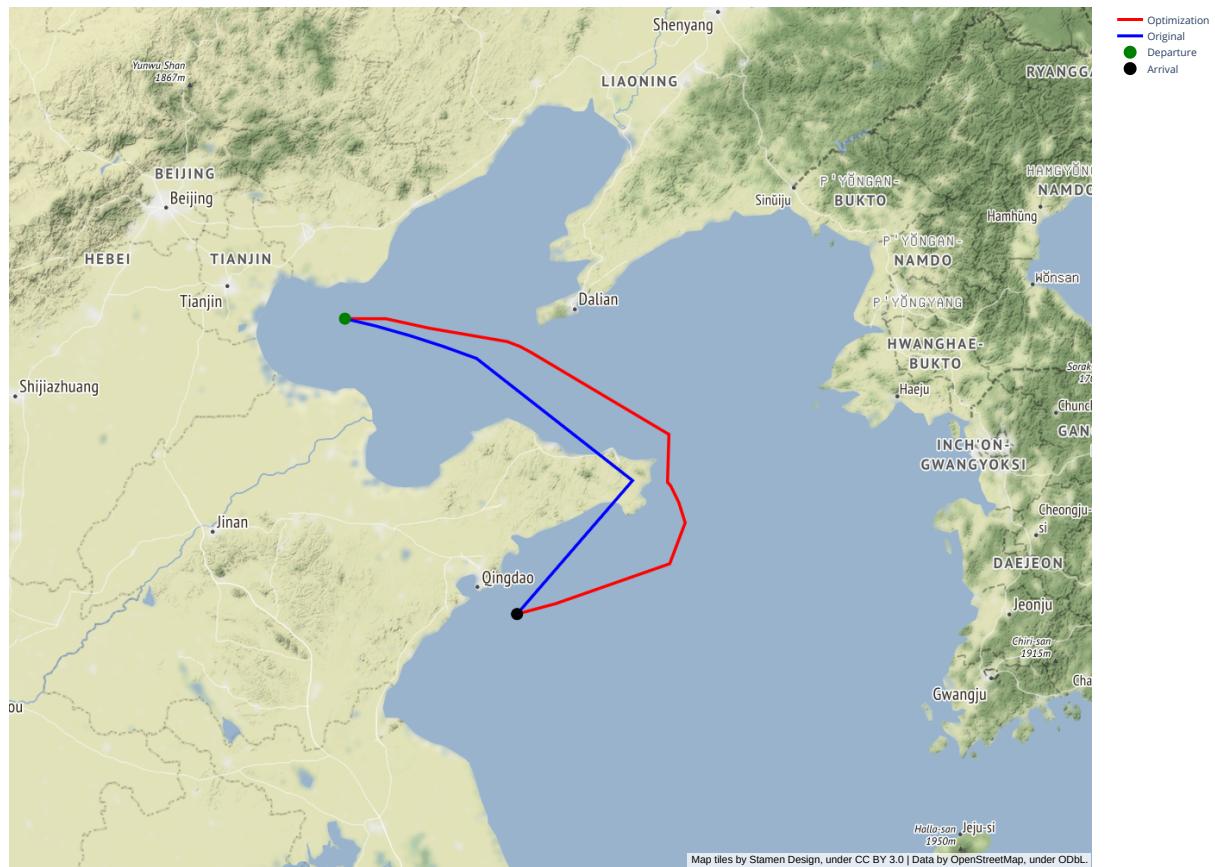


Figure 13: Initial / Optimized Route, TIANJIN - QINGDAO

Voyage	Date	Latitude	Longitude
Departure	2019-10-03 23:59:00	38.0° 49.0' N	118.0° 40.0' E
Arrival	2019-10-05 01:42:00	35.0° 49.0' S	120.0° 52.0' E
<hr/>			
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	375.03	354.93	380.88
Time (hours)	24.27	25.72	30.17
Avg Speed (kt)	15.53	13.80	12.55
Total FOC (MT)	58.14	45.54	44.68

Weather comparison optimization / initial:

- **RestrictETA = True**

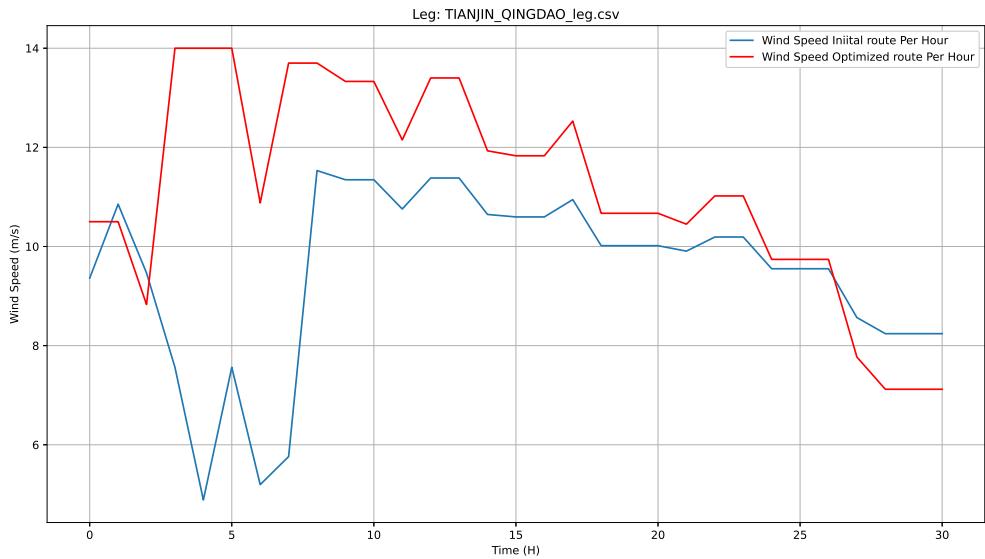


Figure 14: Wind Speed comparison Initial / Optimized Route, TIANJIN - QINGDAO

- **RestrictETA = False**

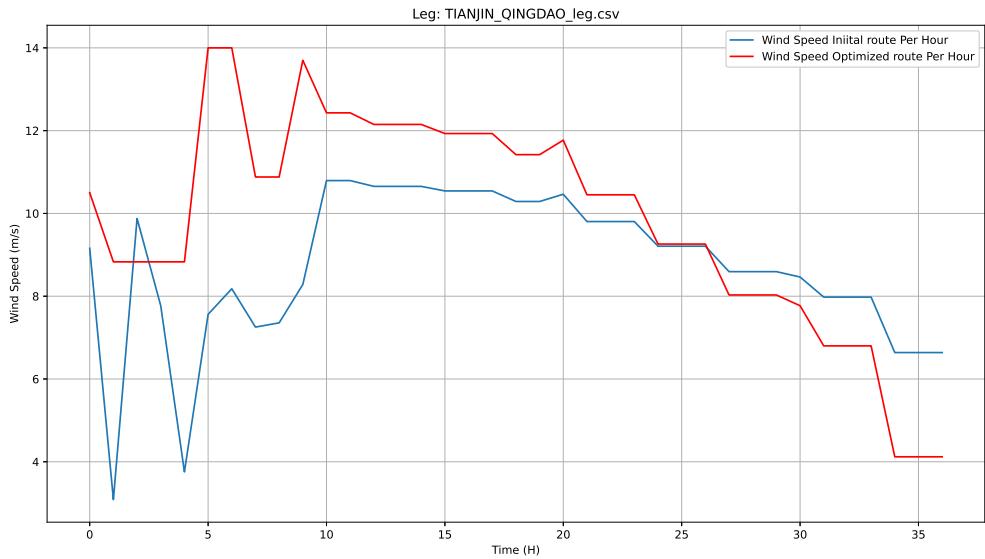


Figure 15: Wind Speed comparison Initial / Optimized Route, TIANJIN - QINGDAO

Leg 3 # Basic INFO:

- Total Actual FOC : **0.09 MT**
 - Total Predicted FOC (Neural Net): **0.09 MT**
 - Total Predicted FOC (Neural DT): **0.08 MT**
 - FOC Perc Diff (Neural Net): **0.00 %**
 - FOC Perc Diff (Neural DT): **11.76 %**
- Departure Port : **QINGDAO / 2019-10-06 23:59:00**
- Arrival Port : **SHANGHAI / 2019-10-07 05:59:00**
- Total Sailing Time: **6 hours**
- Distance Travelled: **164.86 n mi**
- Draft: **11.2 m**

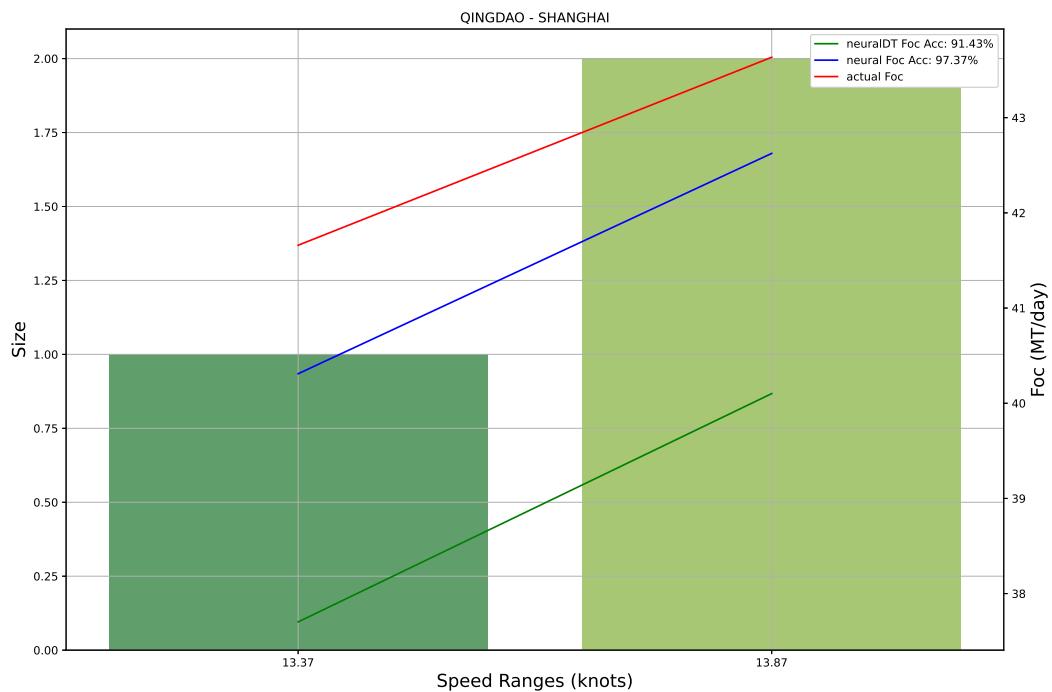


Figure 16: FOC Actual vs Predicted / Speed Ranges, QINGDAO - SHANGHAI

Weather Comparison - Sensor / Weather Service (NOA)

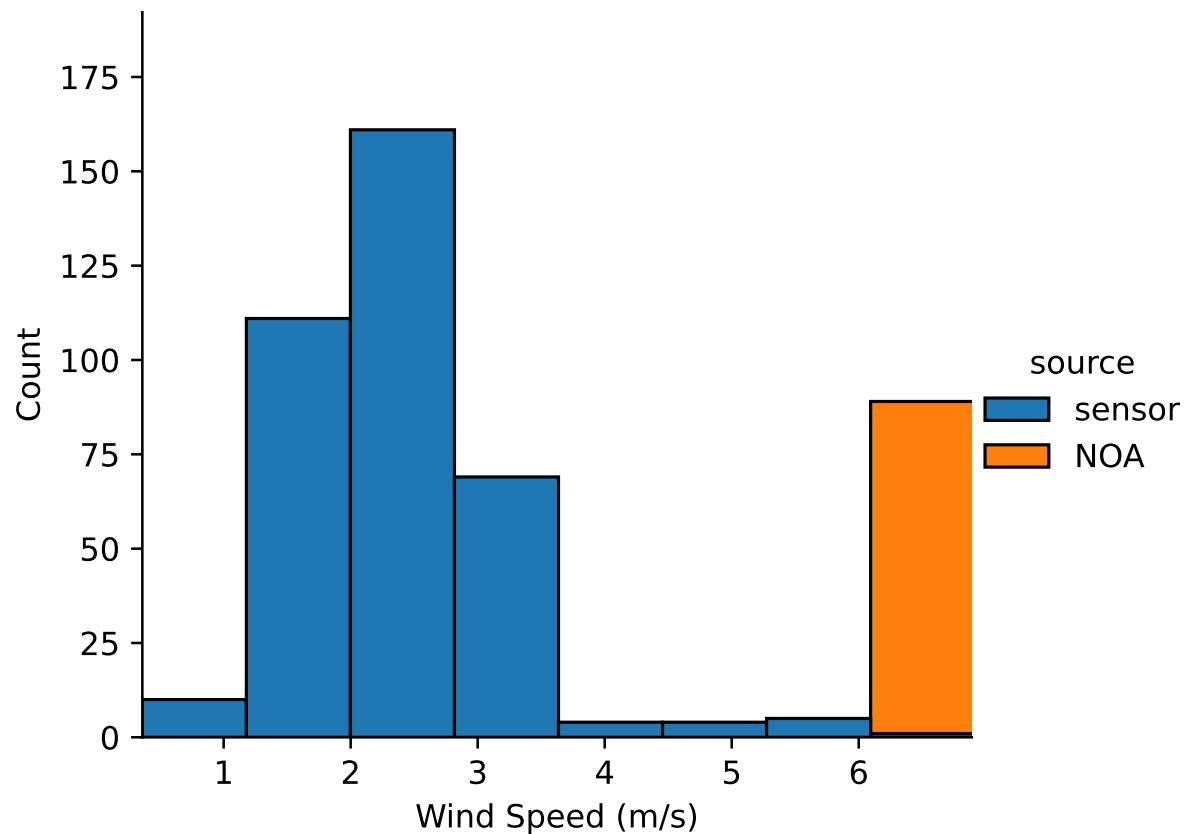


Figure 17: Wind Speed Sensor VS NOA Distributions comparison

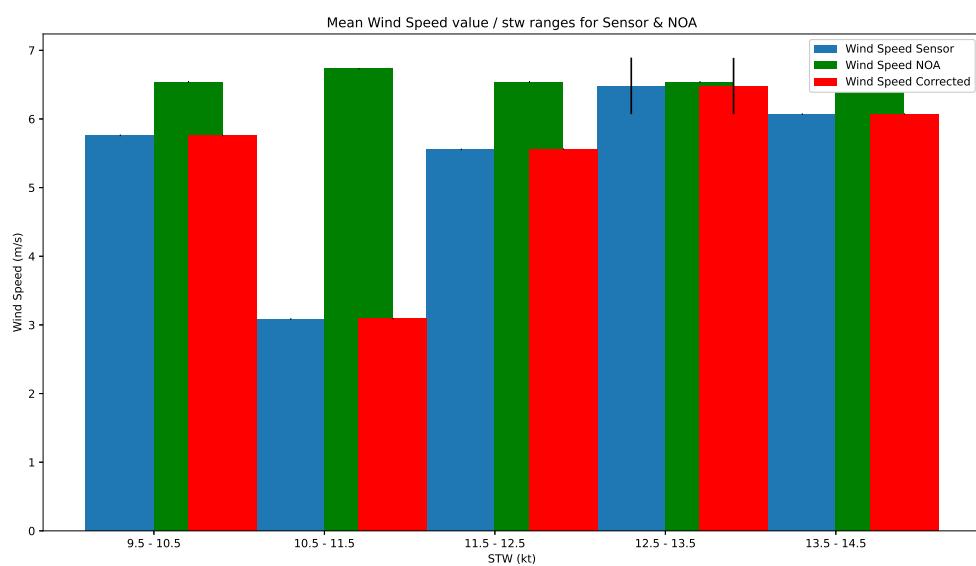


Figure 18: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

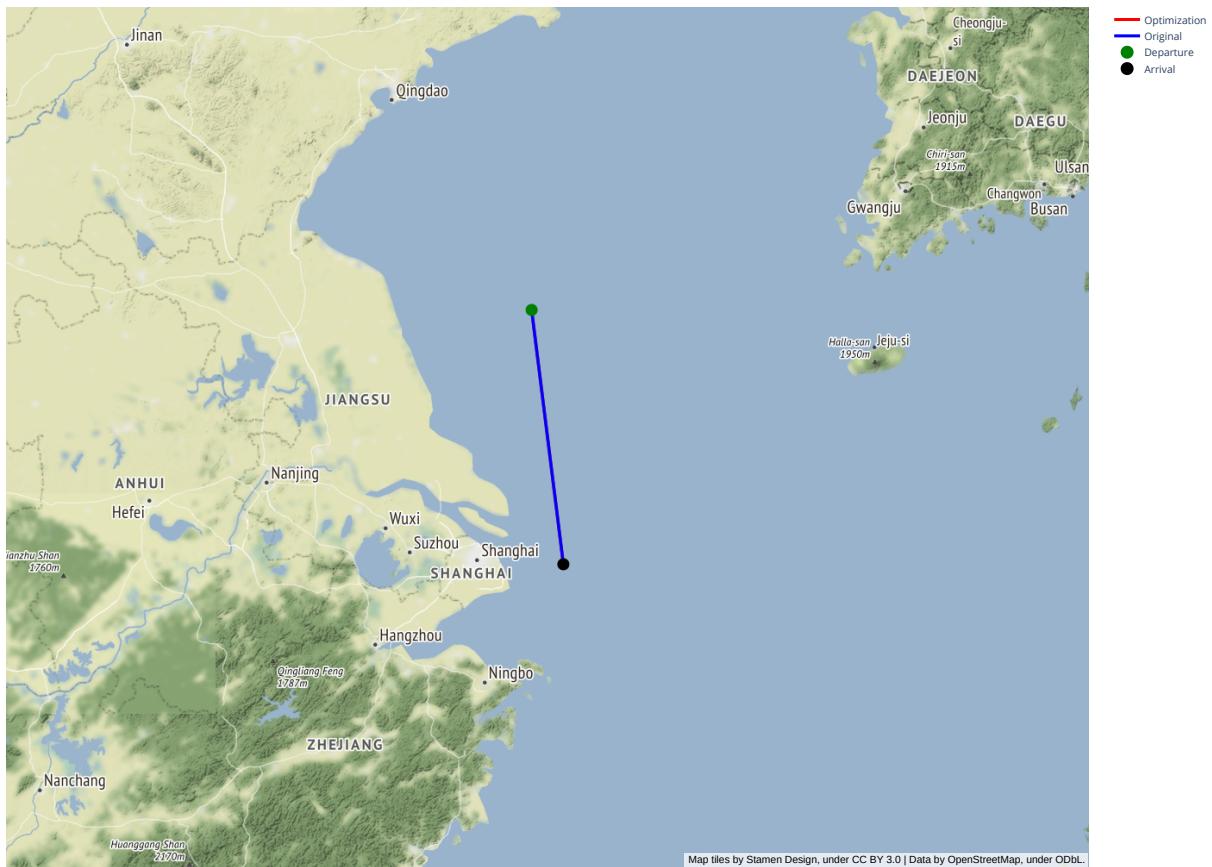


Figure 19: Initial / Optimized Route, QINGDAO - SHANGHAI

Voyage	Date	Latitude	Longitude
Departure	2019-10-06 23:59:00	33.0° 54.0' N	122.0° 9.0' E
Arrival	2019-10-07 05:59:00	31.0° 10.0' S	122.0° 33.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	NA	82.36	162.97
Time (hours)	NA	6.00	85.77
Avg Speed (kt)	NA	13.73	1.90
Total FOC (MT)	NA	0.09	95.15

Weather comparison optimization / initial:

- **RestrictETA = True**

NA

Figure 20: Wind Speed comparison Initial / Optimized Route, QINGDAO - SHANGHAI

- **RestrictETA = False**

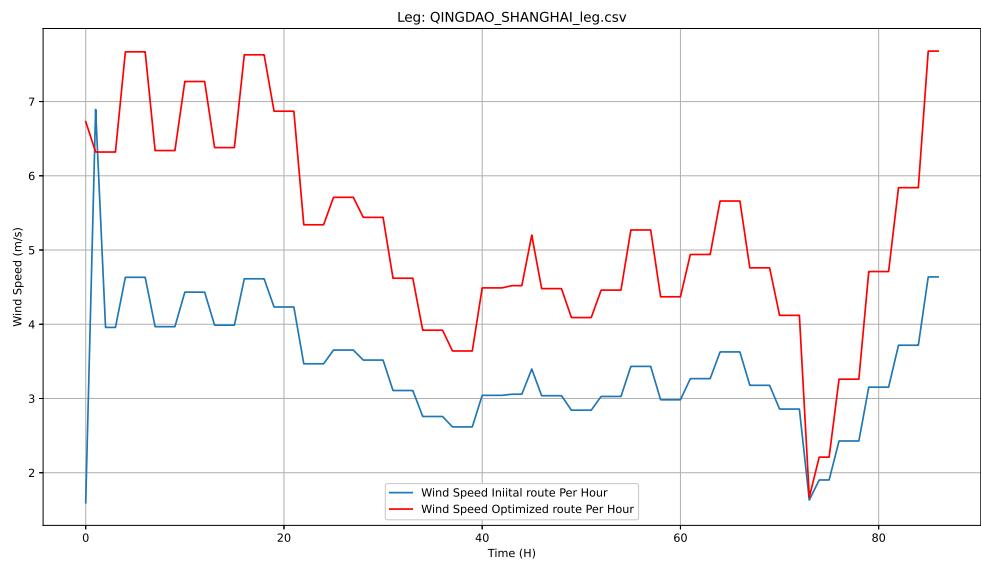


Figure 21: Wind Speed comparison Initial / Optimized Route, QINGDAO - SHANGHAI

Leg 4 # Basic INFO:

- Total Actual FOC : **4.04 MT**
 - Total Predicted FOC (Neural Net): **3.87 MT**
 - Total Predicted FOC (Neural DT): **3.77 MT**
 - FOC Perc Diff (Neural Net): **4.30 %**
 - FOC Perc Diff (Neural DT): **6.91 %**
- Departure Port : **SHANGHAI / 2019-10-08 03:43:00**
- Arrival Port : **NINGBO / 2019-10-08 05:59:00**
- Total Sailing Time: **2 hours**
- Distance Travelled: **27.03 n mi**
- Draft: **10.6 m**

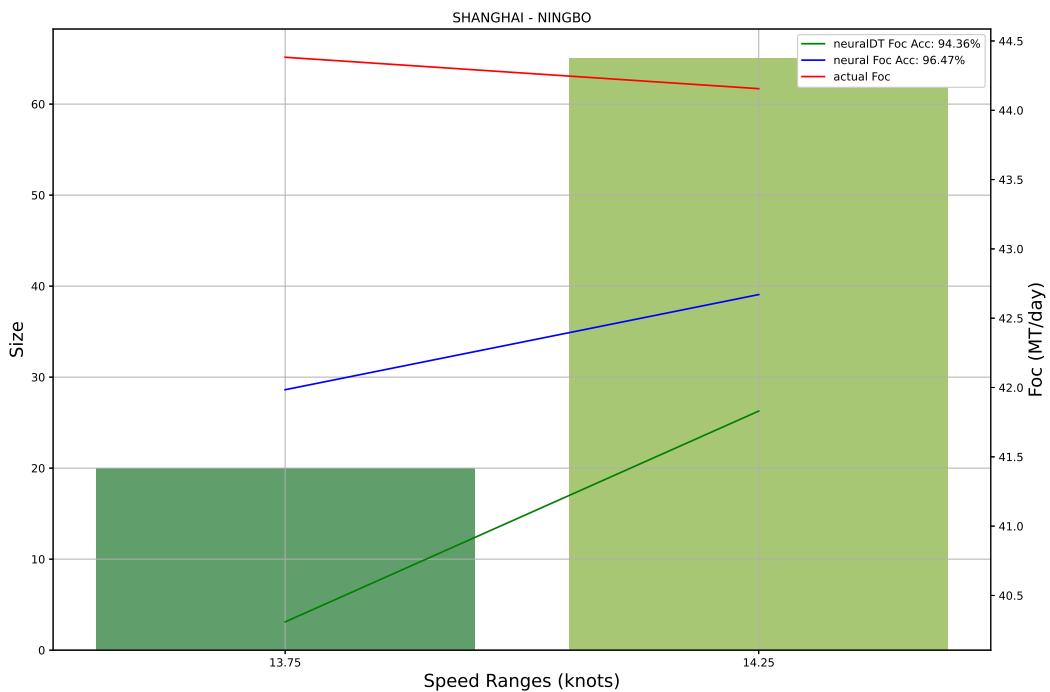


Figure 22: FOC Actual vs Predicted / Speed Ranges, SHANGHAI - NINGBO

Weather Comparison - Sensor / Weather Service (NOA)

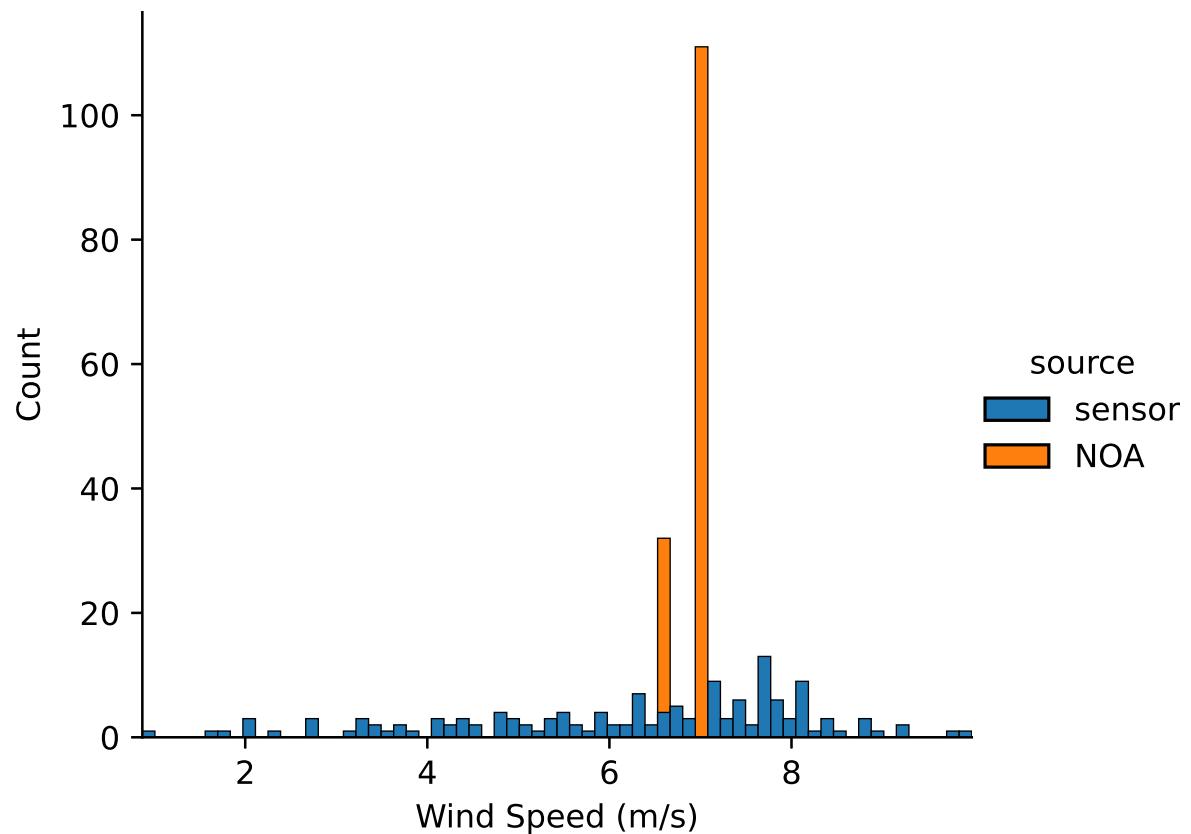


Figure 23: Wind Speed Sensor VS NOA Distributions comparison

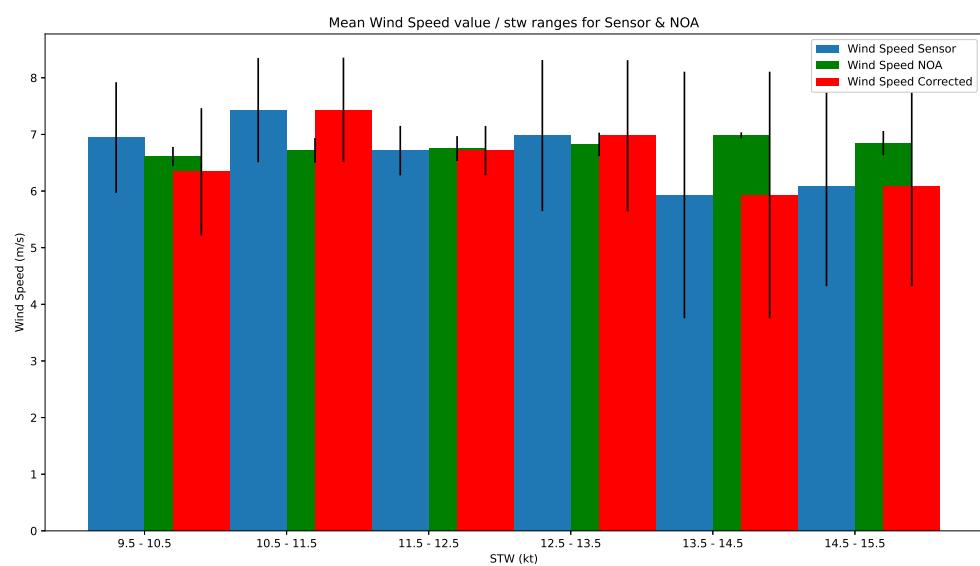


Figure 24: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

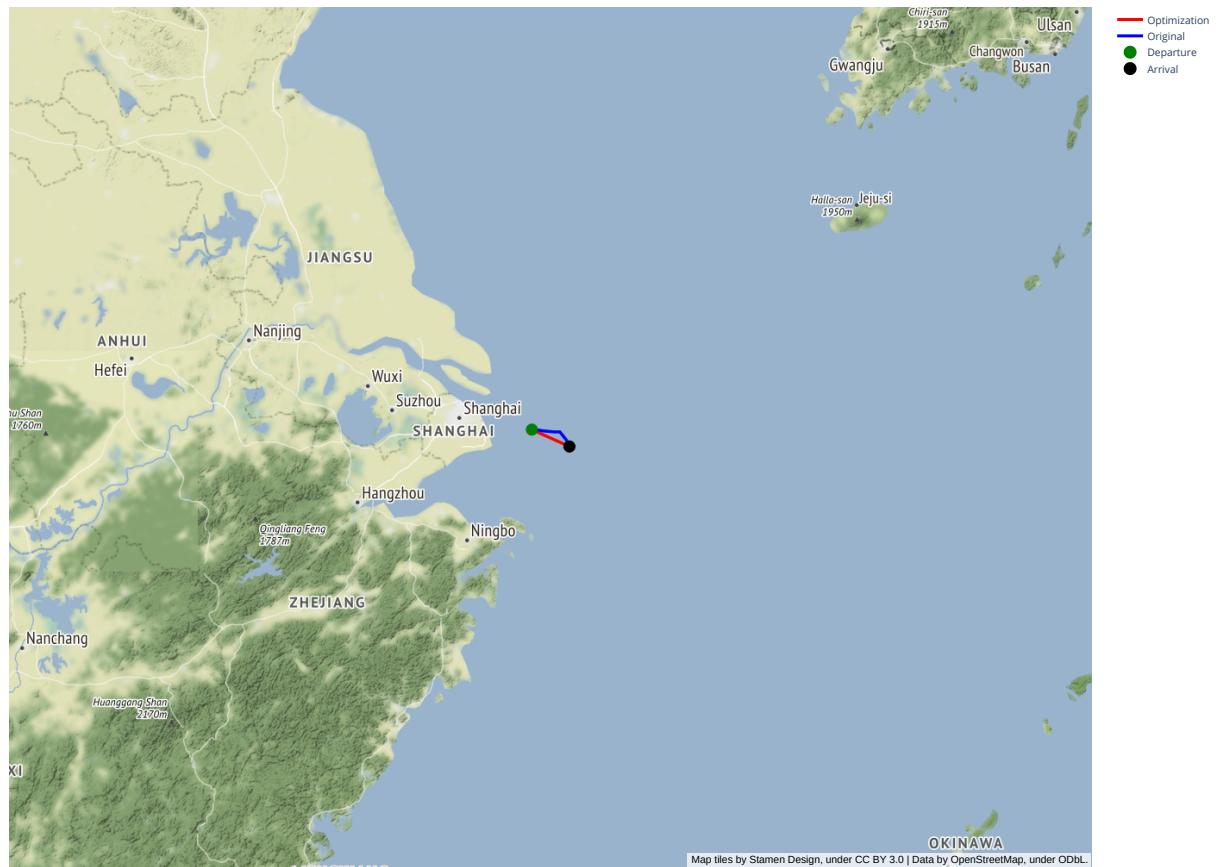


Figure 25: Initial / Optimized Route, SHANGHAI - NINGBO

Voyage	Date	Latitude	Longitude
Departure	2019-10-08 03:43:00	31.0° 5.0' N	122.0° 23.0' E
Arrival	2019-10-08 05:59:00	30.0° 54.0' S	122.0° 51.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	14.43	32.42	13.83
Time (hours)	1.13	2.27	1.03
Avg Speed (kt)	12.60	14.28	13.20
Total FOC (MT)	1.69	3.87	1.65

Weather comparison optimization / initial:

- **RestrictETA = True**

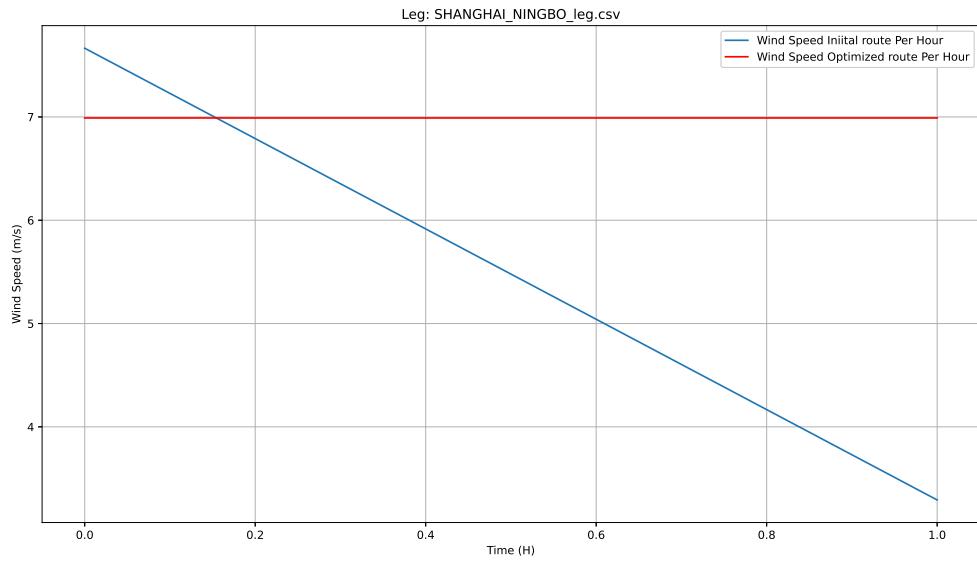


Figure 26: Wind Speed comparison Initial / Optimized Route, SHANGHAI - NINGBO

- **RestrictETA = False**

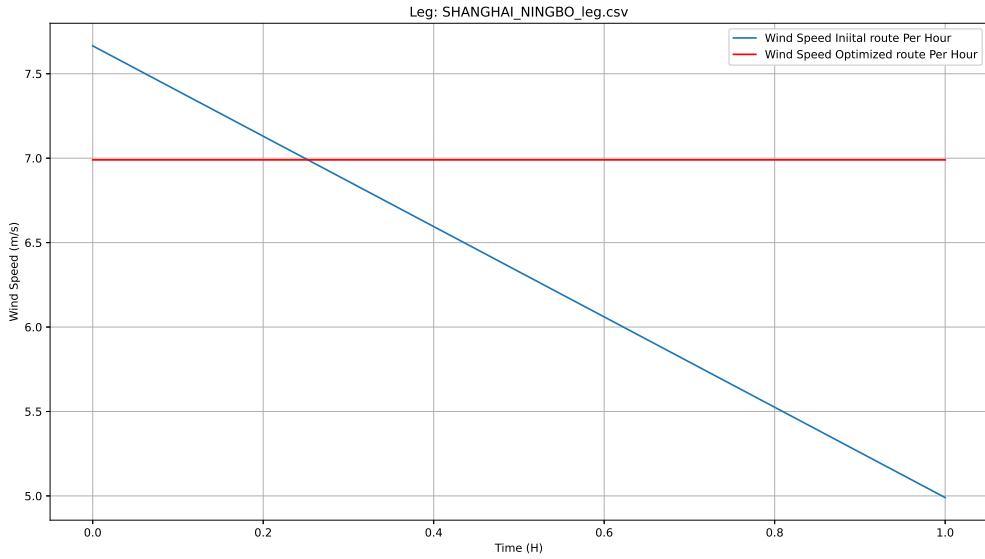


Figure 27: Wind Speed comparison Initial / Optimized Route, SHANGHAI - NINGBO

Leg 5 # Basic INFO:

- Total Actual FOC : **71.97 MT**
 - Total Predicted FOC (Neural Net): **73.85 MT**
 - Total Predicted FOC (Neural DT): **69.51 MT**
 - FOC Perc Diff (Neural Net): **2.58 %**
 - FOC Perc Diff (Neural DT): **3.48 %**
- Departure Port : **NINGBO / 2019-10-10 01:36:00**
- Arrival Port : **NANSHA / 2019-10-12 05:59:00**
- Total Sailing Time: **52 hours**
- Distance Travelled: **581.92 n mi**
- Draft: **11.0 m**

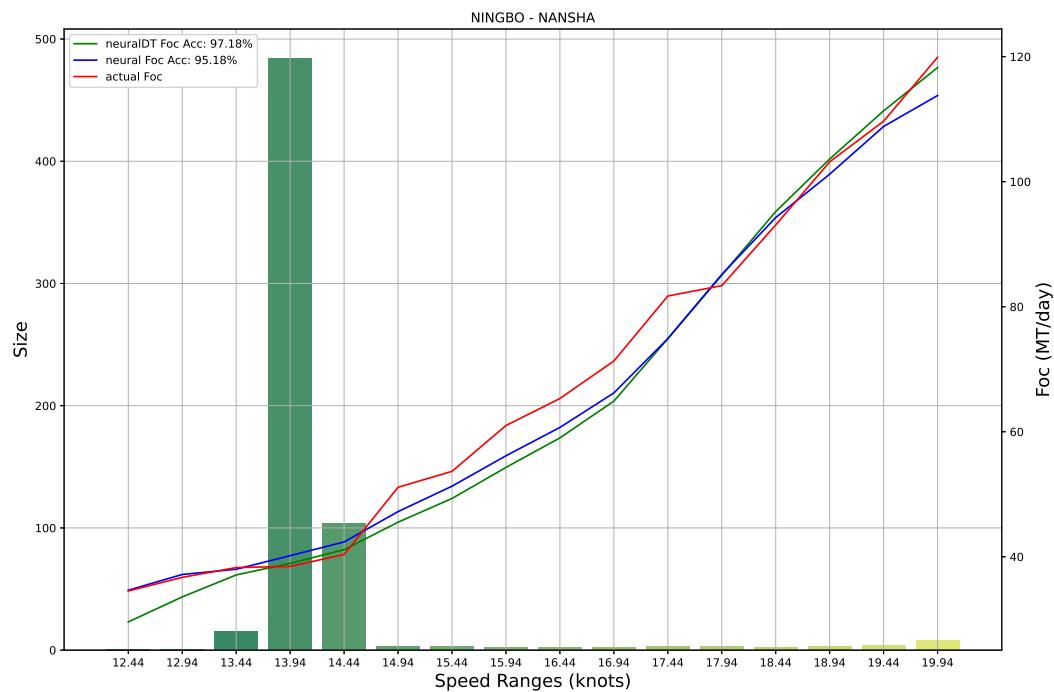


Figure 28: FOC Actual vs Predicted / Speed Ranges, NINGBO - NANSHA

Weather Comparison - Sensor / Weather Service (NOA)

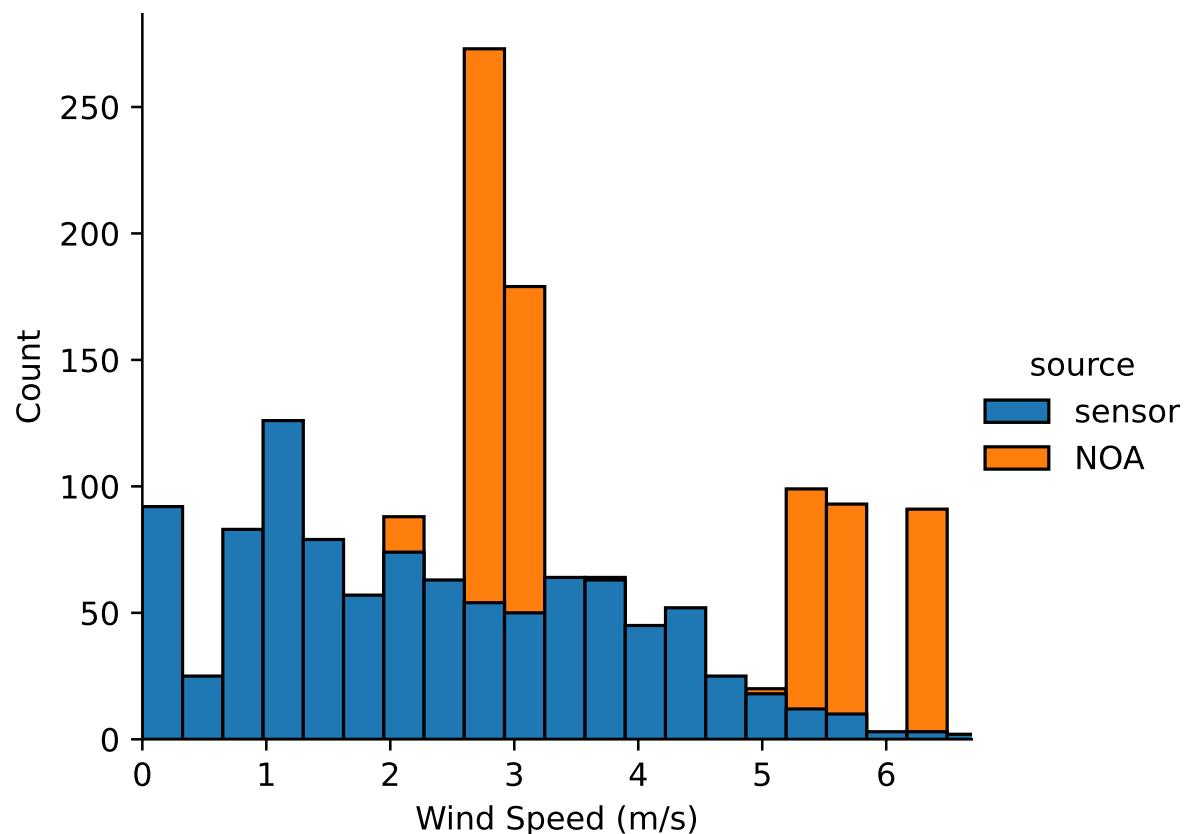


Figure 29: Wind Speed Sensor VS NOA Distributions comparison

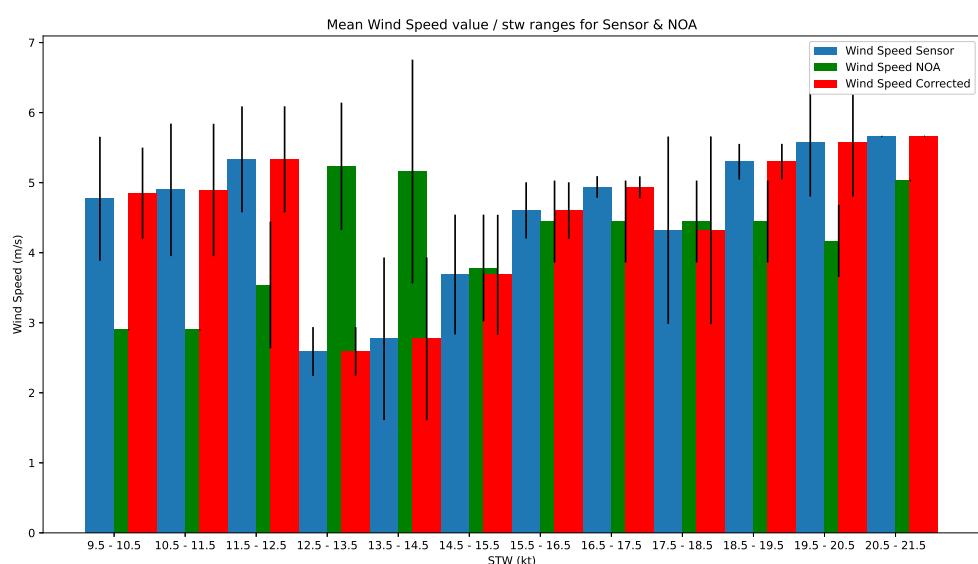


Figure 30: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

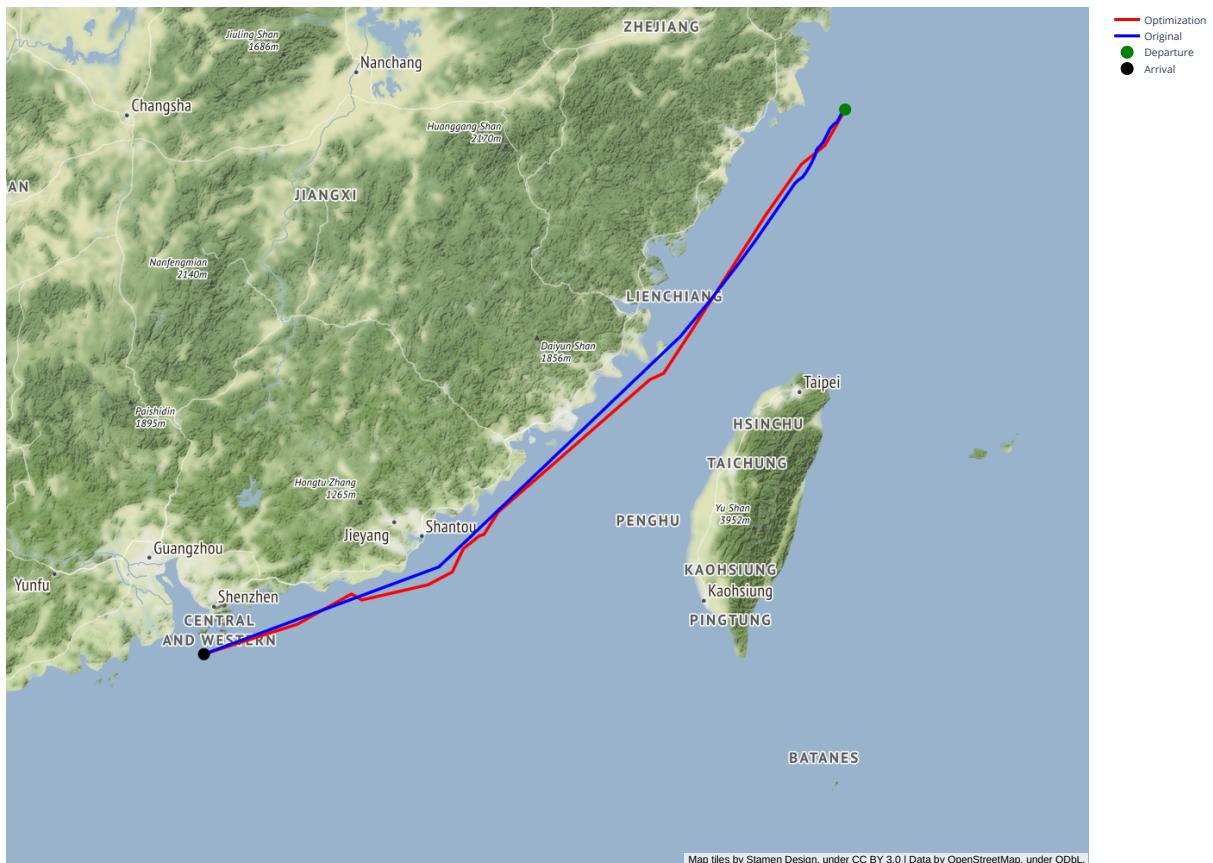


Figure 31: Initial / Optimized Route, NINGBO - NANSHA

Voyage	Date	Latitude	Longitude
Departure	2019-10-10 01:36:00	28.0° 15.0' N	122.0° 7.0' E
Arrival	2019-10-12 05:59:00	21.0° 59.0' S	113.0° 56.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	600.55	749.37	601.25
Time (hours)	49.28	52.38	49.80
Avg Speed (kt)	12.21	14.31	12.09
Total FOC (MT)	64.38	73.85	63.98

Weather comparison optimization / initial:

- **RestrictETA = True**

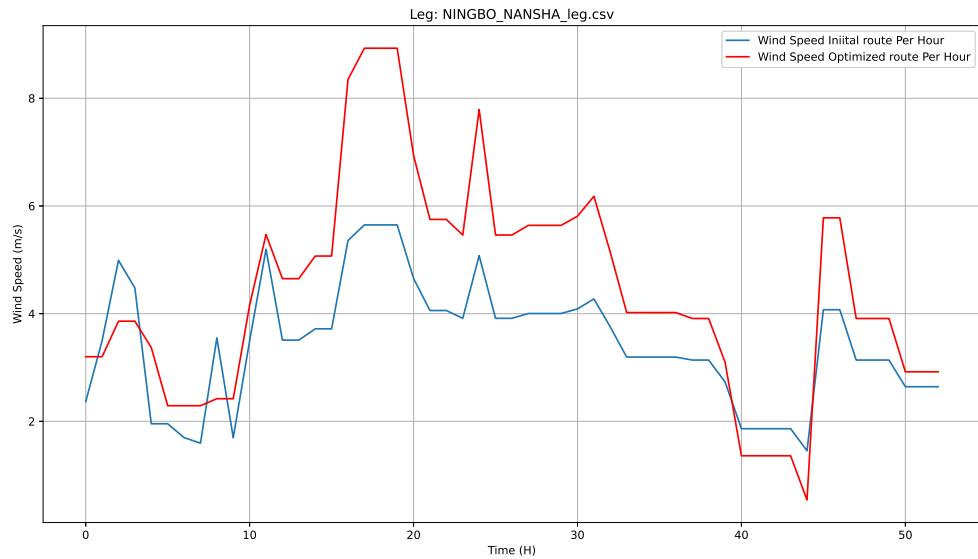


Figure 32: Wind Speed comparison Initial / Optimized Route, NINGBO - NANSHA

- **RestrictETA = False**

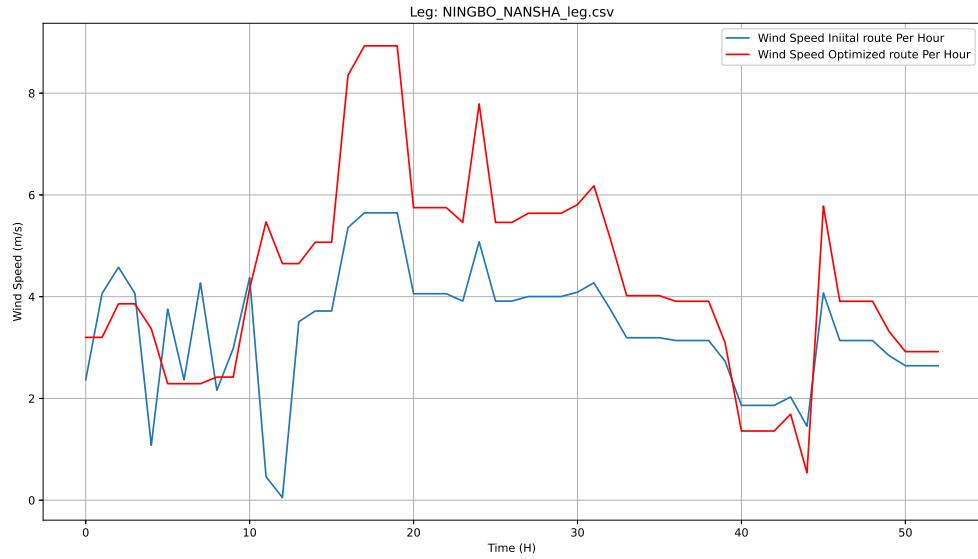


Figure 33: Wind Speed comparison Initial / Optimized Route, NINGBO - NANSHA

Leg 6 # Basic INFO:

- Total Actual FOC : **126.89 MT**
 - Total Predicted FOC (Neural Net): **153.93 MT**
 - Total Predicted FOC (Neural DT): **150.75 MT**
 - FOC Perc Diff (Neural Net): **19.26 %**
 - FOC Perc Diff (Neural DT): **17.30 %**
- Departure Port : **NANSHA / 2019-10-14 00:00:00**
- Arrival Port : **TANJUNG PELEPAS / 2019-10-18 00:18:00**
- Total Sailing Time: **96 hours**
- Distance Travelled: **1,135.33 n mi**
- Draft: **13.5 m**

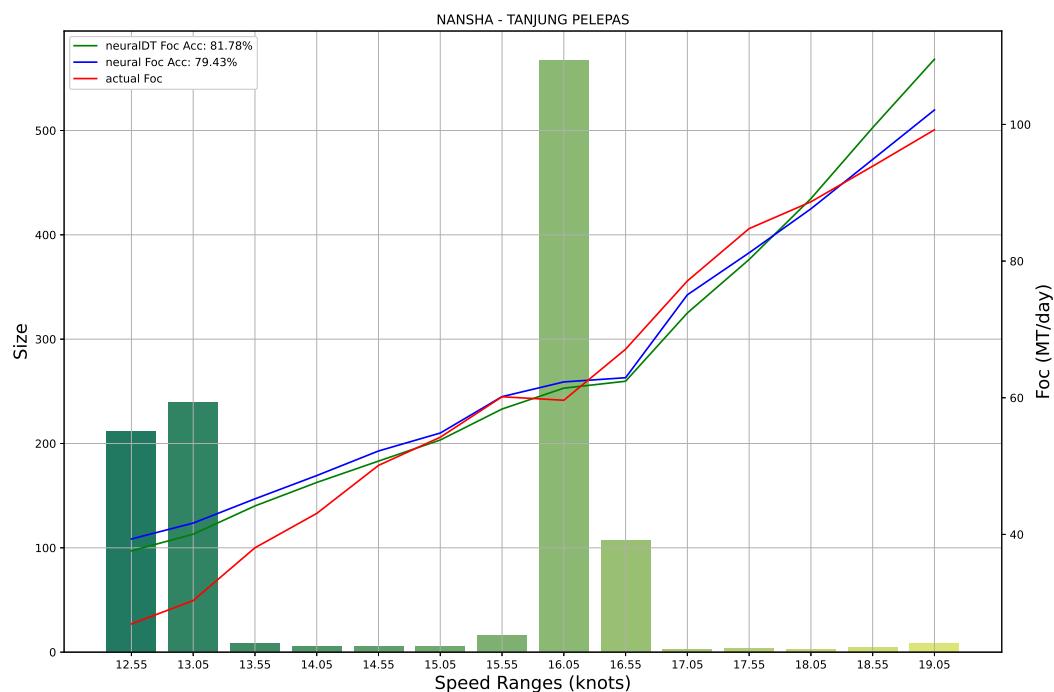


Figure 34: FOC Actual vs Predicted / Speed Ranges, NANSHA - TANJUNG PELEPAS

Weather Comparison - Sensor / Weather Service (NOA)

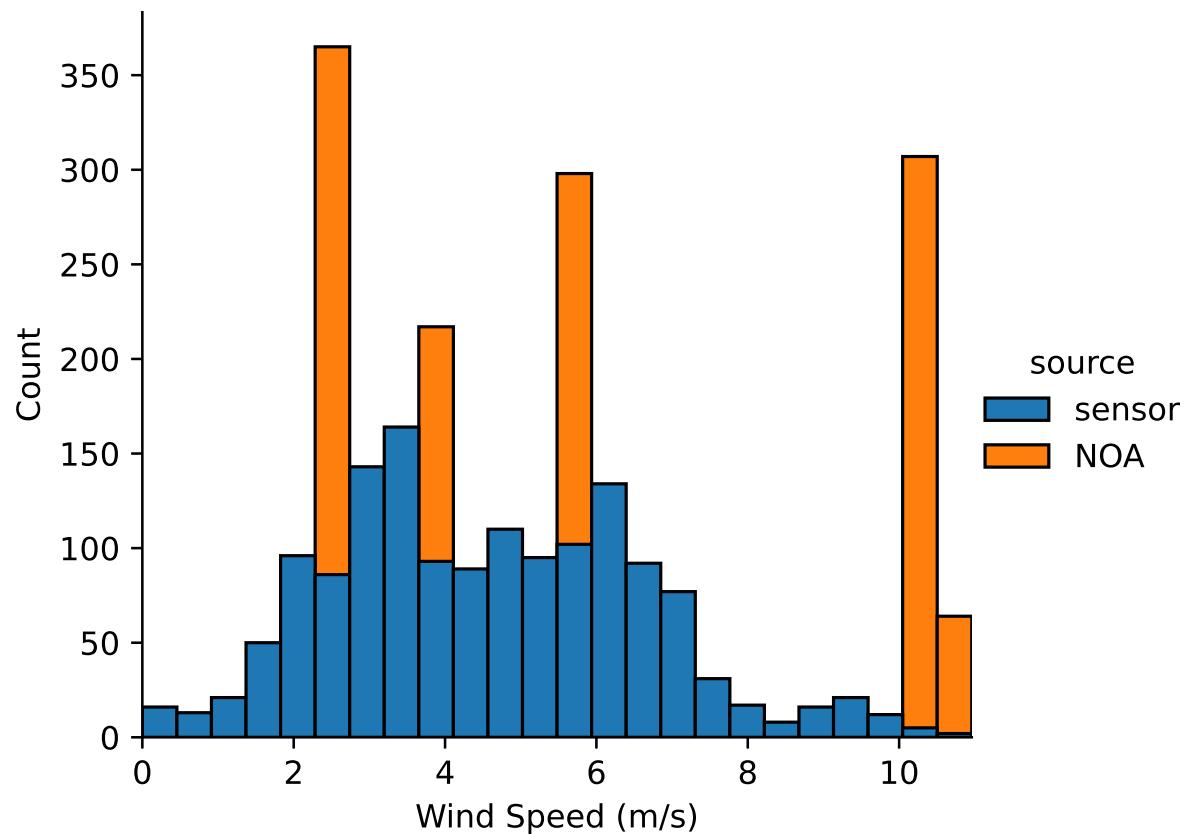


Figure 35: Wind Speed Sensor VS NOA Distributions comparison

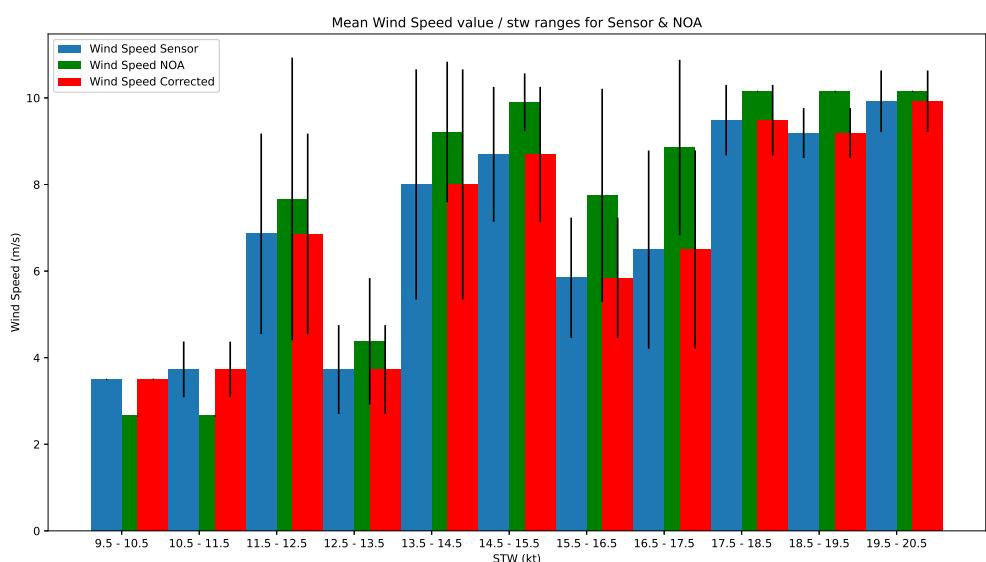


Figure 36: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

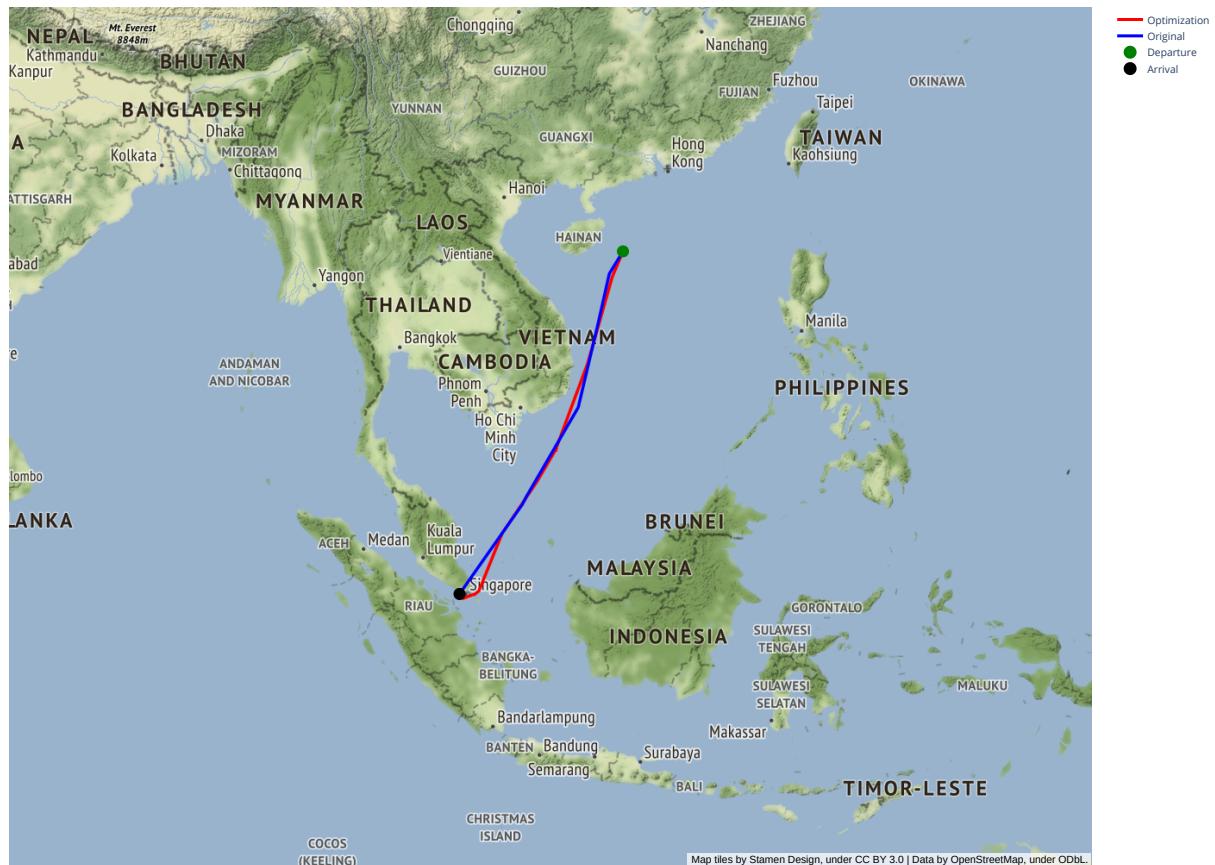


Figure 37: Initial / Optimized Route, NANSHA - TANJUNG PELEPAS

Voyage	Date	Latitude	Longitude
Departure	2019-10-14 00:00:00	18.0° 28.0' N	111.0° 53.0' E
Arrival	2019-10-18 00:18:00	1.0° 20.0' S	103.0° 33.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	1,177.29	1,434.81	1,174.20
Time (hours)	94.58	96.30	80.37
Avg Speed (kt)	12.43	14.90	14.59
Total FOC (MT)	150.79	153.93	168.62

Weather comparison optimization / initial:

- **RestrictETA = True**

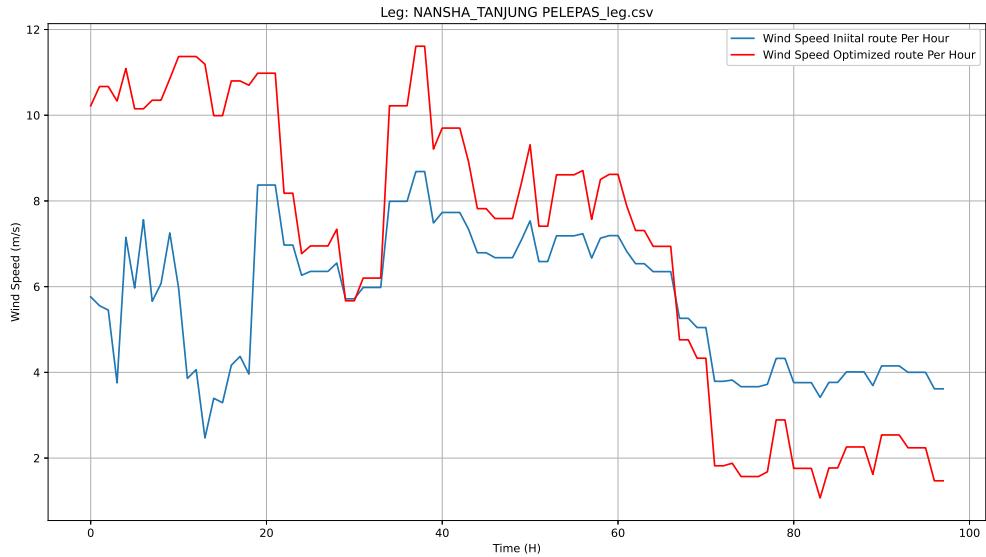


Figure 38: Wind Speed comparison Initial / Optimized Route, NANSHA - TANJUNG PELEPAS

- **RestrictETA = False**

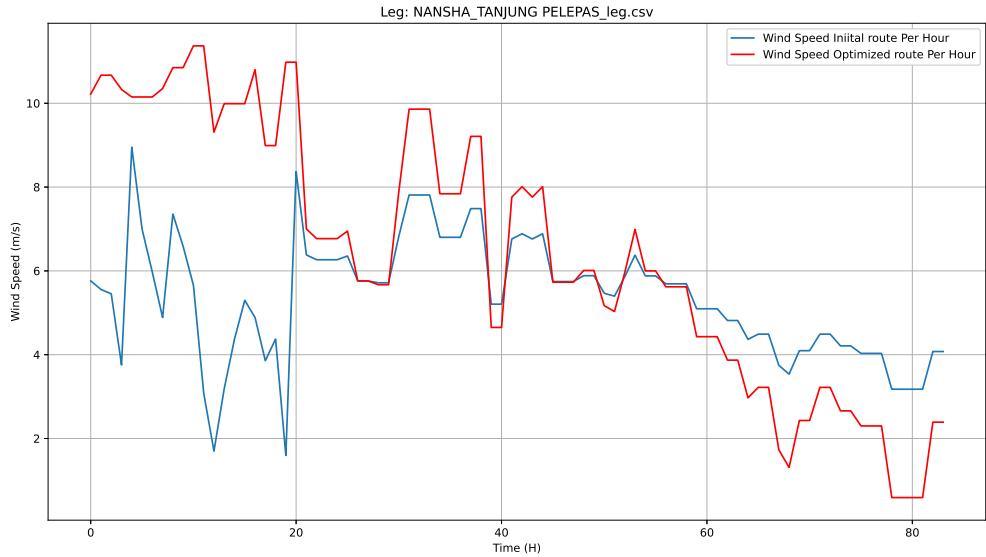


Figure 39: Wind Speed comparison Initial / Optimized Route, NANSHA - TANJUNG PELEPAS

Leg 7 # Basic INFO:

- Total Actual FOC : **855.06 MT**
 - Total Predicted FOC (Neural Net): **849.76 MT**
 - Total Predicted FOC (Neural DT): **784.66 MT**
 - FOC Perc Diff (Neural Net): **0.62 %**
 - FOC Perc Diff (Neural DT): **8.59 %**
- Departure Port : **SINGAPORE / 2019-10-20 08:30:00**
- Arrival Port : **CAPE TOWN / 2019-11-05 05:58:00**
- Total Sailing Time: **381 hours**
- Distance Travelled: **5,159.09 n mi**
- Draft: **14.5 m**

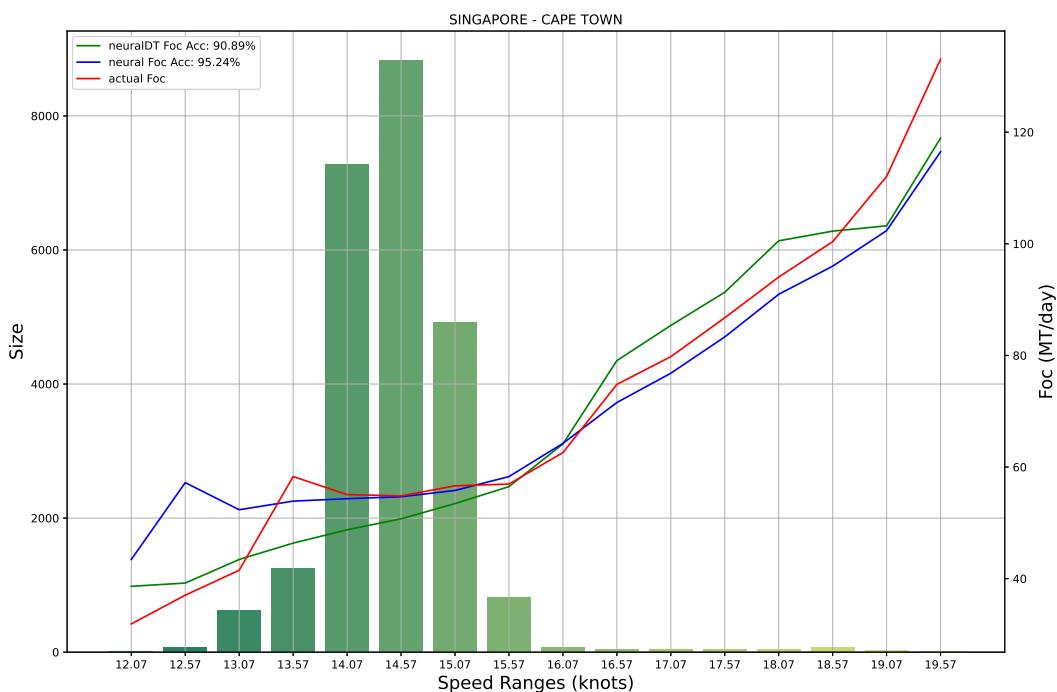


Figure 40: FOC Actual vs Predicted / Speed Ranges, SINGAPORE - CAPE TOWN

Weather Comparison - Sensor / Weather Service (NOA)

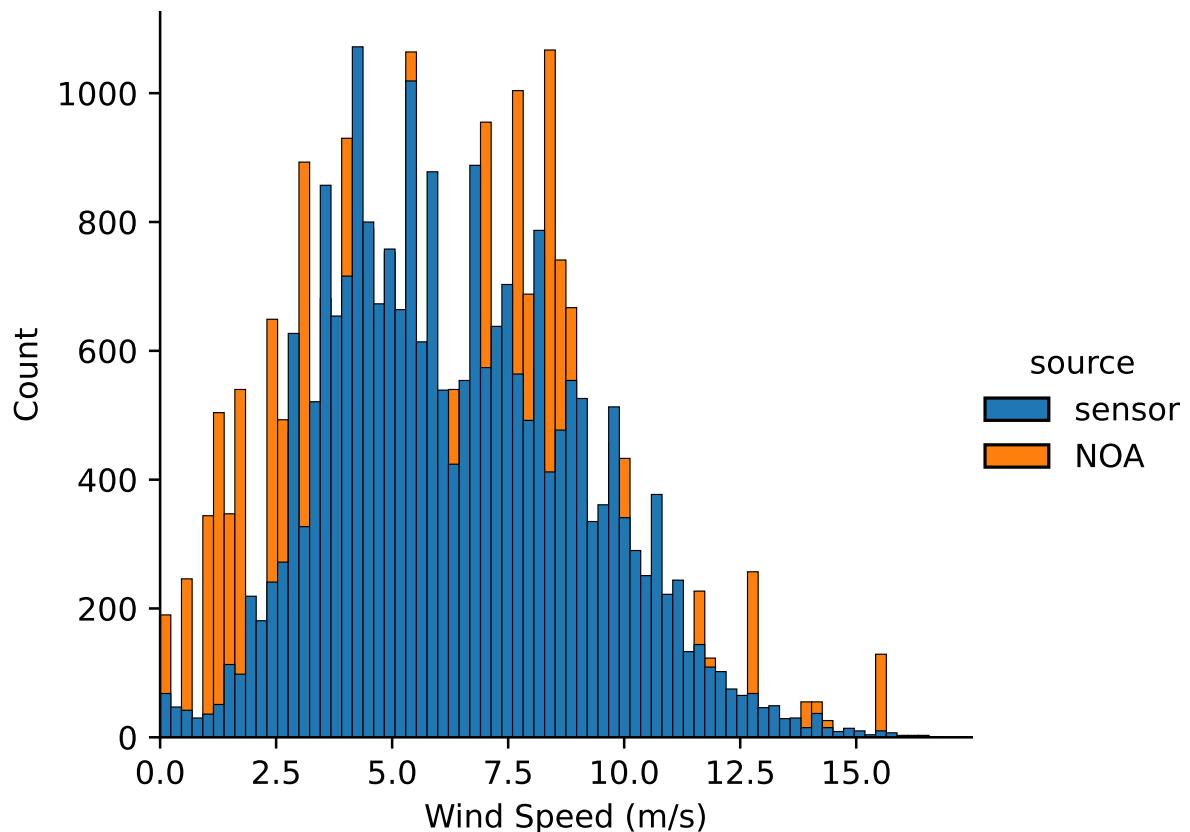


Figure 41: Wind Speed Sensor VS NOA Distributions comparison

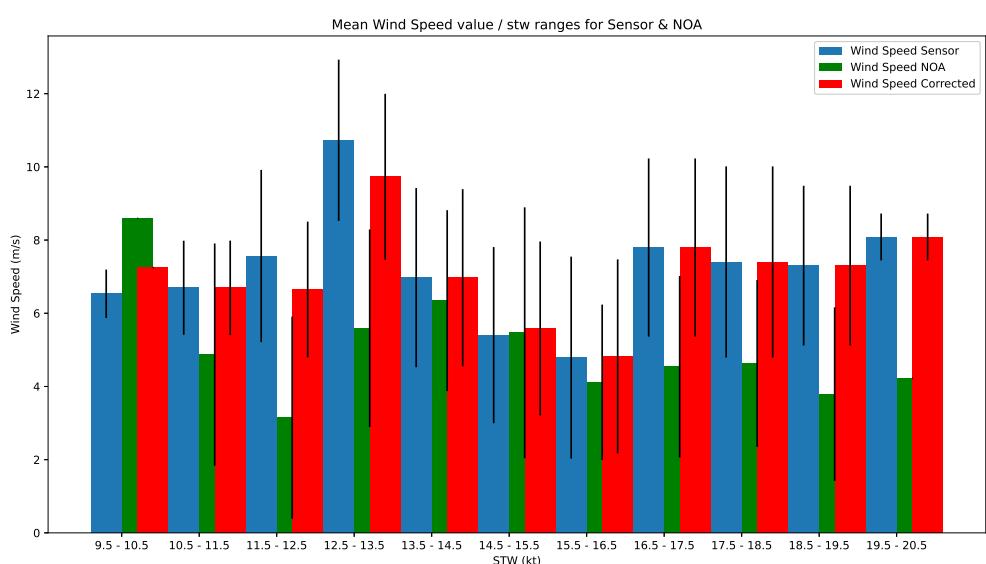


Figure 42: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

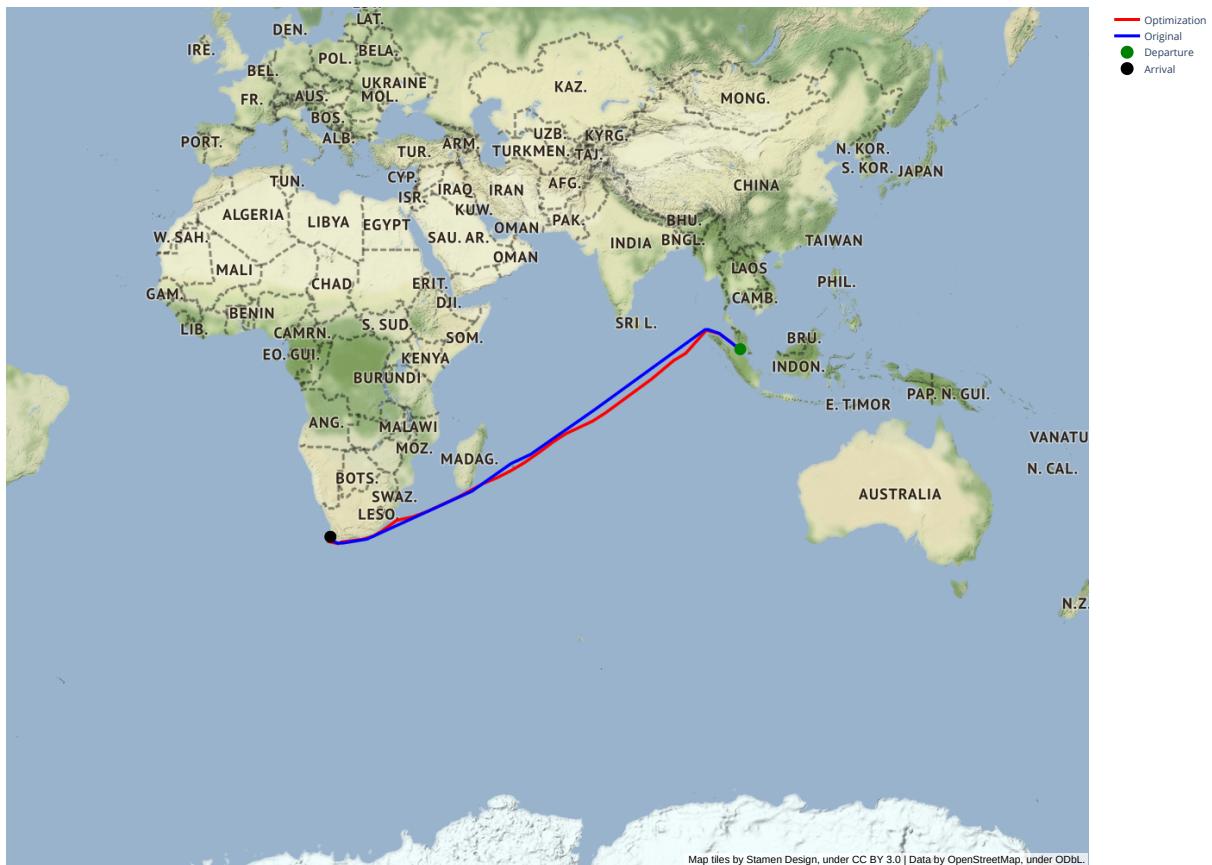


Figure 43: Initial / Optimized Route, SINGAPORE - CAPE TOWN

Voyage	Date	Latitude	Longitude
Departure	2019-10-20 08:30:00	2.0° 13.0' N	101.0° 55.0' E
Arrival	2019-11-05 05:58:00	34.0° 7.0' N	18.0° 22.0' W
<hr/>			
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	5,542.67	5,529.44	5,561.39
Time (hours)	378.68	381.47	397.62
Avg Speed (kt)	14.63	14.50	13.99
Total FOC (MT)	801.87	849.76	777.22

Weather comparison optimization / initial:

- **RestrictETA = True**

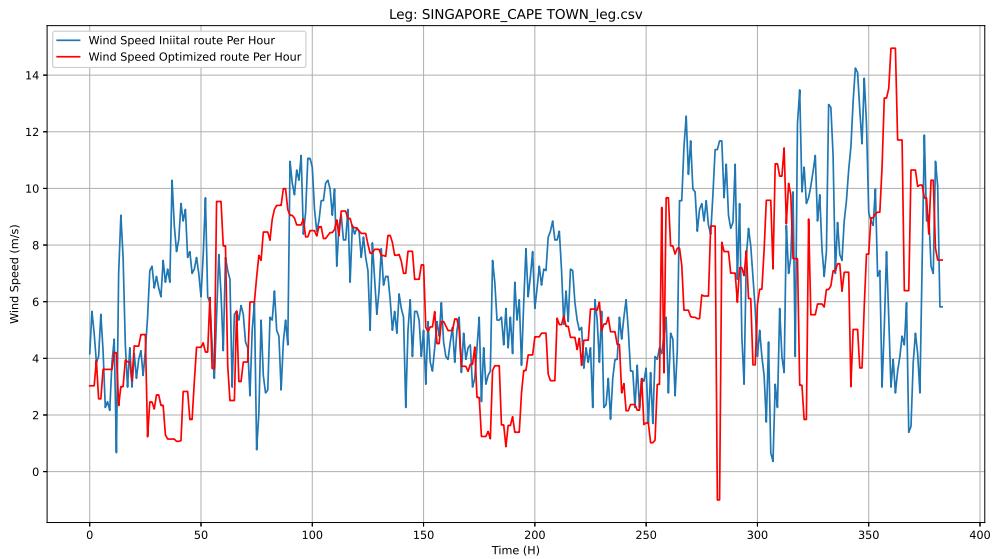


Figure 44: Wind Speed comparison Initial / Optimized Route, SINGAPORE - CAPE TOWN

- **RestrictETA = False**

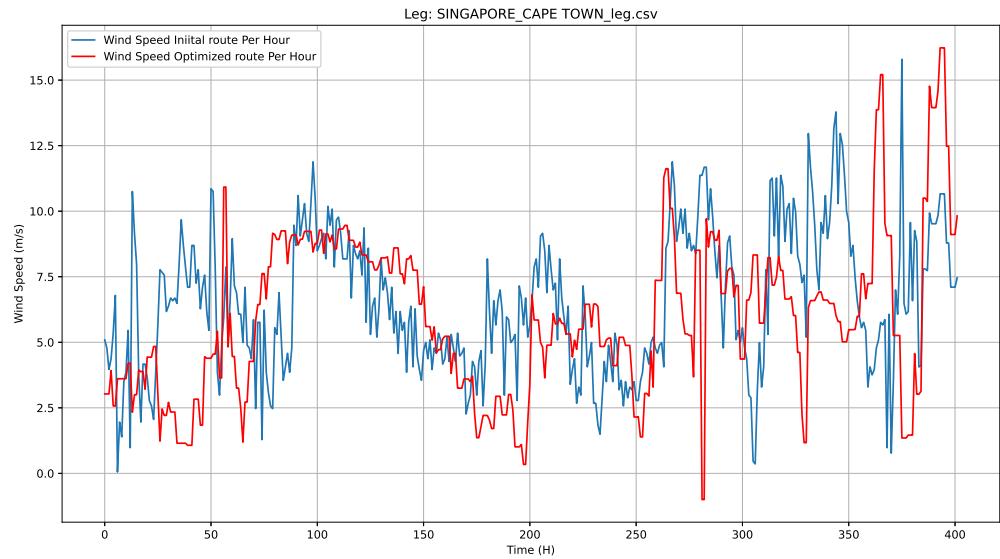


Figure 45: Wind Speed comparison Initial / Optimized Route, SINGAPORE - CAPE TOWN

Leg 8 # Basic INFO:

- Total Actual FOC : **338.89 MT**
 - Total Predicted FOC (Neural Net): **319.53 MT**
 - Total Predicted FOC (Neural DT): **327.13 MT**
 - FOC Perc Diff (Neural Net): **5.88 %**
 - FOC Perc Diff (Neural DT): **3.53 %**
- Departure Port : **CAPE TOWN / 2019-11-06 17:54:00**
- Arrival Port : **POINTE NOIRE / 2019-11-11 07:29:00**
- Total Sailing Time: **110 hours**
- Distance Travelled: **1,751.61 n mi**
- Draft: **12.8 m**

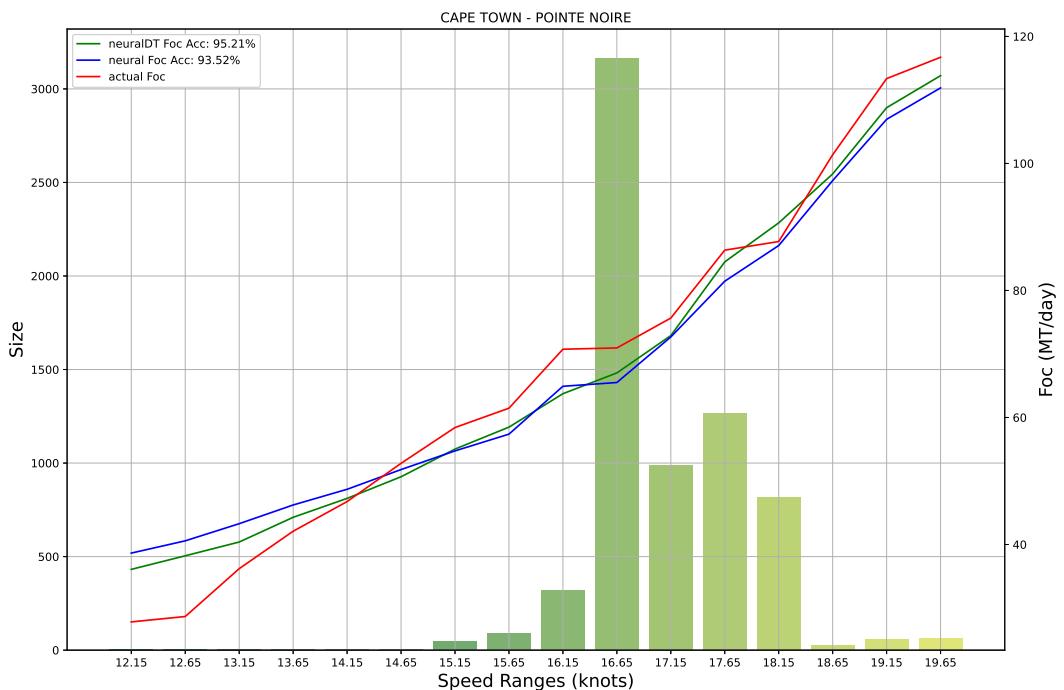


Figure 46: FOC Actual vs Predicted / Speed Ranges, CAPE TOWN - POINTE NOIRE

Weather Comparison - Sensor / Weather Service (NOA)

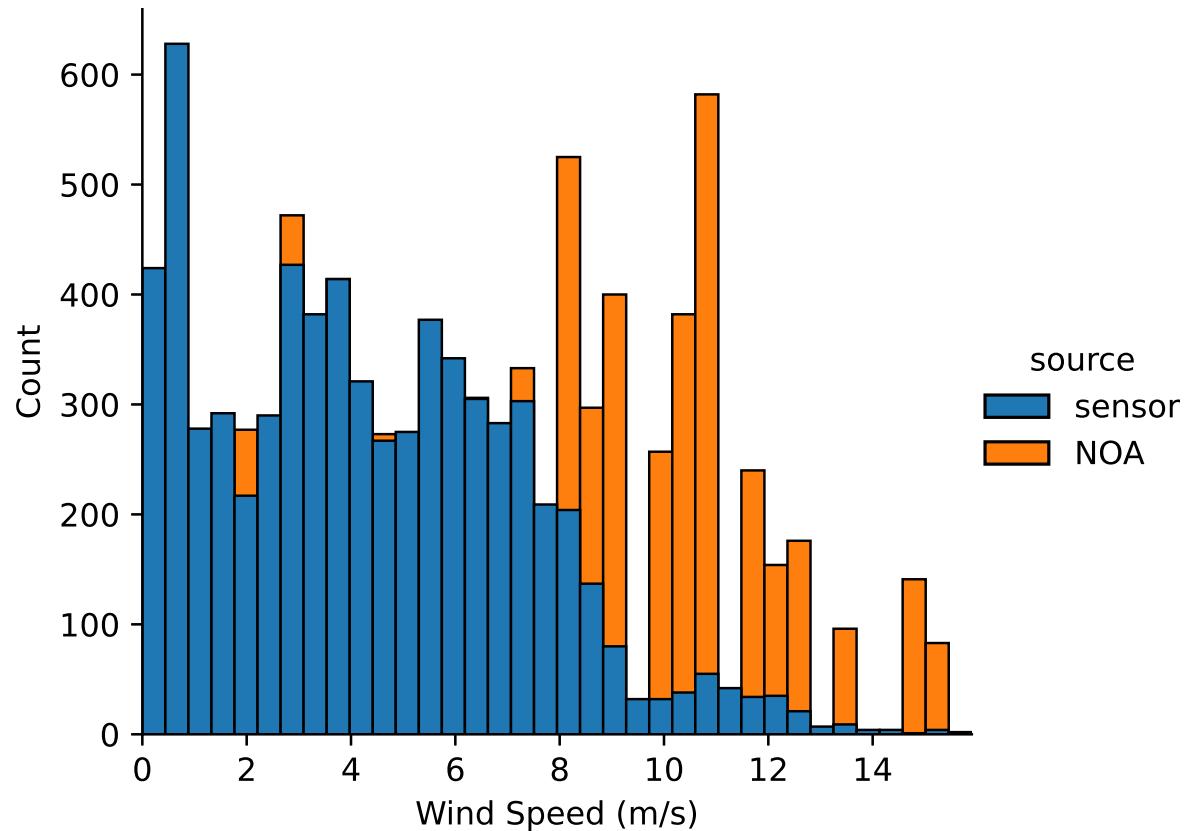


Figure 47: Wind Speed Sensor VS NOA Distributions comparison

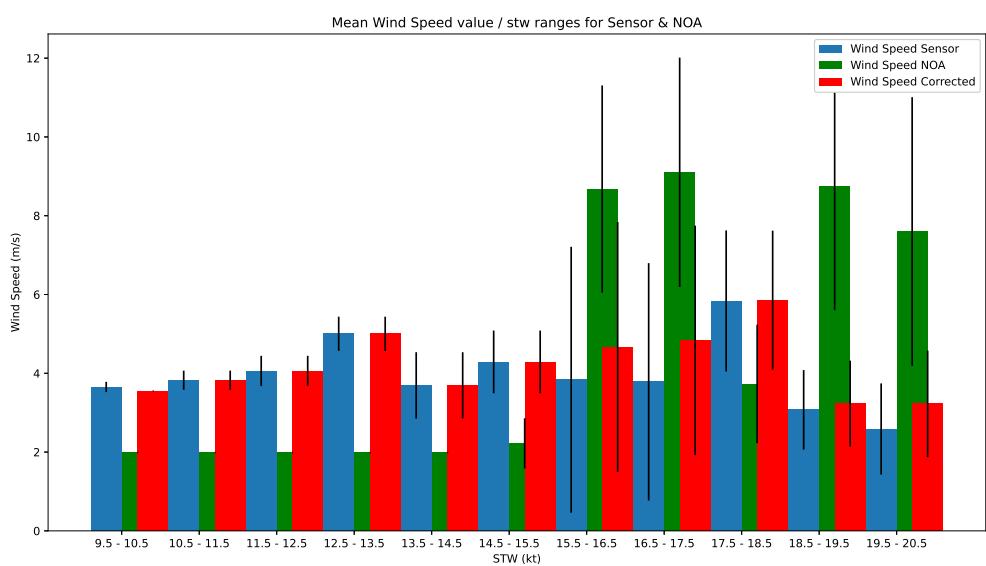


Figure 48: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

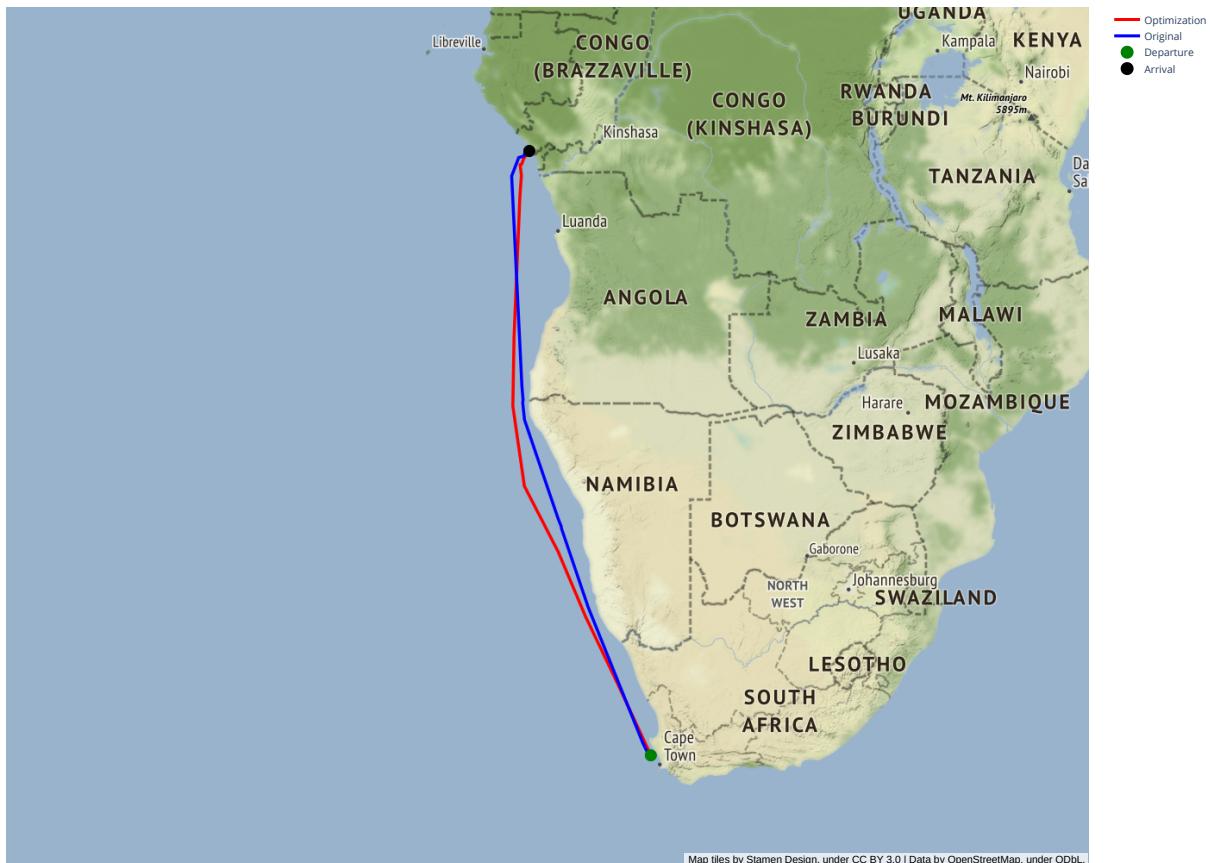


Figure 49: Initial / Optimized Route, CAPE TOWN - POINTE NOIRE

Voyage	Date	Latitude	Longitude
Departure	2019-11-06 17:54:00	34.0° 29.0' S	17.0° 58.0' W
Arrival	2019-11-11 07:29:00	5.0° 12.0' N	11.0° 47.0' W
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	1,774.15	1,869.36	1,790.99
Time (hours)	106.87	109.58	108.32
Avg Speed (kt)	16.56	17.06	16.55
Total FOC (MT)	340.40	319.53	346.29

Weather comparison optimization / initial:

- **RestrictETA = True**

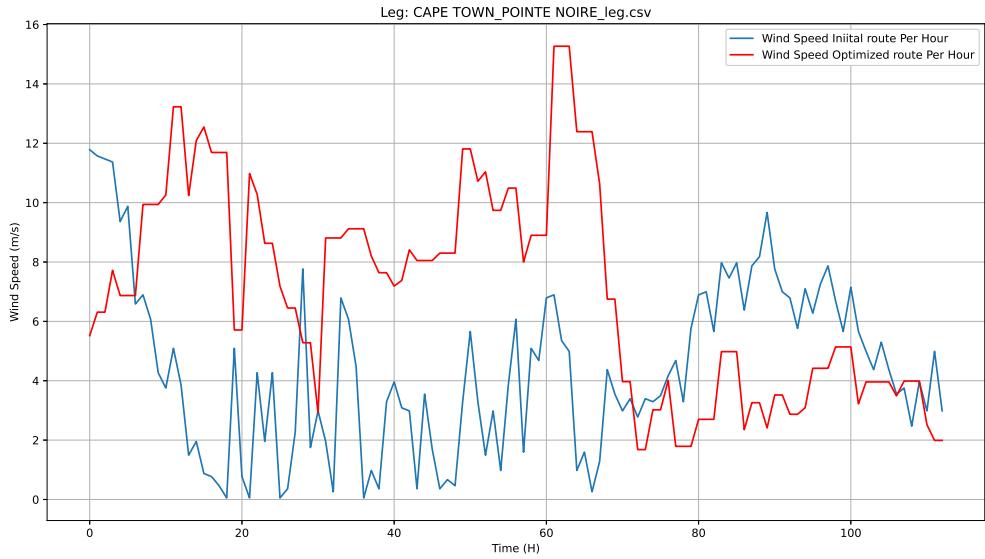


Figure 50: Wind Speed comparison Initial / Optimized Route, CAPE TOWN - POINTE NOIRE

- **RestrictETA = False**

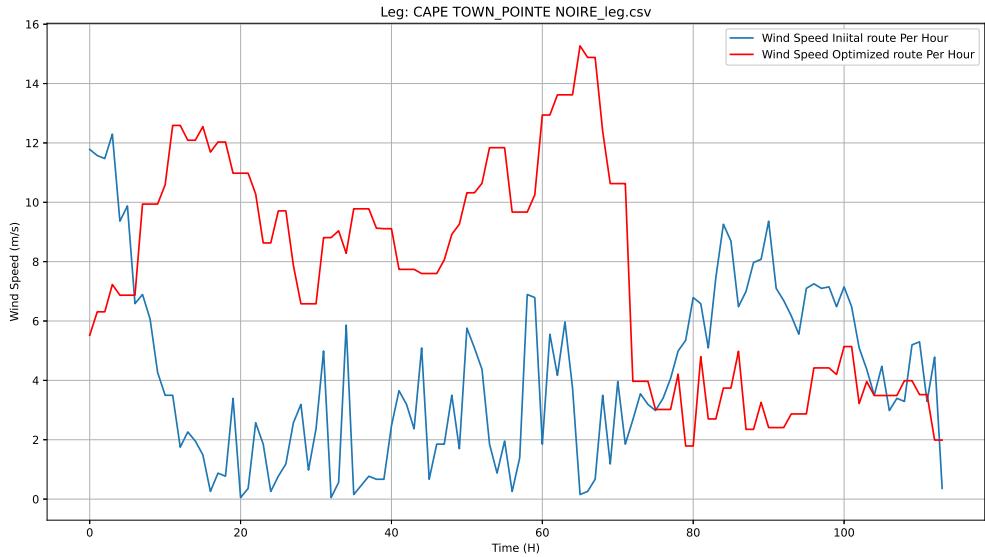


Figure 51: Wind Speed comparison Initial / Optimized Route, CAPE TOWN - POINTE NOIRE

Leg 9 # Basic INFO:

- Total Actual FOC : **38.88 MT**
 - Total Predicted FOC (Neural Net): **38.14 MT**
 - Total Predicted FOC (Neural DT): **34.19 MT**
 - FOC Perc Diff (Neural Net): **1.92 %**
 - FOC Perc Diff (Neural DT): **12.84 %**
- Departure Port : **POINTE NOIRE / 2019-11-15 06:00:00**
- Arrival Port : **LUANDA / 2019-11-16 03:29:00**
- Total Sailing Time: **21 hours**
- Distance Travelled: **250.31 n mi**
- Draft: **11.3 m**

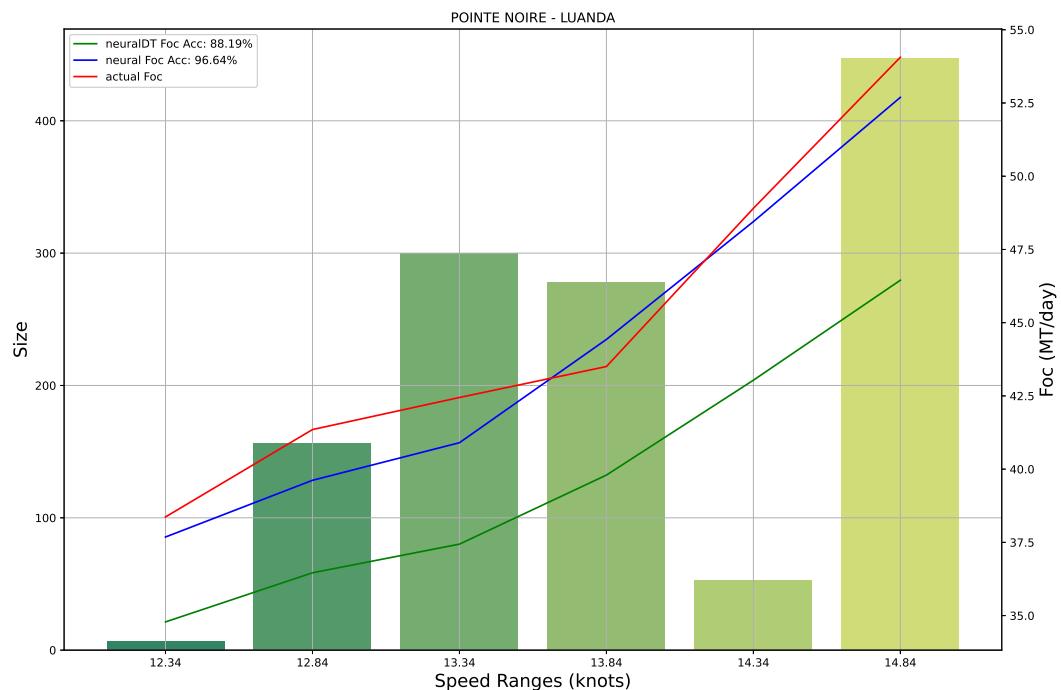


Figure 52: FOC Actual vs Predicted / Speed Ranges, POINTE NOIRE - LUANDA

Weather Comparison - Sensor / Weather Service (NOA)

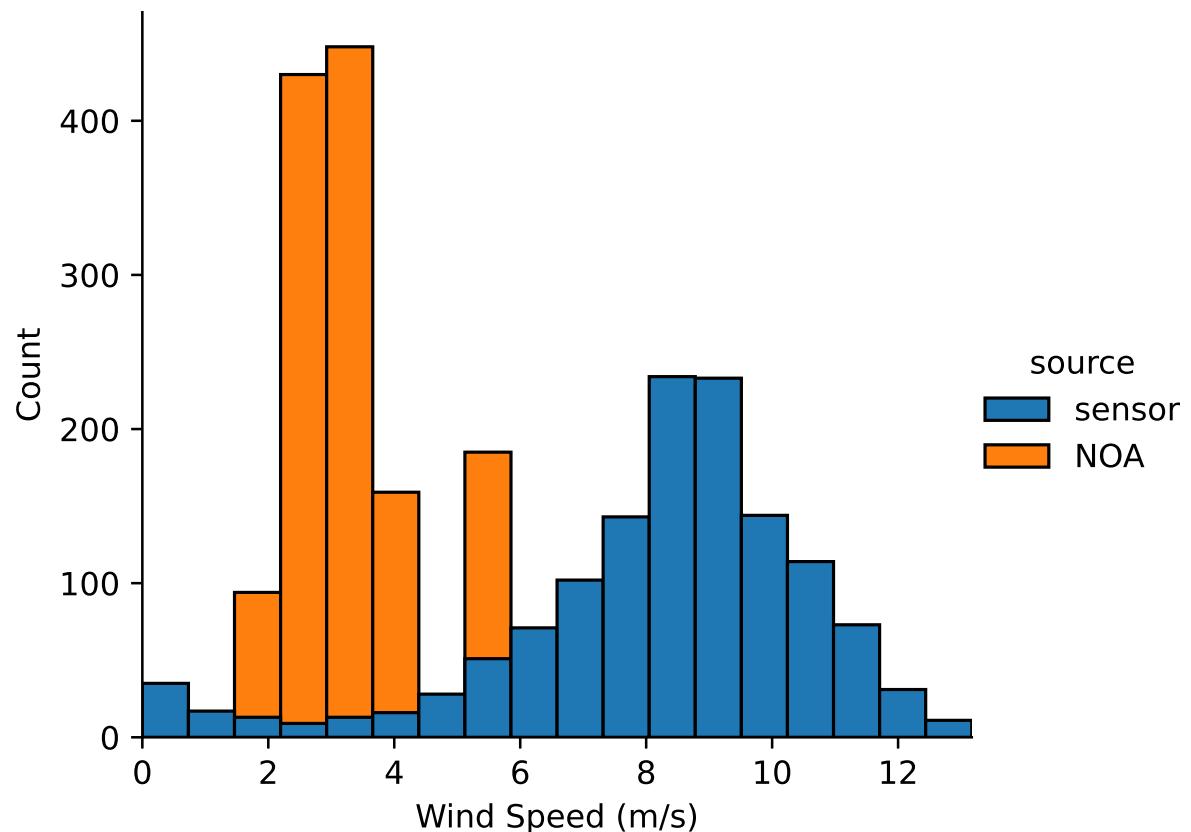


Figure 53: Wind Speed Sensor VS NOA Distributions comparison

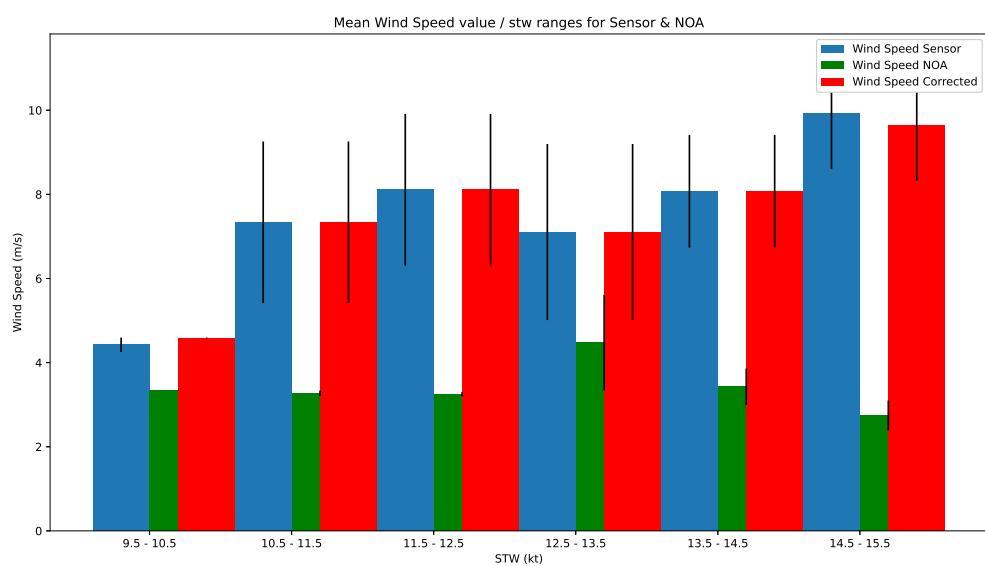


Figure 54: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :



Figure 55: Initial / Optimized Route, POINTE NOIRE - LUANDA

Voyage	Date	Latitude	Longitude
Departure	2019-11-15 06:00:00	5.0° 9.0' S	11.0° 37.0' W
Arrival	2019-11-16 03:29:00	9.0° 18.0' N	13.0° 16.0' W
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	237.87	301.02	236.58
Time (hours)	19.02	21.48	17.13
Avg Speed (kt)	12.50	14.01	13.80
Total FOC (MT)	24.89	38.14	26.98

Weather comparison optimization / initial:

- **RestrictETA = True**

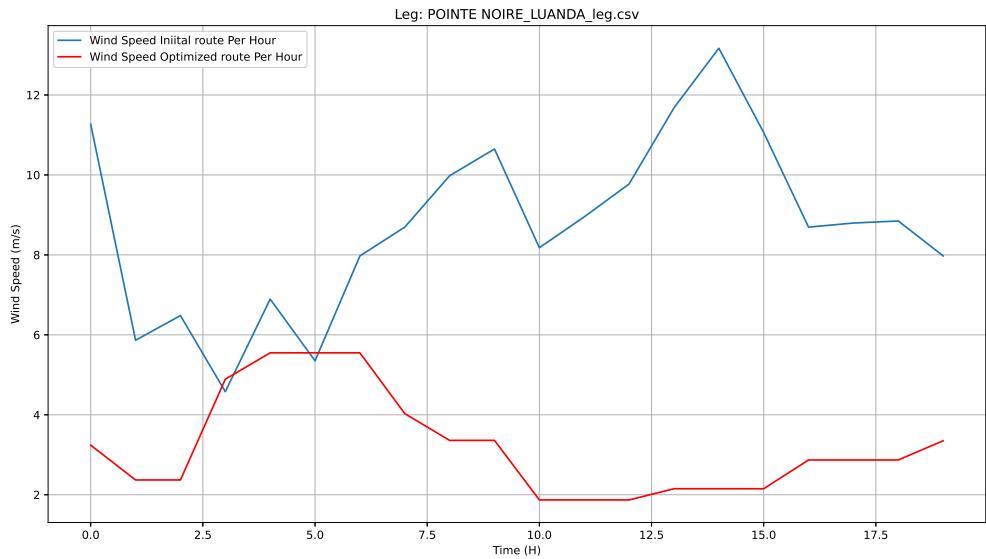


Figure 56: Wind Speed comparison Initial / Optimized Route, POINTE NOIRE - LUANDA

- **RestrictETA = False**

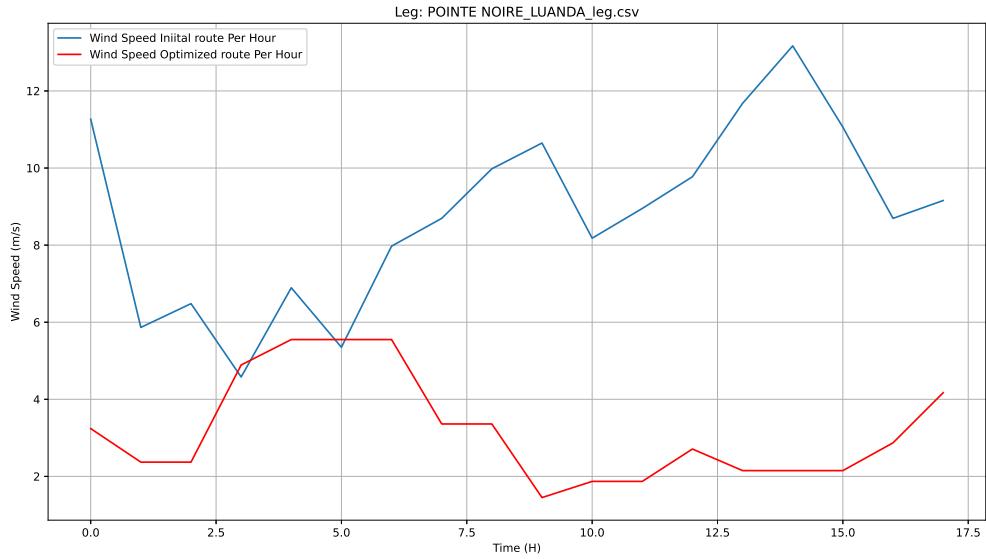


Figure 57: Wind Speed comparison Initial / Optimized Route, POINTE NOIRE - LUANDA

Leg 10 # Basic INFO:

- Total Actual FOC : **231.25 MT**
 - Total Predicted FOC (Neural Net): **228.83 MT**
 - Total Predicted FOC (Neural DT): **234.99 MT**
 - FOC Perc Diff (Neural Net): **1.05 %**
 - FOC Perc Diff (Neural DT): **1.60 %**
- Departure Port : **LUANDA / 2019-11-23 19:30:00**
- Arrival Port : **CAPE TOWN / 2019-11-28 11:12:00**
- Total Sailing Time: **112 hours**
- Distance Travelled: **1,520.59 n mi**
- Draft: **9.8 m**

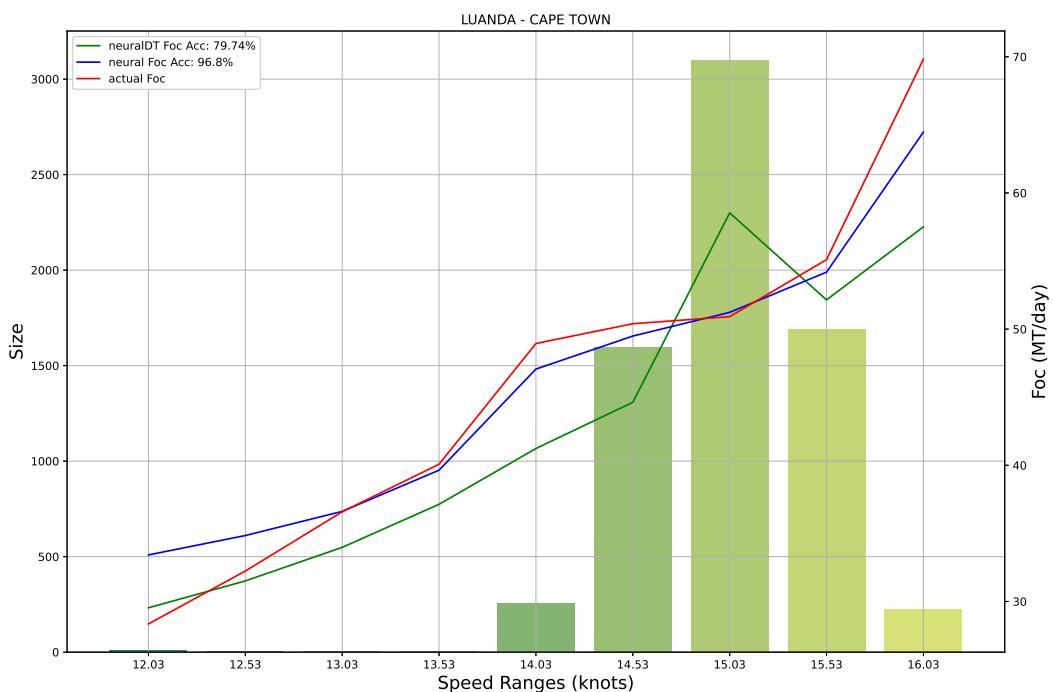


Figure 58: FOC Actual vs Predicted / Speed Ranges, LUANDA - CAPE TOWN

Weather Comparison - Sensor / Weather Service (NOA)

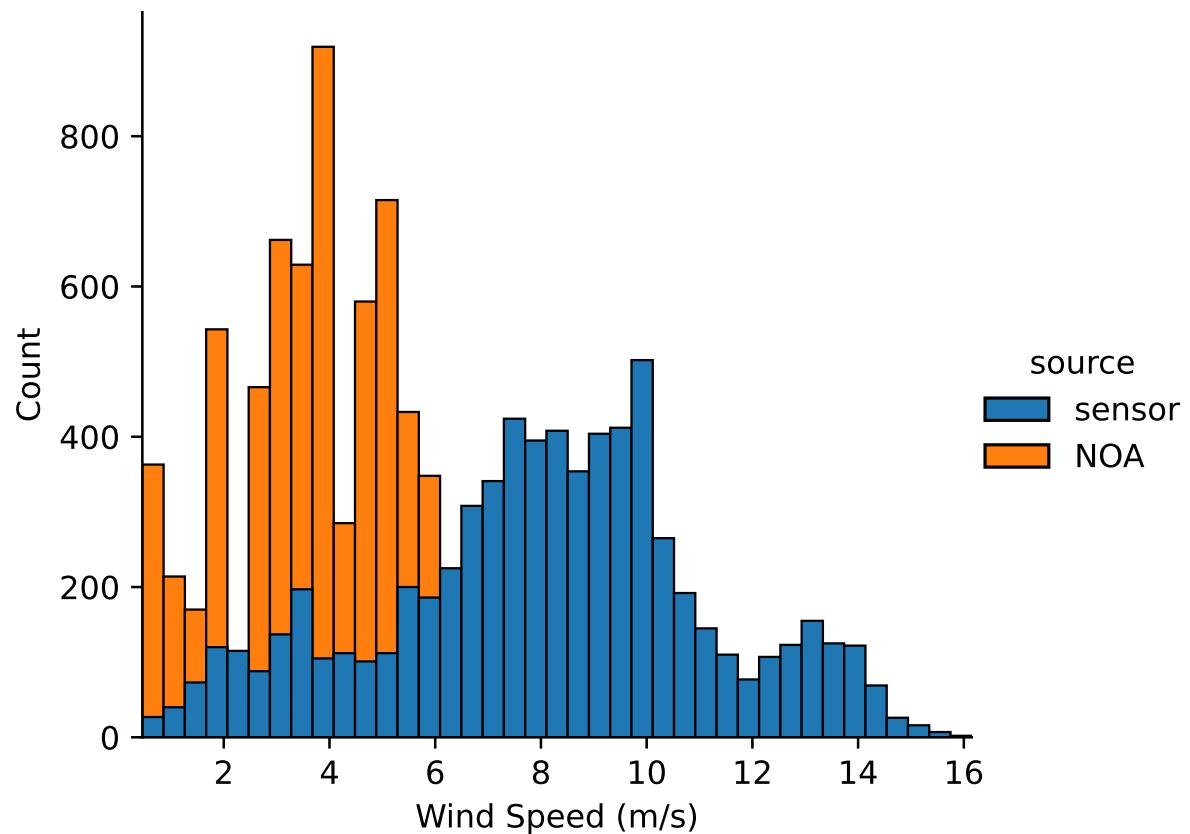


Figure 59: Wind Speed Sensor VS NOA Distributions comparison

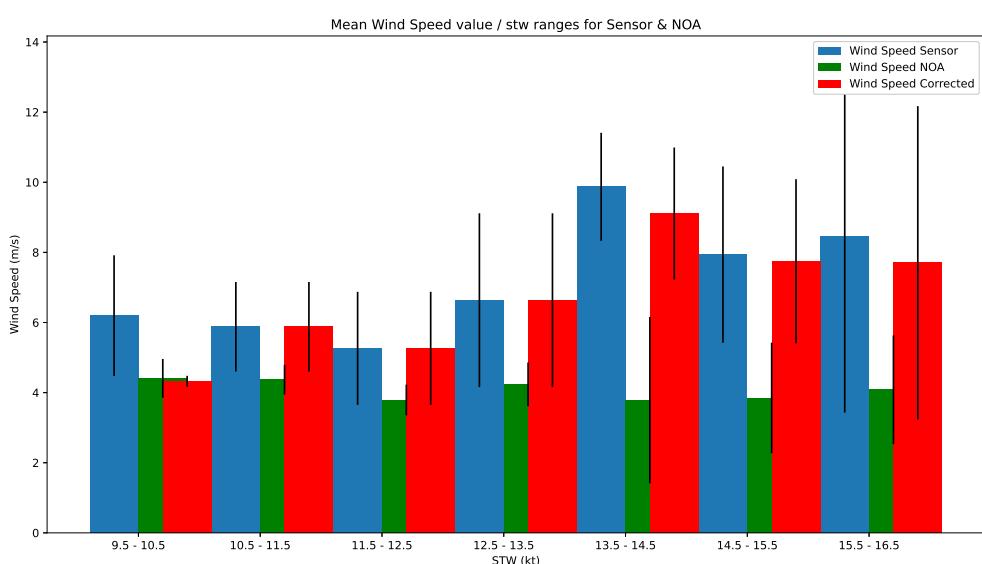


Figure 60: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

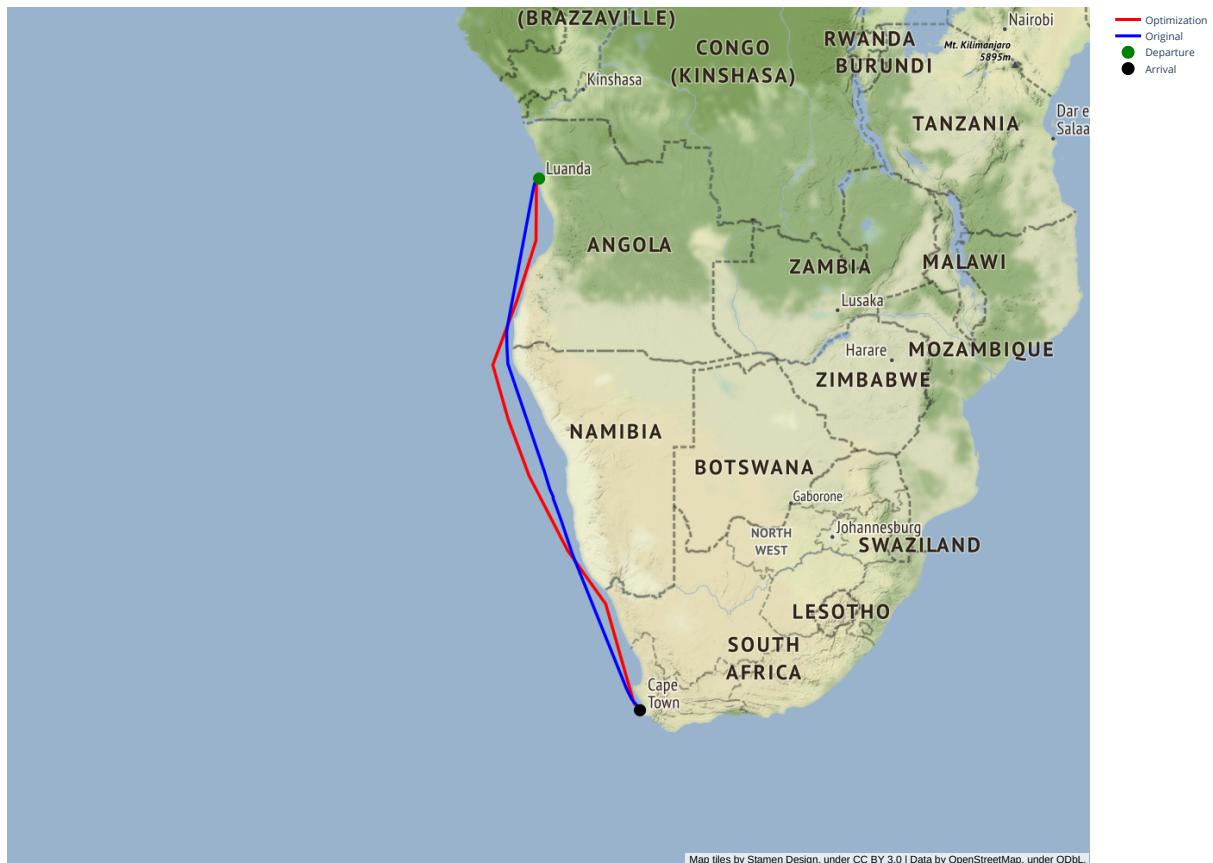


Figure 61: Initial / Optimized Route, LUANDA - CAPE TOWN

Voyage	Date	Latitude	Longitude
Departure	2019-11-23 19:30:00	9.0° 9.0' S	13.0° 5.0' W
Arrival	2019-11-28 11:12:00	34.0° 10.0' N	18.0° 13.0' W
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	1,573.27	1,678.13	1,606.36
Time (hours)	109.28	111.70	110.30
Avg Speed (kt)	14.39	15.02	14.56
Total FOC (MT)	182.07	228.83	190.45

Weather comparison optimization / initial:

- **RestrictETA = True**

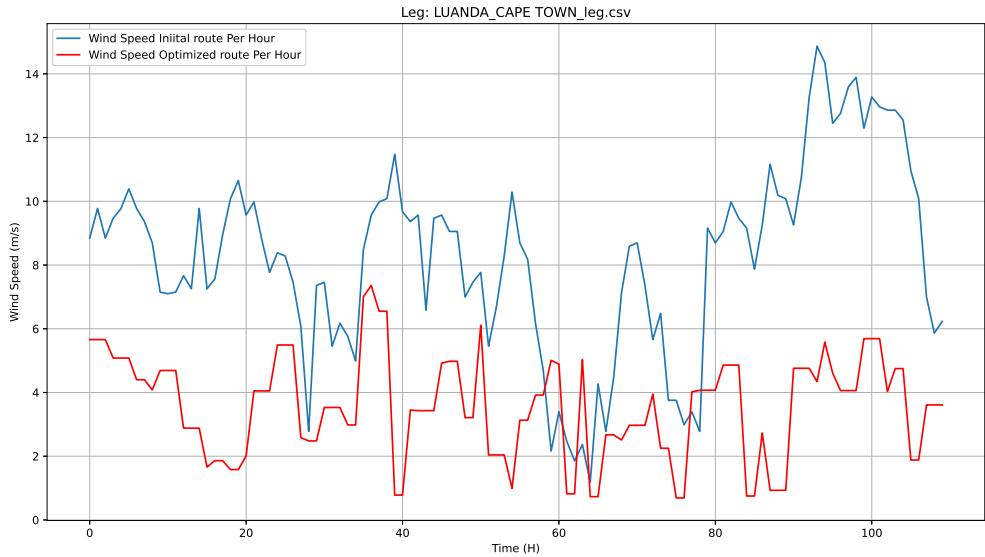


Figure 62: Wind Speed comparison Initial / Optimized Route, LUANDA - CAPE TOWN

- **RestrictETA = False**

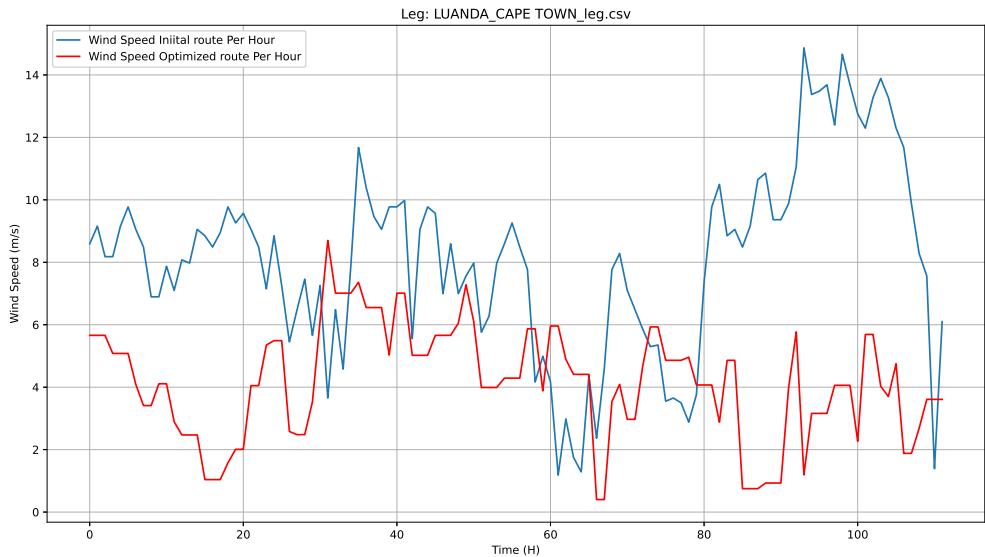


Figure 63: Wind Speed comparison Initial / Optimized Route, LUANDA - CAPE TOWN

Leg 11 # Basic INFO:

- Total Actual FOC : **746.00 MT**
 - Total Predicted FOC (Neural Net): **748.69 MT**
 - Total Predicted FOC (Neural DT): **672.96 MT**
 - FOC Perc Diff (Neural Net): **0.36 %**
 - FOC Perc Diff (Neural DT): **10.29 %**
- Departure Port : **CAPE TOWN / 2019-11-30 13:40:00**
- Arrival Port : **PORT KELANG / 2019-12-18 02:58:00**
- Total Sailing Time: **421 hours**
- Distance Travelled: **5,159.18 n mi**
- Draft: **11.1 m**

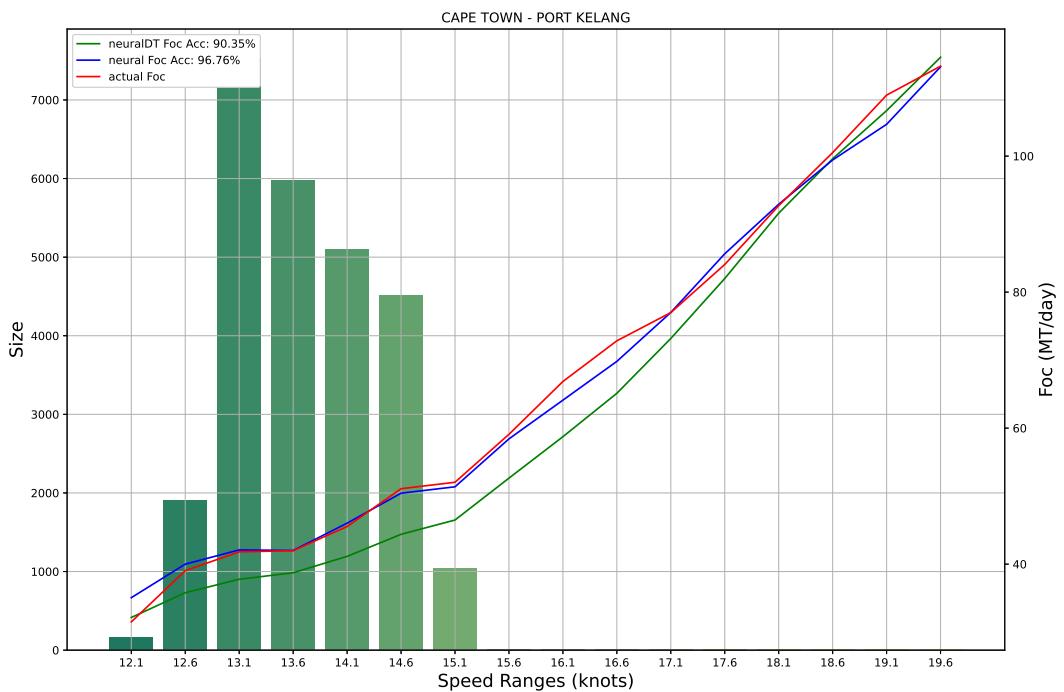


Figure 64: FOC Actual vs Predicted / Speed Ranges, CAPE TOWN - PORT KELANG

Weather Comparison - Sensor / Weather Service (NOA)

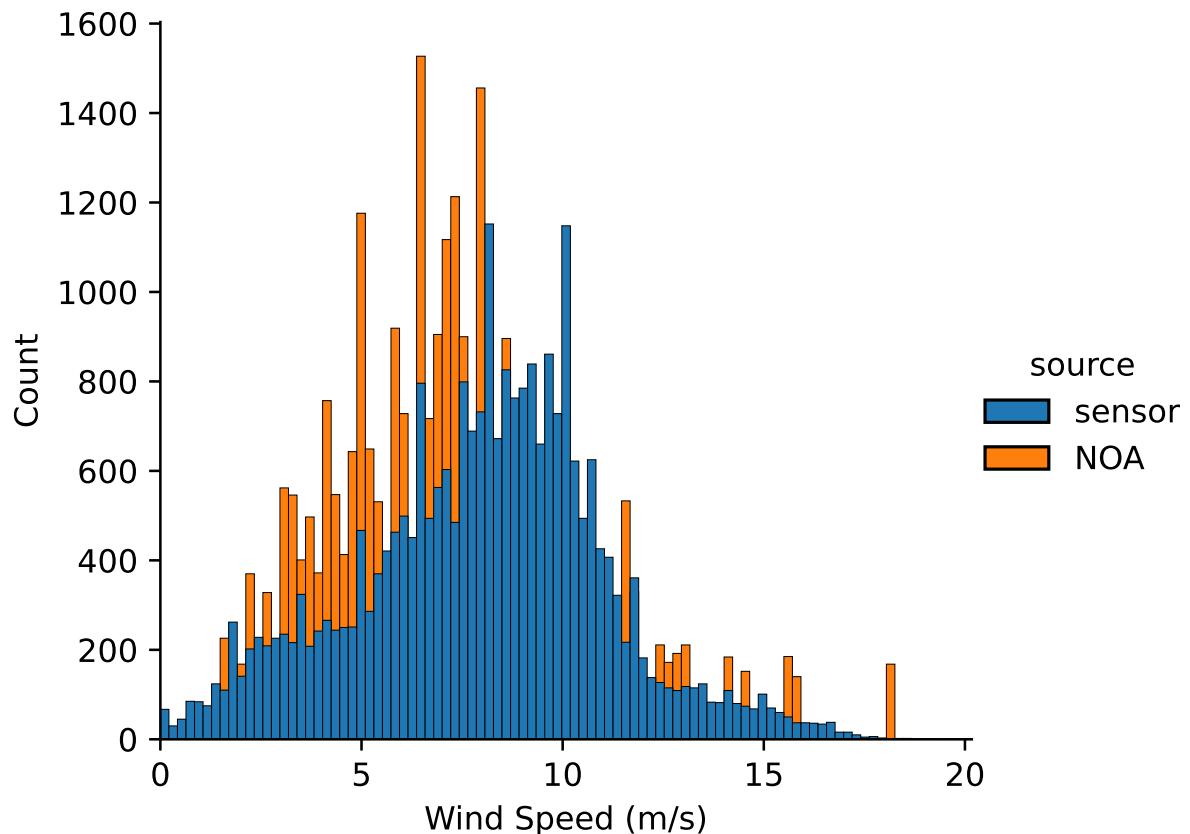


Figure 65: Wind Speed Sensor VS NOA Distributions comparison

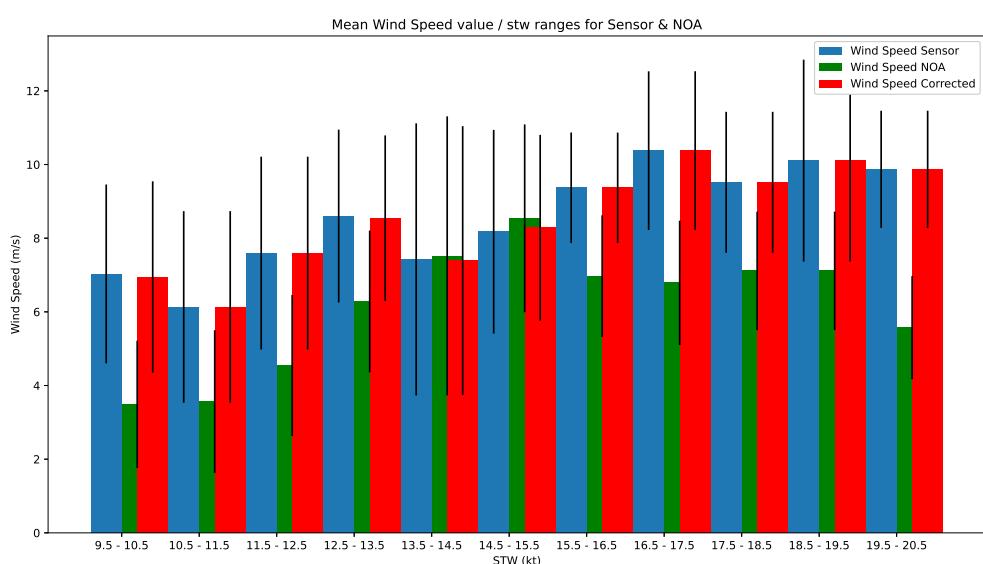


Figure 66: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

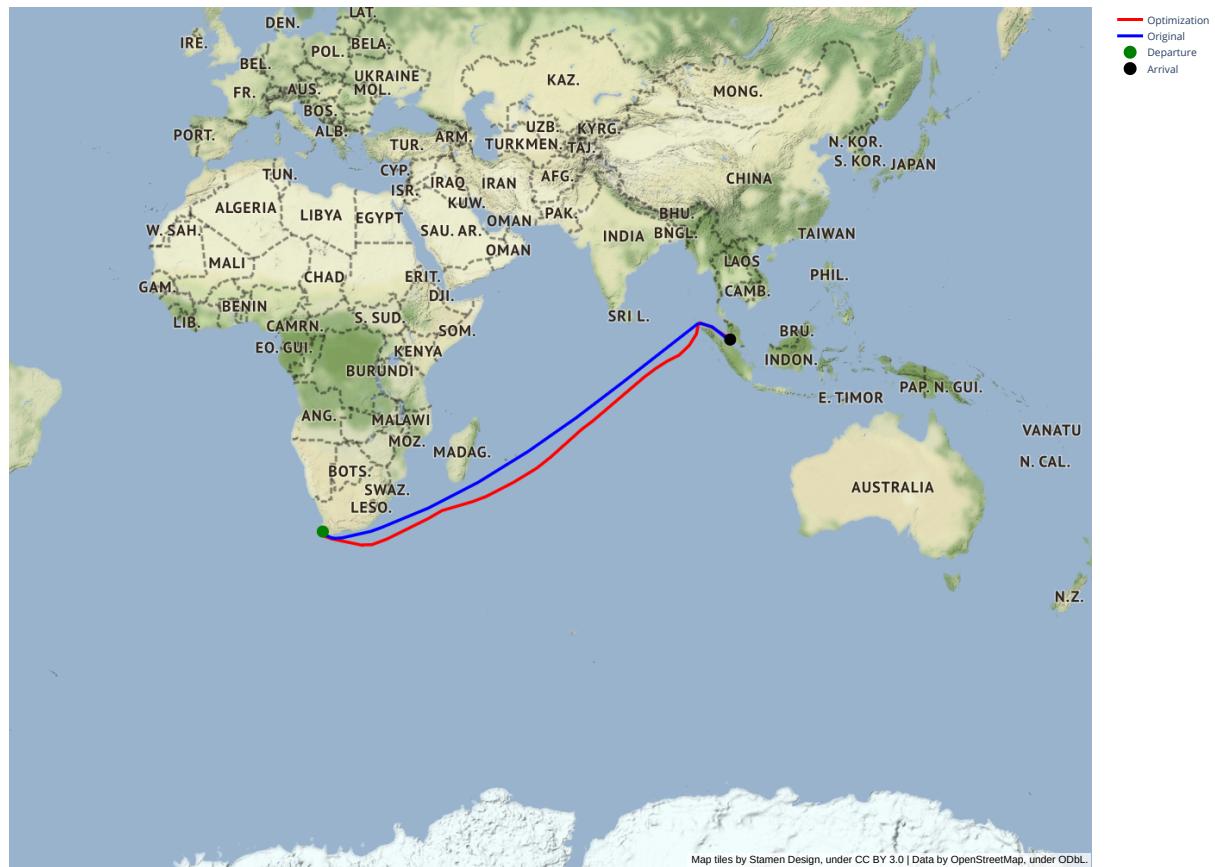


Figure 67: Initial / Optimized Route, CAPE TOWN - PORT KELANG

Voyage	Date	Latitude	Longitude
Departure	2019-11-30 13:40:00	35.0° 57.0' S	18.0° 13.0' W
Arrival	2019-12-18 02:58:00	2.0° 55.0' S	101.0° 17.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	5,522.77	5,778.25	5,556.49
Time (hours)	418.83	421.30	420.25
Avg Speed (kt)	12.98	13.72	13.01
Total FOC (MT)	639.80	748.69	644.46

Weather comparison optimization / initial:

- **RestrictETA = True**

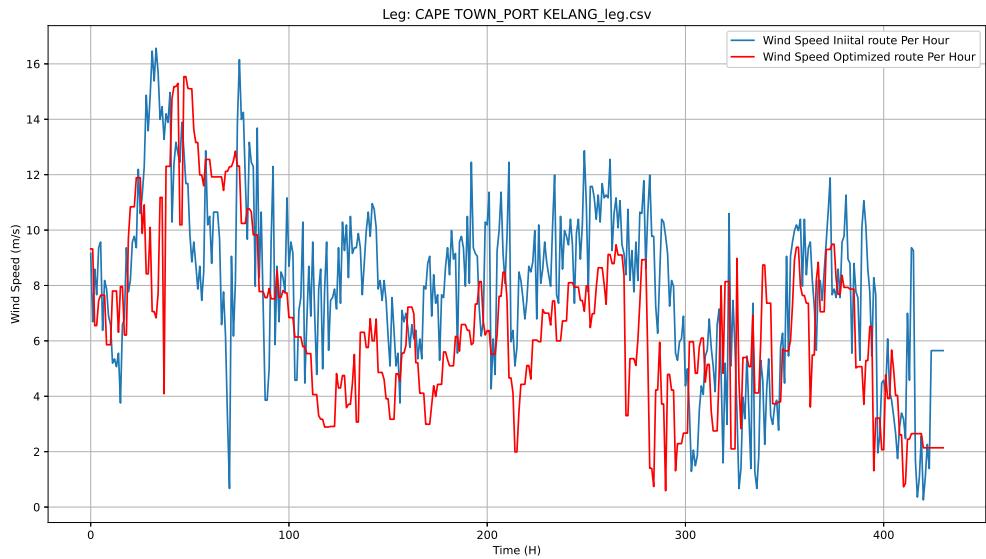


Figure 68: Wind Speed comparison Initial / Optimized Route, CAPE TOWN - PORT KELANG

- **RestrictETA = False**

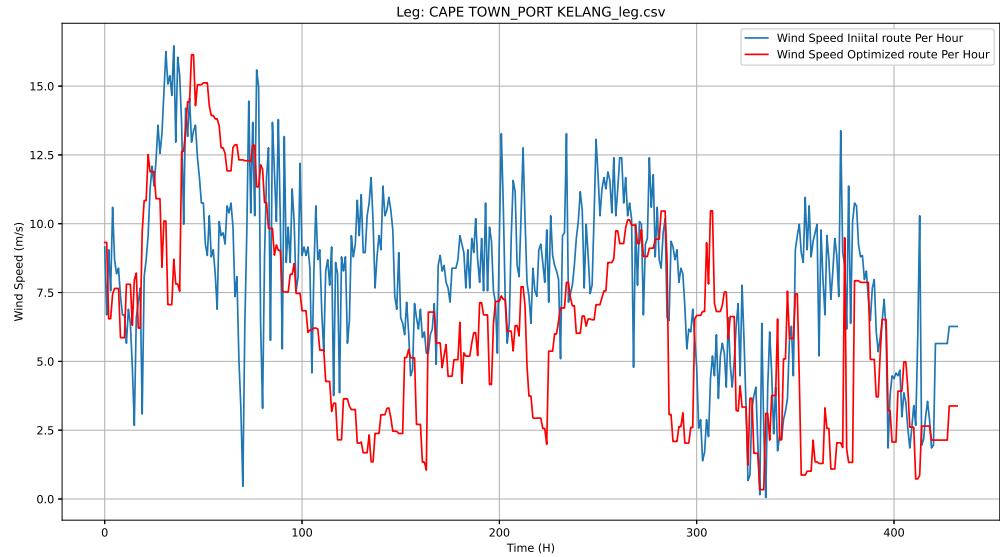


Figure 69: Wind Speed comparison Initial / Optimized Route, CAPE TOWN - PORT KELANG

Leg 12 # Basic INFO:

- Total Actual FOC : **345.70 MT**
 - Total Predicted FOC (Neural Net): **344.61 MT**
 - Total Predicted FOC (Neural DT): **305.45 MT**
 - FOC Perc Diff (Neural Net): **0.32 %**
 - FOC Perc Diff (Neural DT): **12.36 %**
- Departure Port : **SINGAPORE / 2019-12-20 04:48:00**
- Arrival Port : **PUSAN / 2019-12-28 07:59:00**
- Total Sailing Time: **195 hours**
- Distance Travelled: **2,357.13 n mi**
- Draft: **10.0 m**

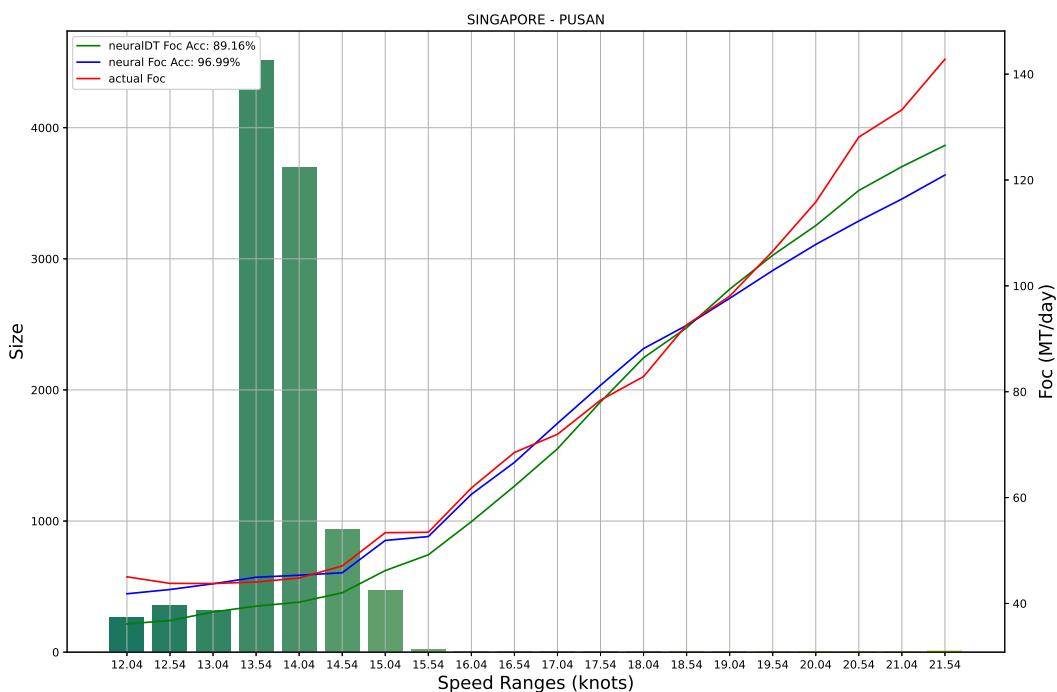


Figure 70: FOC Actual vs Predicted / Speed Ranges, SINGAPORE - PUSAN

Weather Comparison - Sensor / Weather Service (NOA)

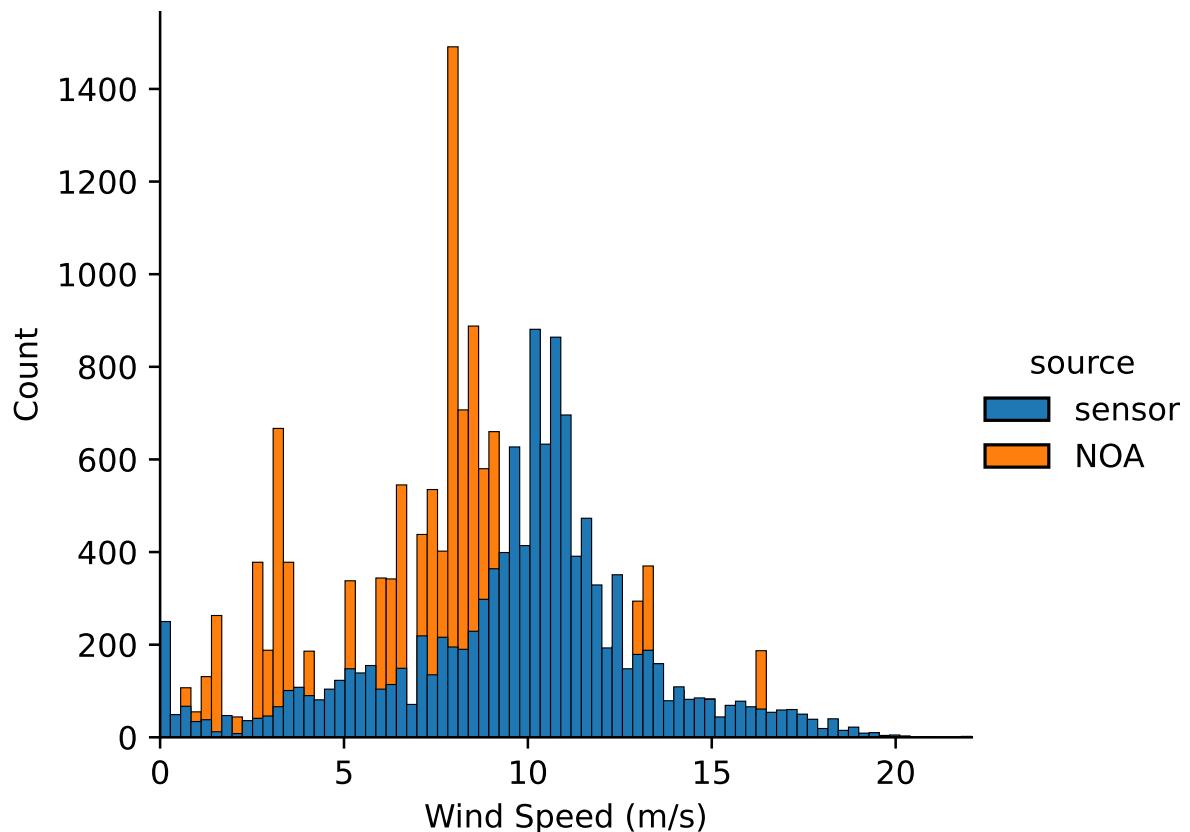


Figure 71: Wind Speed Sensor VS NOA Distributions comparison

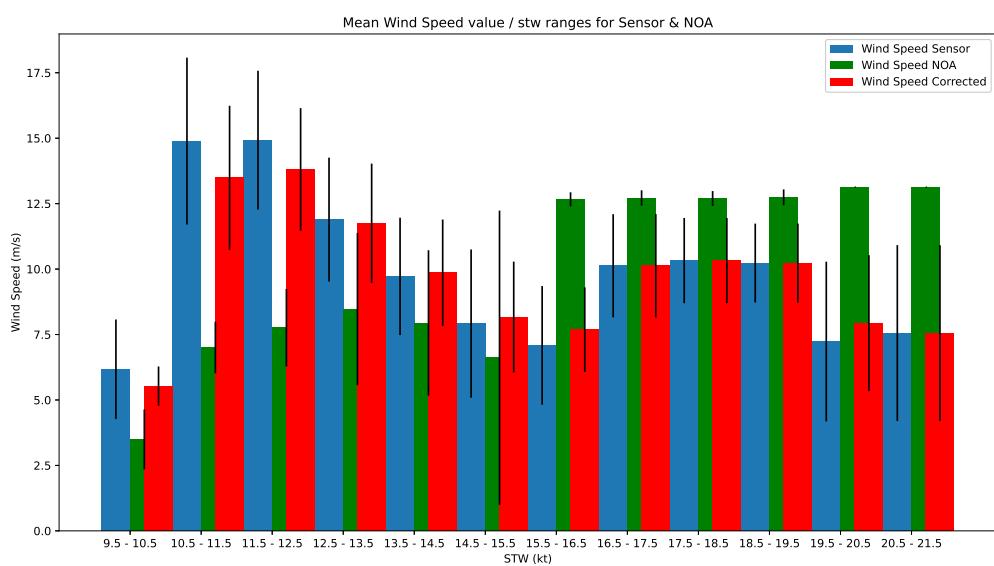


Figure 72: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

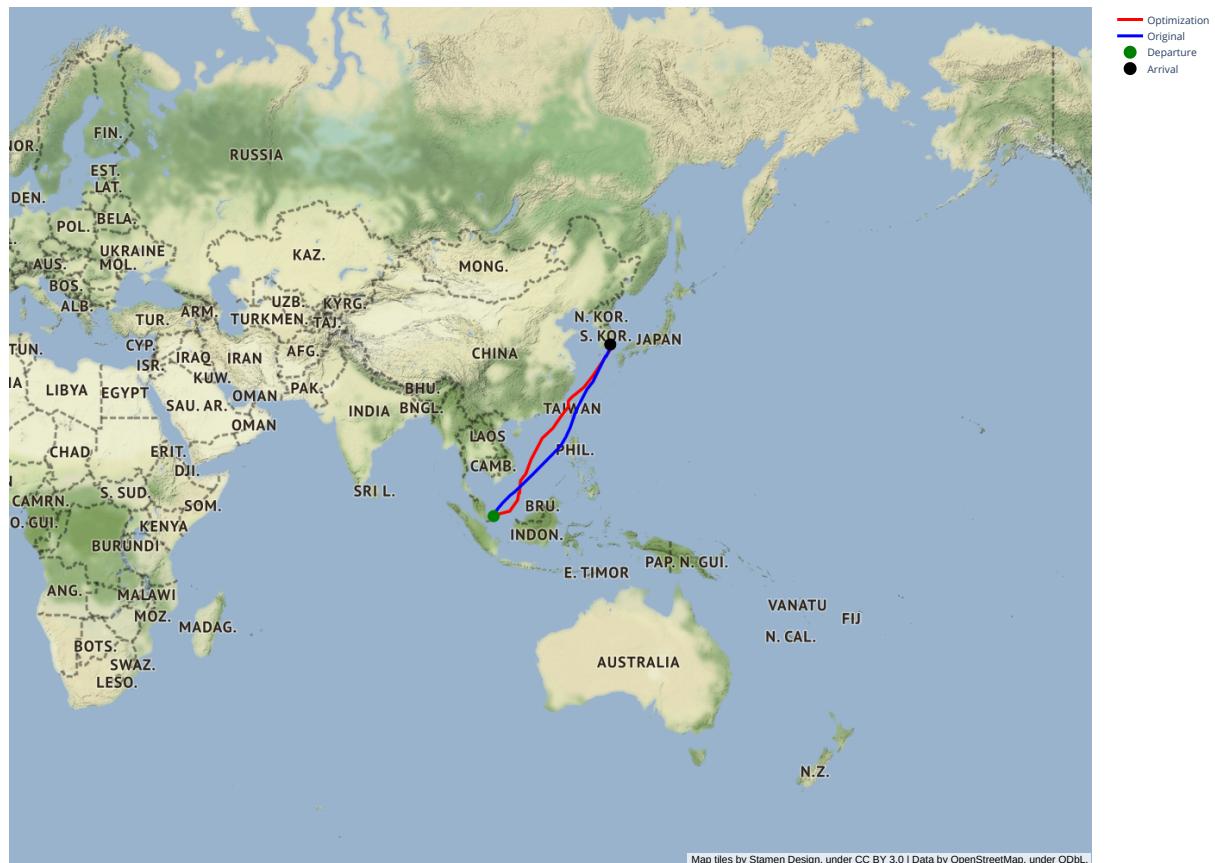


Figure 73: Initial / Optimized Route, SINGAPORE - PUSAN

Voyage	Date	Latitude	Longitude
Departure	2019-12-20 04:48:00	2.0° 28.0' N	105.0° 2.0' E
Arrival	2019-12-28 07:59:00	35.0° 4.0' S	128.0° 48.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	2,402.56	2,698.07	2,514.60
Time (hours)	193.27	195.18	191.23
Avg Speed (kt)	12.40	13.82	13.13
Total FOC (MT)	263.55	344.61	284.12

Weather comparison optimization / initial:

- **RestrictETA = True**

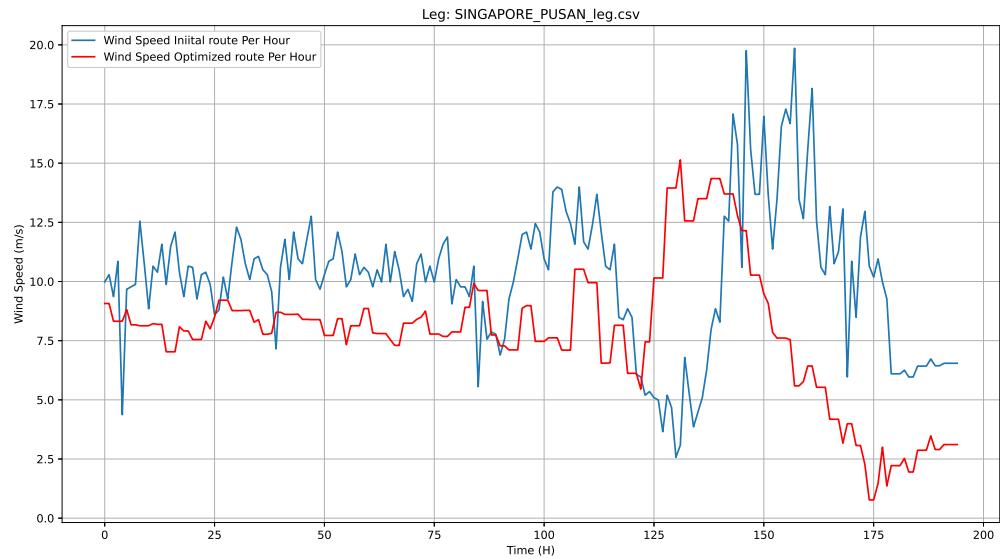


Figure 74: Wind Speed comparison Initial / Optimized Route, SINGAPORE - PUSAN

- **RestrictETA = False**

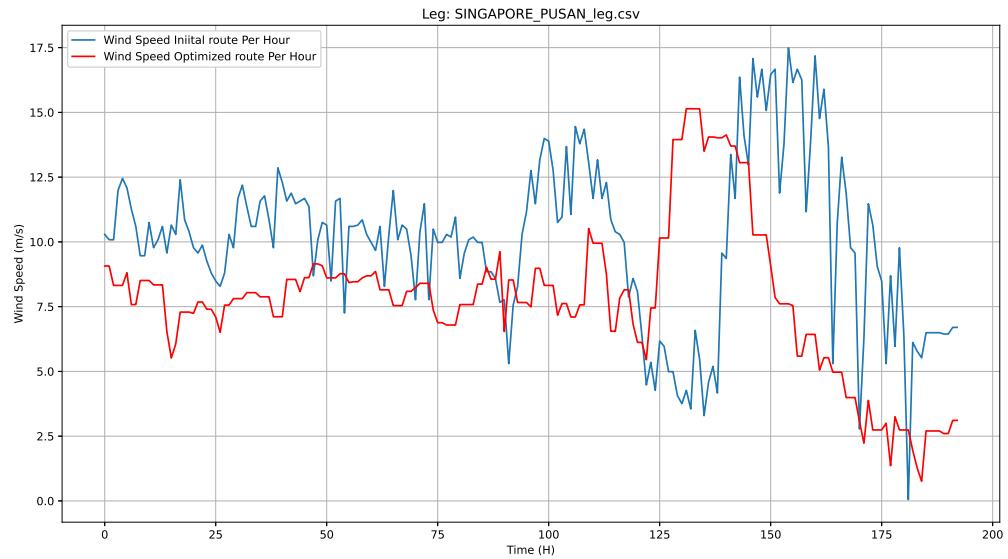


Figure 75: Wind Speed comparison Initial / Optimized Route, SINGAPORE - PUSAN

Leg 13 # Basic INFO:

- Total Actual FOC : **98.60 MT**
 - Total Predicted FOC (Neural Net): **95.68 MT**
 - Total Predicted FOC (Neural DT): **85.10 MT**
 - FOC Perc Diff (Neural Net): **3.01 %**
 - FOC Perc Diff (Neural DT): **14.70 %**
- Departure Port : **PUSAN / 2019-12-29 03:00:00**
- Arrival Port : **TIANJIN / 2019-12-31 07:57:00**
- Total Sailing Time: **53 hours**
- Distance Travelled: **539.78 n mi**
- Draft: **10.4 m**

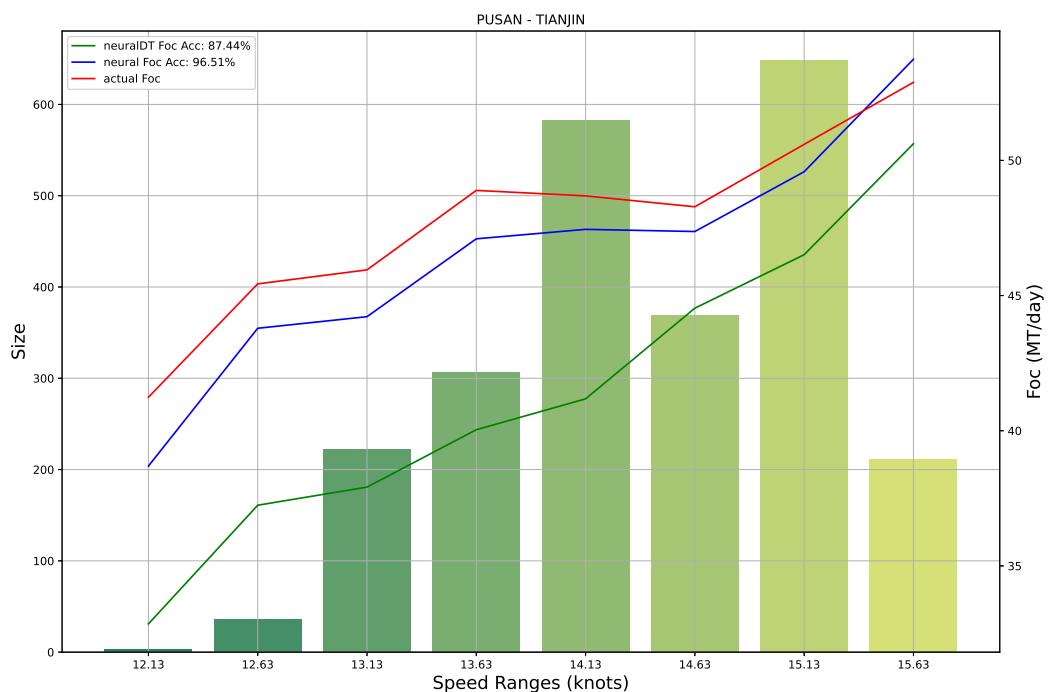


Figure 76: FOC Actual vs Predicted / Speed Ranges, PUSAN - TIANJIN

Weather Comparison - Sensor / Weather Service (NOA)

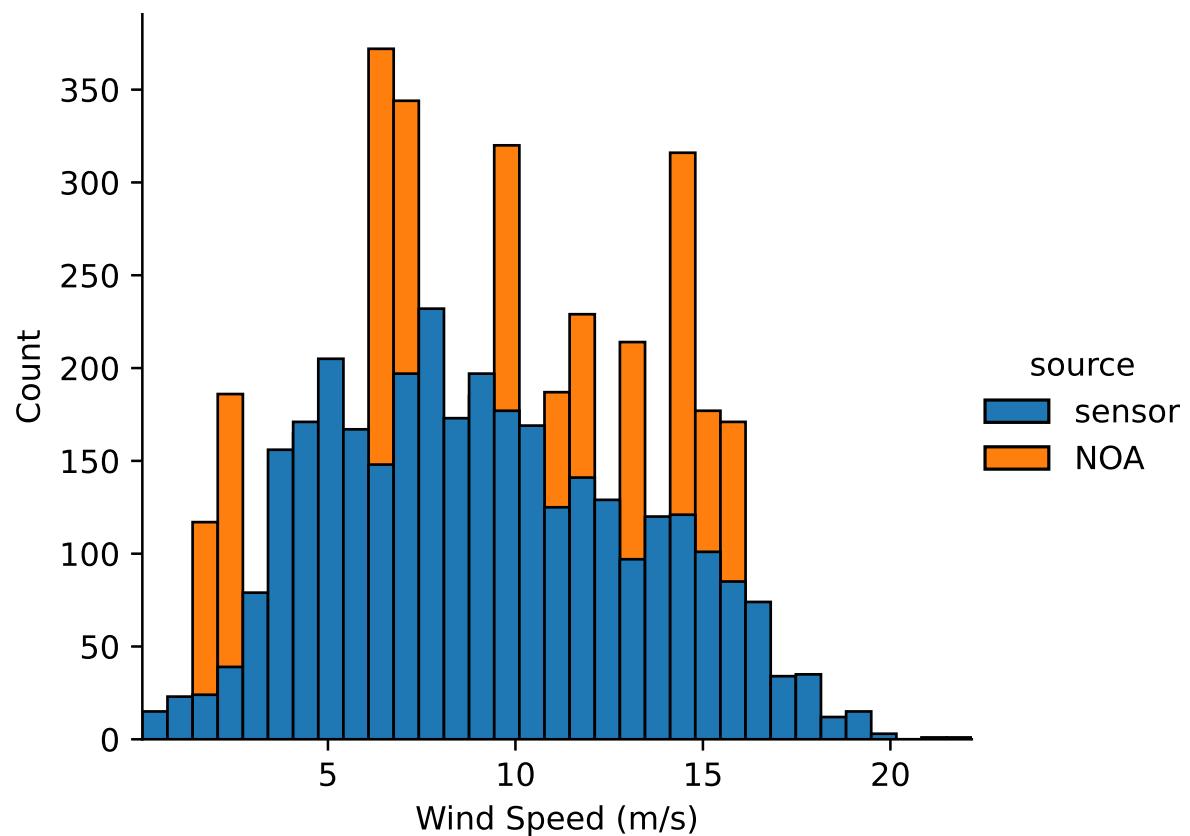


Figure 77: Wind Speed Sensor VS NOA Distributions comparison

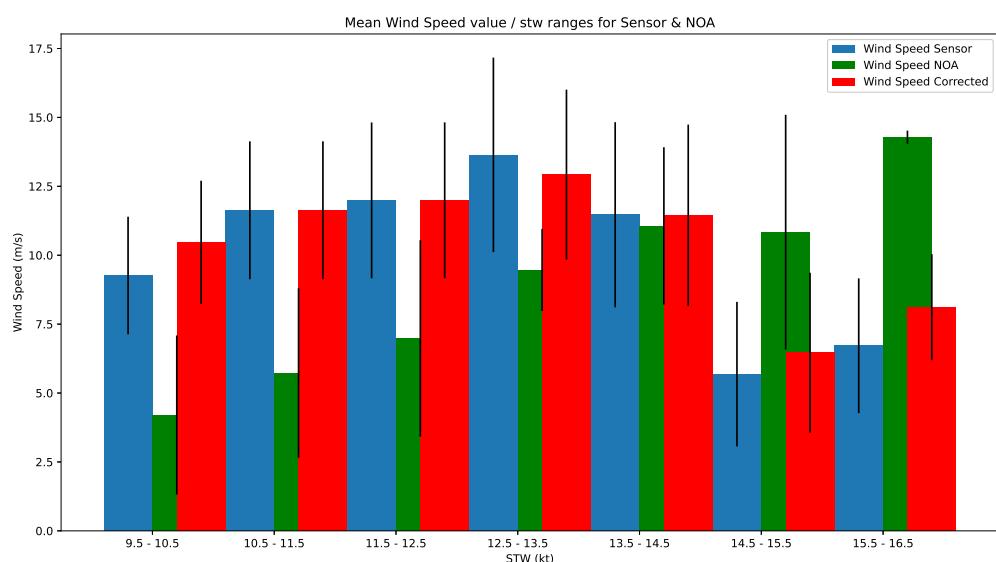


Figure 78: Initial / Weather Features Comparison per Speed Range

Routing Optimization Info :

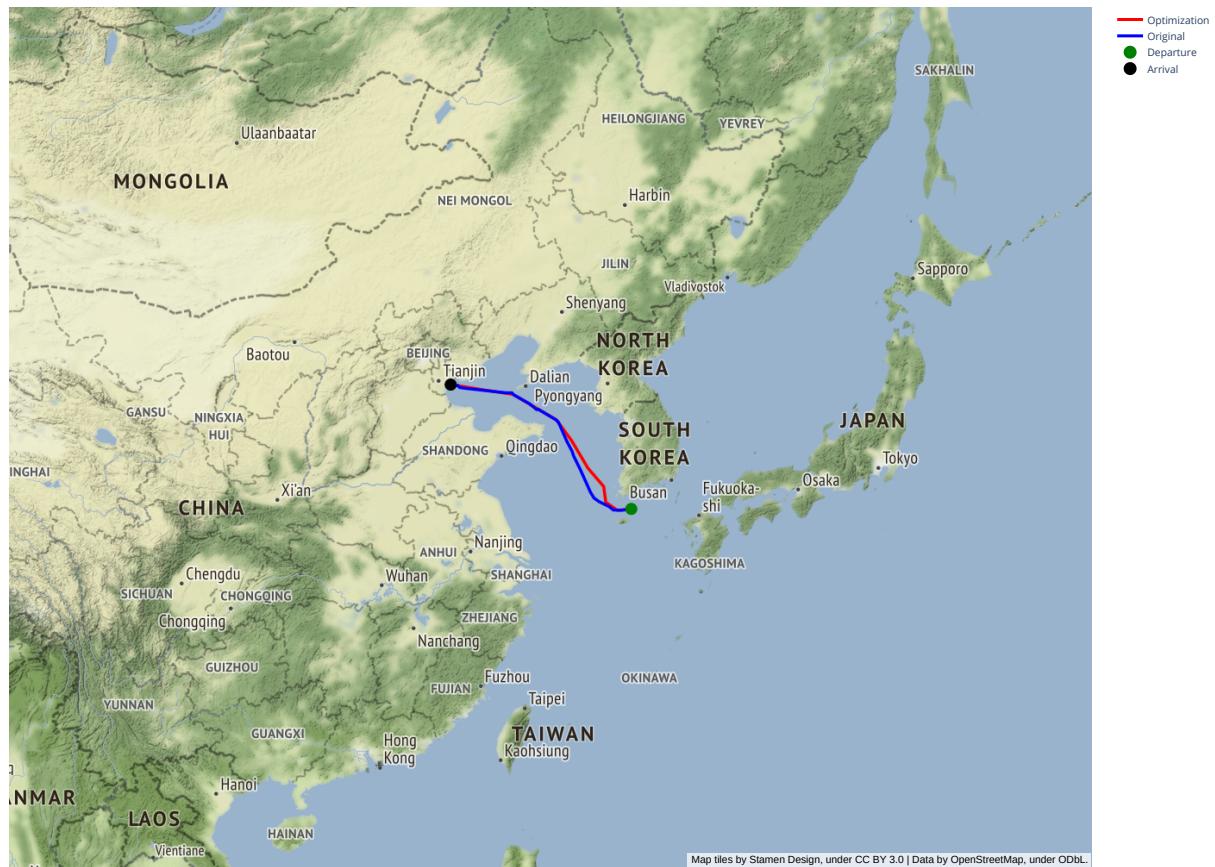


Figure 79: Initial / Optimized Route, PUSAN - TIANJIN

Voyage	Date	Latitude	Longitude
Departure	2019-12-29 03:00:00	33.0° 52.0' N	126.0° 59.0' E
Arrival	2019-12-31 07:57:00	38.0° 58.0' S	117.0° 47.0' E
BASIC COMPARISON	Optimization(RET A = True)	Our Estimation	Optimization(RET A = False)
Distance (nm)	566.49	762.81	573.16
Time (hours)	45.93	52.95	45.83
Avg Speed (kt)	12.34	14.41	12.54
Total FOC (MT)	64.59	95.68	65.99

Weather comparison optimization / initial:

- **RestrictETA = True**

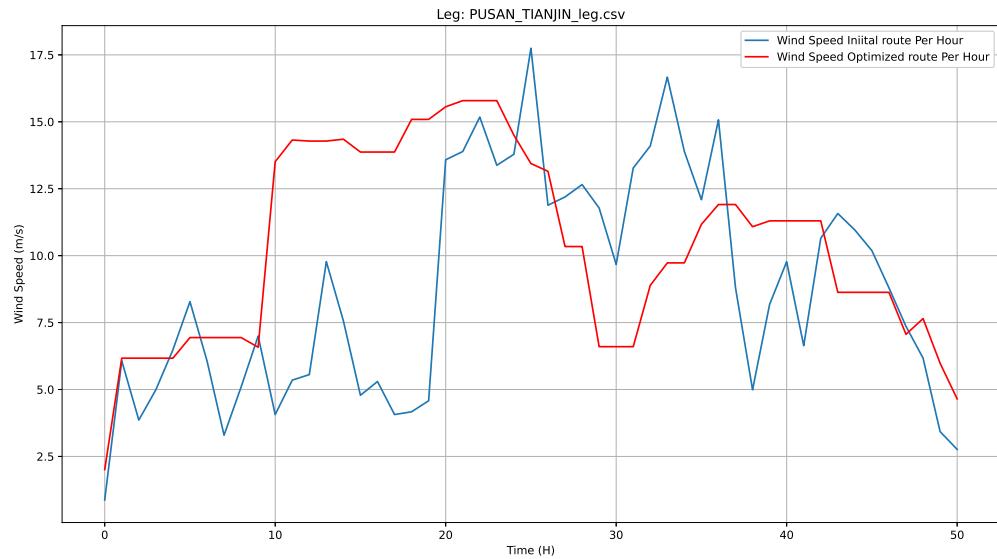


Figure 80: Wind Speed comparison Initial / Optimized Route, PUSAN - TIANJIN

- **RestrictETA = False**

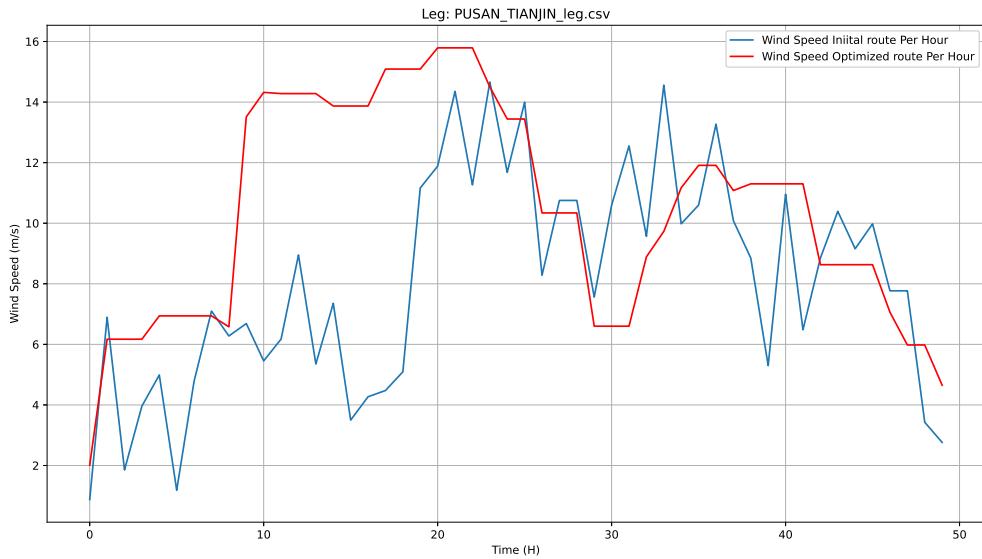


Figure 81: Wind Speed comparison Initial / Optimized Route, PUSAN - TIANJIN

3 Weather Comparison - Sensor / Weather Service (NOA) - Total

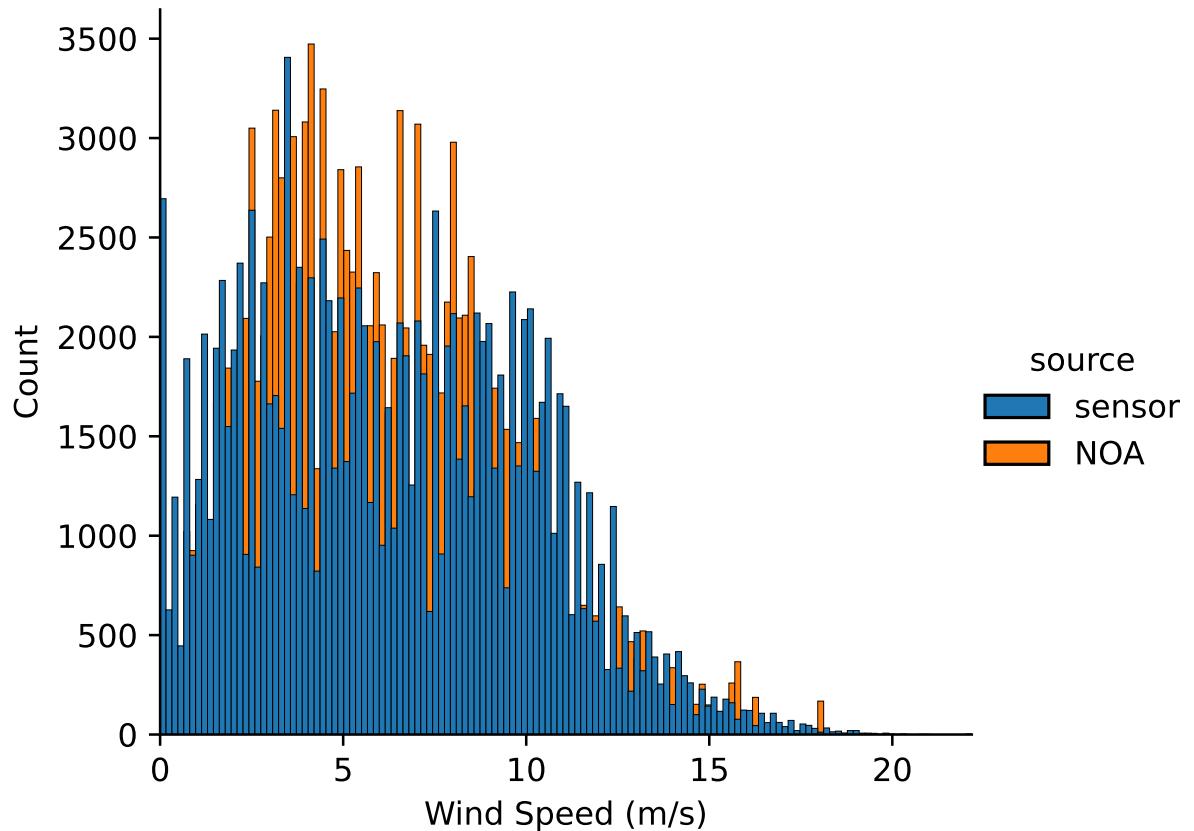


Figure 82: Wind Speed Sensor VS NOA Distributions comparison

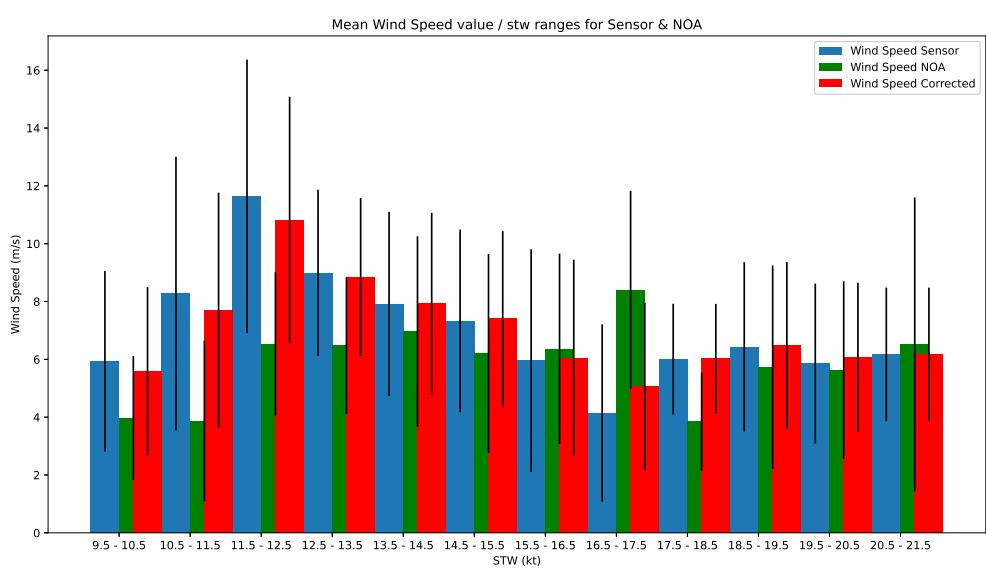


Figure 83: Initial / Weather Features Comparison per Speed Range