

11427 - Arctic Technologies

Wind power in arctic conditions: Wind data analysis

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November 2010



Contents

1	Data overview	1
1.1	Main meteorological data	1
1.2	Availability	2
2	Details per stations	3
2.1	Aasiaat	3
2.2	Ilulissat	4
2.3	Ittoqqortoormiit	6
2.4	Kangerlussuaq	8
2.5	Maniitsoq	10
2.6	Narsaq	11
2.7	Nanortalik	12
2.8	Nuuk	14
2.9	Paamiut	16
2.10	Qaanaq	18
2.11	Qasigiannguit	20
2.12	Qeqertarsuaq	21
2.13	Sisimiut	22
2.14	Tasiilaq	24
2.15	Uummannaq	26
2.16	Upernavik	27

1 Data overview

1.1 Main meteorological data

Table 1: Coordinates and height of masts, mean wind speed $\bar{U}$, Weibull distribution parameters A and k , 50 year extreme U_{50} , main wind direction θ_{main} and corresponding wind rose fraction p

City	Src	Long	Lat	H[m]	$\bar{U}$	A	k	$U_{50}[\text{m/s}]$	$\theta_{\text{main}} [^\circ]$	p
Aasiaat	DMI	-52d47'	68d43'	10	4.54	5.12	1.79	27.50	180	0.11
Ilulissat	DMI	-51d04'	69d14'	10	4.64	5.16	1.53	28.48	90	0.18
Ilulissat	Risø	-51d04'	69d14'	10	2.99	3.34	1.49	-	90	0.19
Ittoqqortoormiit	DMI	-21d57'	70d29'	10	4.22	4.11	0.94	92.30	30	0.20
Ittoqqortoormiit	Risø	-21d57'	70d29'	10	4.01	3.97	0.98	-	30	0.23
Kangerlussuaq	DMI	-50d42'	67d01'	10	4.06	4.57	2.50	20.22	60	0.43
Maniitsoq	Risø	-52d52'	65d24'	10	3.63	4.01	1.39	-	90	0.17
Nanortalik	DMI	-45d13'	60d08'	10	4.85	4.70	0.91	52.57	330	0.12
Nanortalik	Risø	-45d13'	60d08'	10	6.04	6.72	1.54	-	60	0.19
Narsaq	Risø	-45d58'	60d54'	10	3.58	3.78	1.14	-	90	0.12
Nuuk	DMI	-51d45'	64d10'	10	6.48	7.31	1.73	37.61	180	0.17
Nuuk	Risø	-51d45'	64d10'	10	6.79	7.62	1.76	-	180	0.16
Paamiut	DMI	-49d40'	62d00'	10	4.04	4.37	1.35	24.54	330	0.27
Paamiut	Risø	-49d40'	62d00'	10	4.46	4.85	1.30	-	330	0.20
Qaa-q	DMI	-69d23'	77d29'	10	2.46	2.45	0.99	42.15	120	0.12
Qaqortoq	Risø	-46d03'	60d43'	10	4.95	5.21	1.14	-	60	0.15
Qasigiannguit	Risø	-51d10'	68d49'	10	3.26	3.53	1.25	-	30	0.21
Qeqertarsuaq	Risø	-53d31'	69d14'	10	3.90	4.27	1.35	-	90	0.29
Sisimiut	DMI	-53d43'	66d57'	10	4.00	4.39	1.39	28.80	90	0.20
Sisimiut	Risø	-53d43'	66d57'	10	3.66	3.99	1.30	-	60	0.17
Tasiilaq	DMI	-37d37'	65d36'	10	2.66	2.64	0.97	85.23	270	0.12
Upernavik	DMI	-56d08'	72d47'	10	4.30	4.77	1.48	43.71	90	0.15
Upernavik	Risø	-56d08'	72d47'	10	3.48	3.69	1.17	-	90	0.16
Uumman-q	Risø	-52d07'	70d40'	10	4.02	4.41	1.36	-	150	0.34

1.2 Availability

Table 2: Availability

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Aasiaat											
	WS [m/s]	0.98	0.97	0.94	0.97	0.98	0.98	0.99	0.96	0.95	0.82
	WD [deg]	0.97	0.98	0.94	0.96	0.97	0.98	0.99	0.96	0.95	0.82
	Precipitations [mm]	0.41	0.35	0.26	0.39	0.43	0.37	0.41	0.42	0.36	0.00
	T [deg]	0.96	0.96	0.93	0.96	0.96	0.96	0.96	0.96	0.94	0.80
	Pressure [hPa]	0.96	0.96	0.91	0.96	0.96	0.96	0.96	0.95	0.93	0.77
Ilulissat											
	WS [m/s]	0.89	0.96	0.98	0.97	0.95	0.95	0.43	0.99	0.98	0.98
	WD [deg]	0.89	0.96	0.98	0.97	0.95	0.95	0.44	0.99	0.98	0.98
	Precipitations [mm]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T [deg]	0.91	0.96	0.96	0.96	0.96	0.90	0.43	0.97	0.97	0.96
	Pressure [hPa]	0.90	0.94	0.96	0.96	0.95	0.88	0.42	0.96	0.97	0.96
Ittoqqortoormiit											
	WS [m/s]	0.97	0.92	0.98	0.96	0.97	0.98	0.92	0.97	0.97	0.95
	WD [deg]	0.96	0.91	0.98	0.95	0.96	0.97	0.92	0.97	0.97	0.95
	Precipitations [mm]	0.29	0.25	0.36	0.31	0.36	0.28	0.42	0.39	0.31	0.10
	T [deg]	0.97	0.94	0.96	0.97	0.97	0.96	0.96	0.96	0.96	0.93
	Pressure [hPa]	0.96	0.93	0.96	0.97	0.97	0.96	0.96	0.95	0.95	0.91
Kangerlussuaq											
	WS [m/s]	0.97	0.99	0.99	0.96	0.97	0.98	0.99	0.99	0.99	0.99
	WD [deg]	0.97	0.99	0.99	0.96	0.97	0.98	0.99	0.99	0.99	0.99
	Precipitations [mm]	0.27	0.23	0.21	0.24	0.24	0.21	0.24	0.25	0.26	0.18
	T [deg]	0.96	0.96	0.96	0.96	0.97	0.96	0.96	0.97	0.96	0.96
	Pressure [hPa]	0.96	0.96	0.96	0.96	0.97	0.96	0.96	0.97	0.96	0.96
Nanortalik											
	WS [m/s]	0.98	0.98	0.98	0.97	0.96	0.96	0.92	0.91	0.99	0.84
	WD [deg]	0.98	0.98	0.98	0.97	0.96	0.96	0.92	0.86	0.99	0.85
	Precipitations [mm]	0.37	0.41	0.31	0.33	0.37	0.39	0.35	0.36	0.36	0.22
	T [deg]	0.97	0.96	0.96	0.96	0.94	0.93	0.90	0.89	0.97	0.82
	Pressure [hPa]	0.97	0.96	0.96	0.96	0.94	0.92	0.89	0.88	0.96	0.80
Nuuk											
	WS [m/s]	0.92	0.93	0.86	0.89	0.95	0.92	0.99	0.99	1.00	1.00
	WD [deg]	0.92	0.93	0.86	0.89	0.95	0.92	0.99	0.99	1.00	0.99
	Precipitations [mm]	0.50	0.50	0.37	0.41	0.45	0.51	0.44	0.45	0.45	0.33
	T [deg]	0.91	0.95	0.95	0.89	0.93	0.89	0.96	0.95	0.97	0.94
	Pressure [hPa]	0.90	0.95	0.94	0.87	0.92	0.87	0.96	0.95	0.97	0.93
Paamiut											
	WS [m/s]	0.91	0.95	0.97	0.97	0.54	0.90	0.70	0.09	0.95	0.96
	WD [deg]	0.91	0.95	0.97	0.97	0.54	0.89	0.66	0.09	0.95	0.96
	Precipitations [mm]	0.40	0.04	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T [deg]	0.96	0.95	0.95	0.96	0.96	0.75	0.71	0.08	0.93	0.95
	Pressure [hPa]	0.96	0.95	0.95	0.96	0.96	0.73	0.67	0.08	0.92	0.94
Qaanaq											
	WS [m/s]	0.00	0.24	0.94	0.95	0.96	0.94	0.64	0.95	0.99	0.98
	WD [deg]	0.00	0.24	0.94	0.95	0.96	0.94	0.64	0.95	0.99	0.98
	Precipitations [mm]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T [deg]	0.00	0.28	0.93	0.96	0.96	0.95	0.66	0.96	0.97	0.96
	Pressure [hPa]	0.00	0.26	0.92	0.95	0.95	0.93	0.63	0.95	0.97	0.95
Sisimiut											
	WS [m/s]	0.88	0.89	0.98	0.97	0.98	0.95	0.95	0.99	0.98	0.98
	WD [deg]	0.88	0.89	0.98	0.97	0.98	0.95	0.95	0.99	0.98	0.98
	Precipitations [mm]	0.00	0.14	0.28	0.27	0.25	0.00	0.00	0.00	0.00	0.27
	T [deg]	0.94	0.95	0.97	0.96	0.96	0.95	0.96	0.97	0.96	0.96
	Pressure [hPa]	0.94	0.94	0.97	0.96	0.96	0.94	0.96	0.96	0.95	0.96
Tasilaq											
	WS [m/s]	0.97	0.98	0.97	0.98	0.99	0.98	0.90	0.89	0.72	0.96
	WD [deg]	0.97	0.98	0.97	0.98	0.99	0.98	0.90	0.89	0.72	0.96
	Precipitations [mm]	0.36	0.37	0.46	0.42	0.38	0.44	0.43	0.43	0.35	0.40
	T [deg]	0.97	0.95	0.96	0.96	0.97	0.97	0.94	0.95	0.95	0.95
	Pressure [hPa]	0.97	0.95	0.95	0.96	0.97	0.97	0.93	0.94	0.95	0.95
Upernavik											
	WS [m/s]	0.95	0.94	0.65	0.56	0.92	0.92	0.93	0.97	0.96	0.95
	WD [deg]	0.95	0.94	0.65	0.56	0.91	0.88	0.93	0.97	0.96	0.96
	Precipitations [mm]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	T [deg]	0.96	0.96	0.69	0.58	0.90	0.92	0.94	0.95	0.95	0.94
	Pressure [hPa]	0.96	0.95	0.69	0.58	0.90	0.90	0.93	0.94	0.94	0.92

2 Details per stations

2.1 Aasiaat

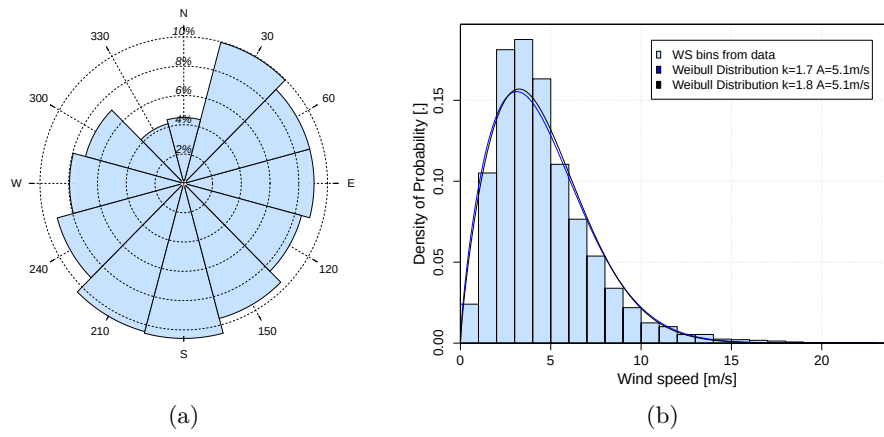


Figure 1: .

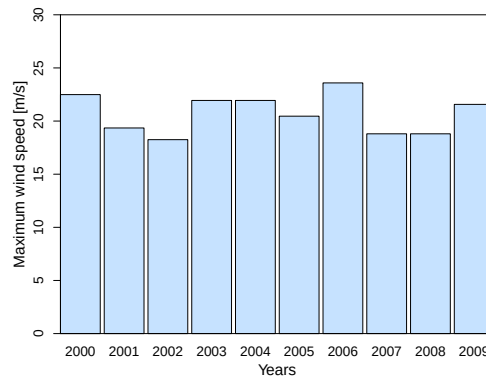
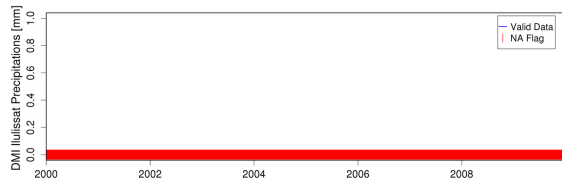
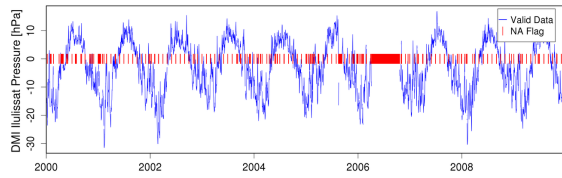


Figure 2

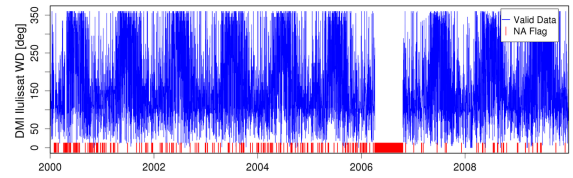
2.2 Ilulissat



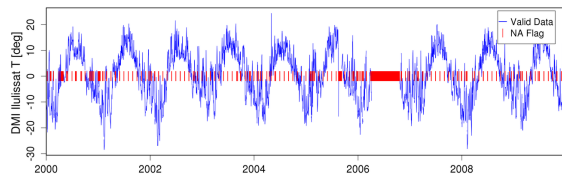
(a) Precipitations



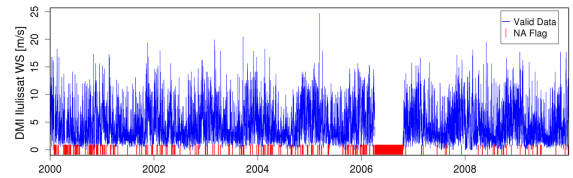
(b) Pressure



(d) Wind direction

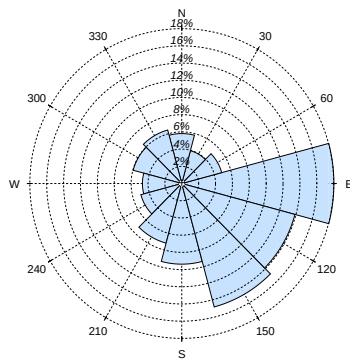


(c) Temperature

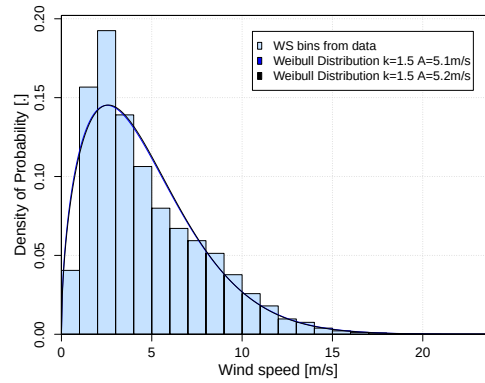


(e) Wind speed

Figure 3: Data overview for:Ilulissat



(a)



(b)

Figure 4: .

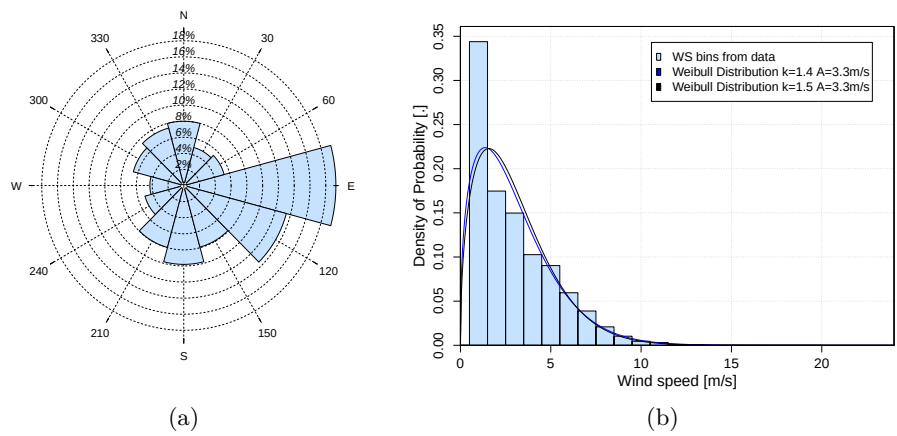


Figure 5: .

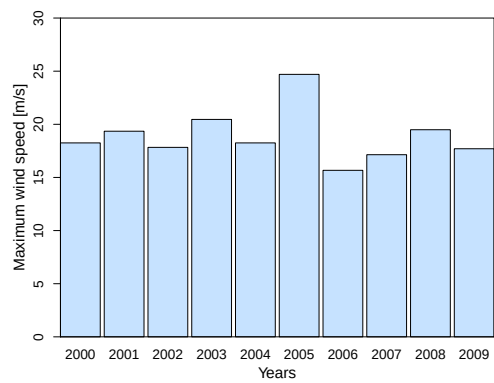
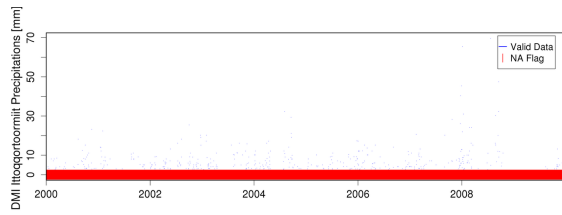
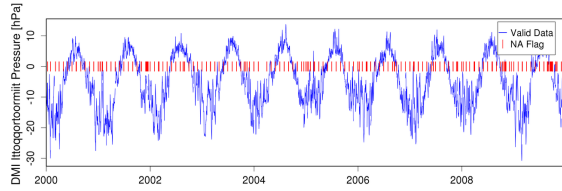


Figure 6

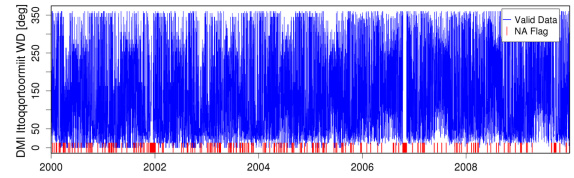
2.3 Ittoqqortoormiit



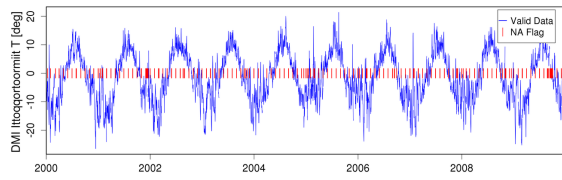
(a) Precipitations



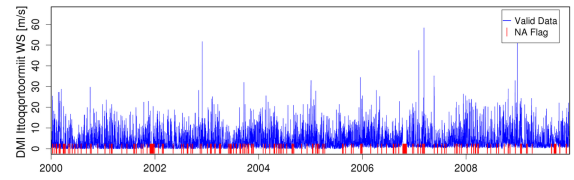
(b) Pressure



(d) Wind direction

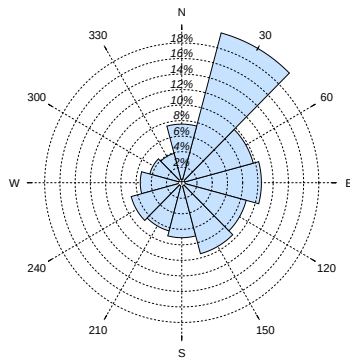


(c) Temperature

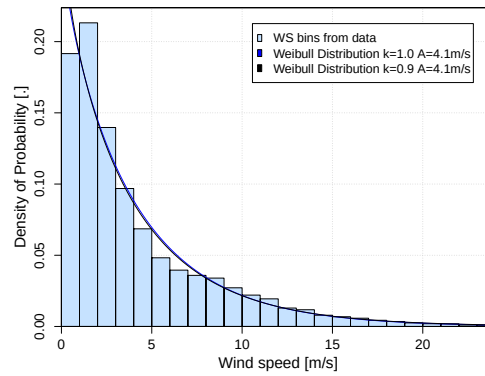


(e) Wind speed

Figure 7: Data overview for:Ittoqqortoormiit



(a)



(b)

Figure 8: .

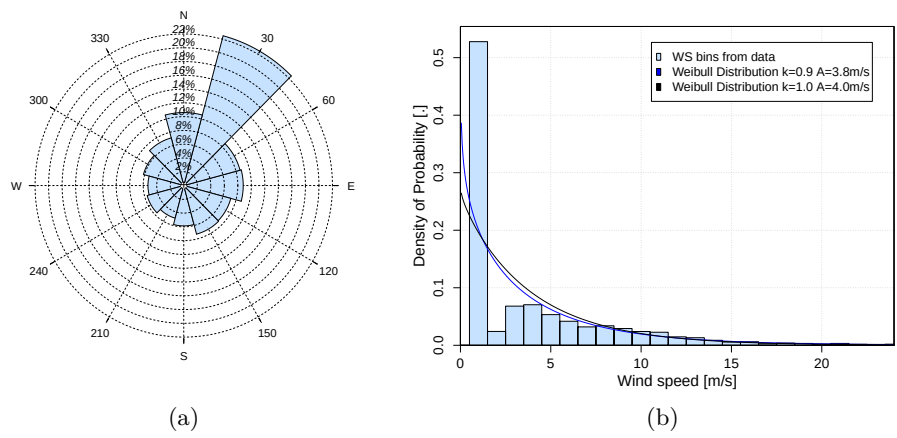


Figure 9: TAB.

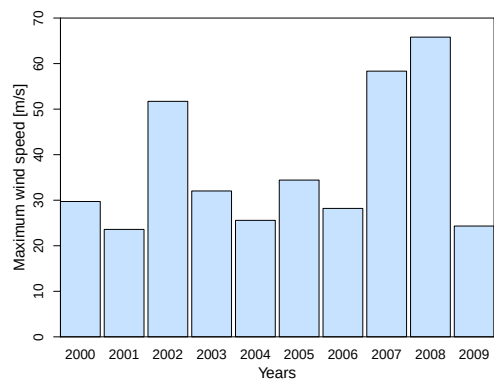


Figure 10

2.4 Kangerlussuaq

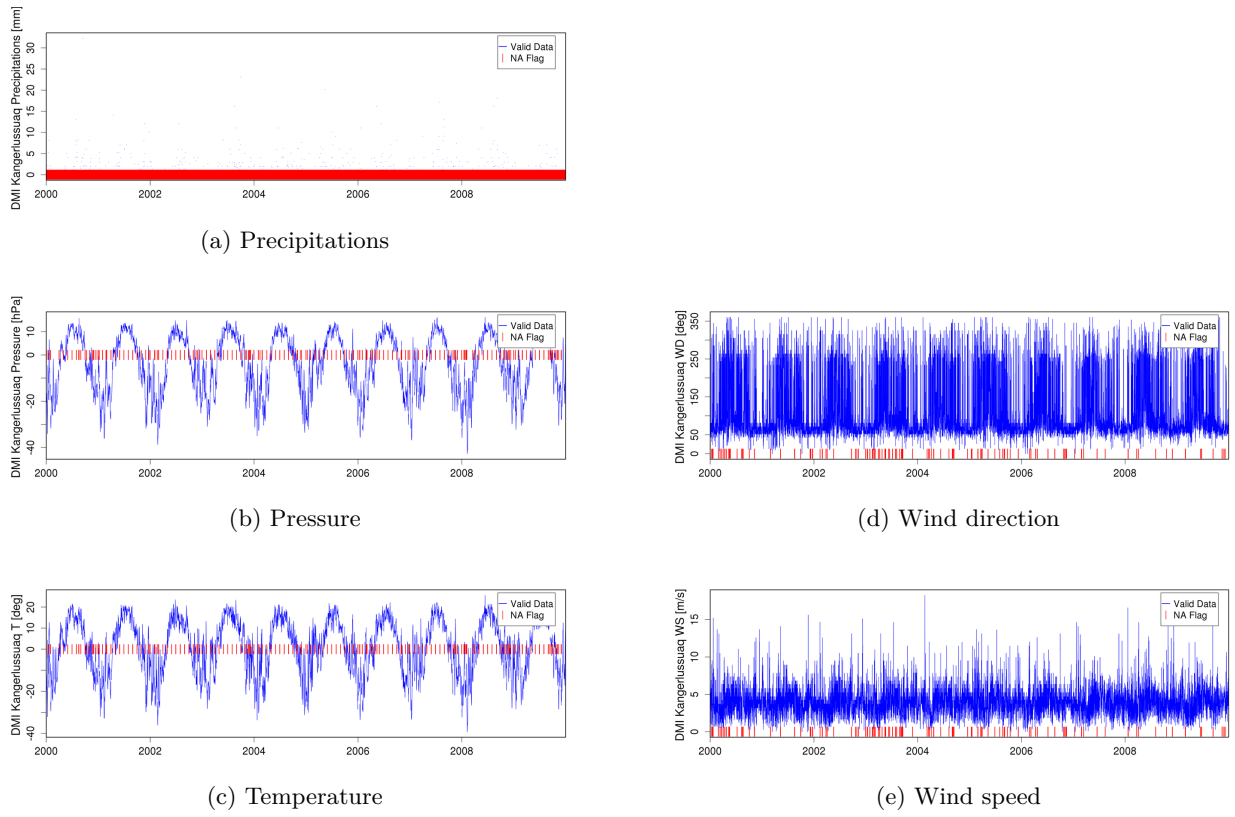


Figure 11: Data overview for:Kangerlussuaq

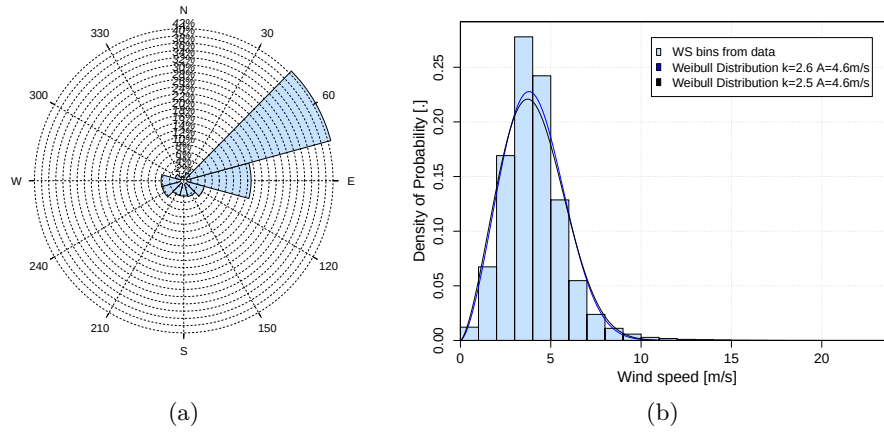


Figure 12: .

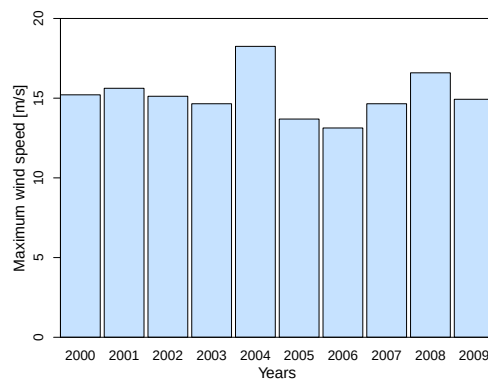


Figure 13

2.5 Maniitsoq

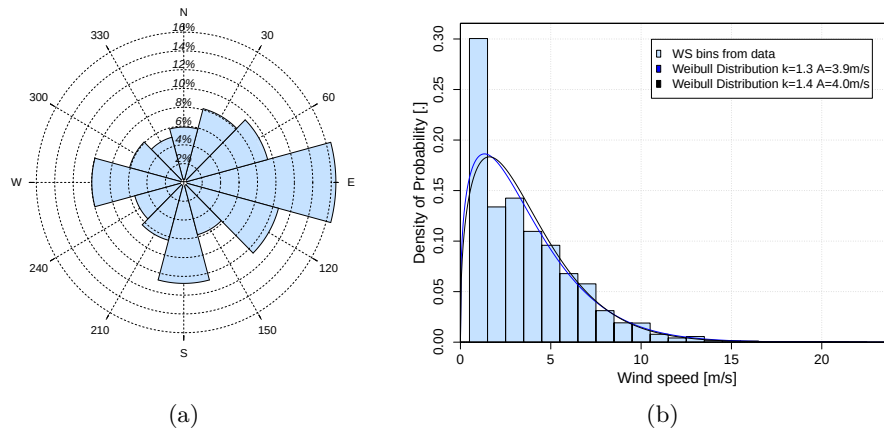


Figure 14: TAB.

2.6 Narsaq

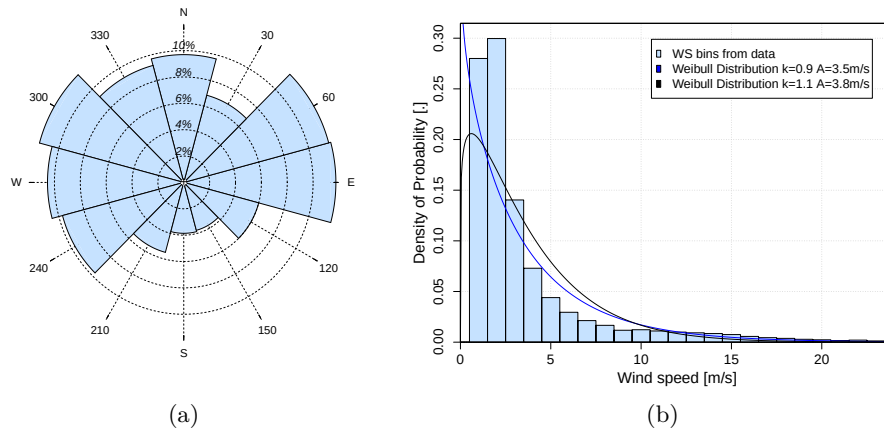
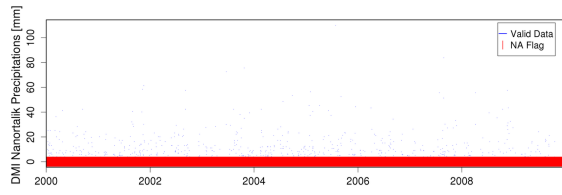
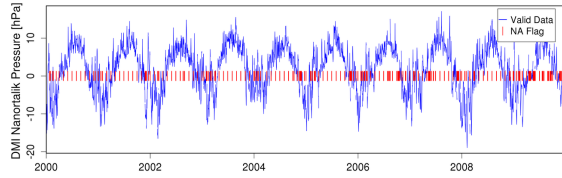


Figure 15: TAB.

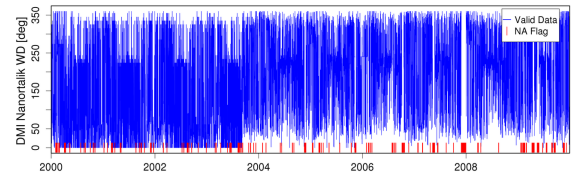
2.7 Nanortalik



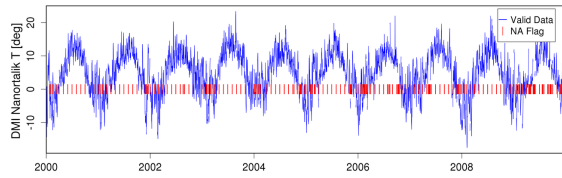
(a) Precipitations



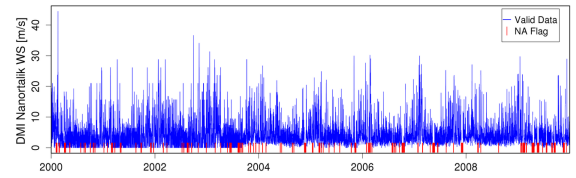
(b) Pressure



(d) Wind direction

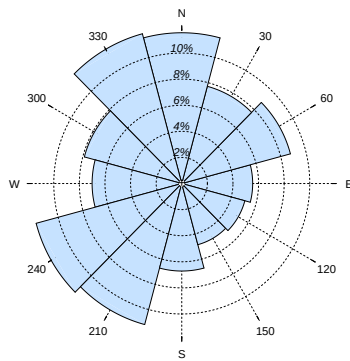


(c) Temperature

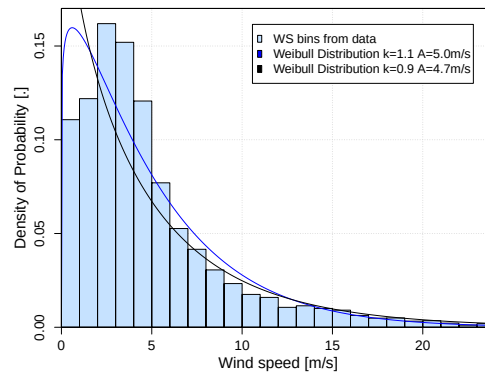


(e) Wind speed

Figure 16: Data overview for:Nanortalik



(a)



(b)

Figure 17: .

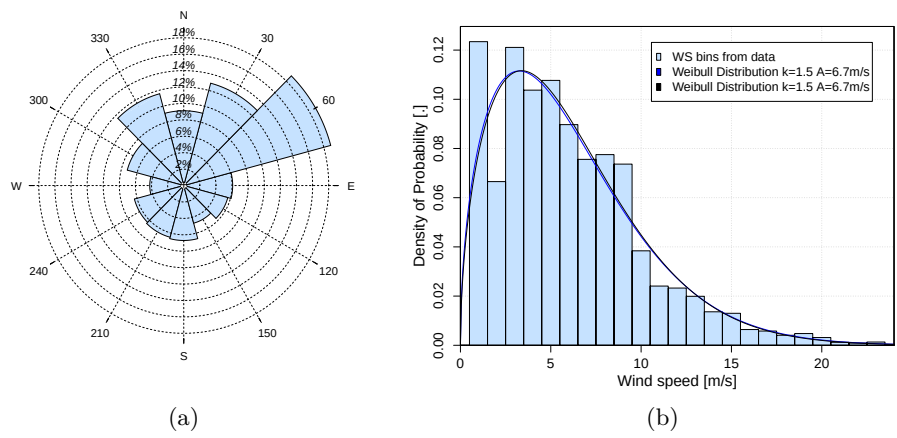


Figure 18: TAB.

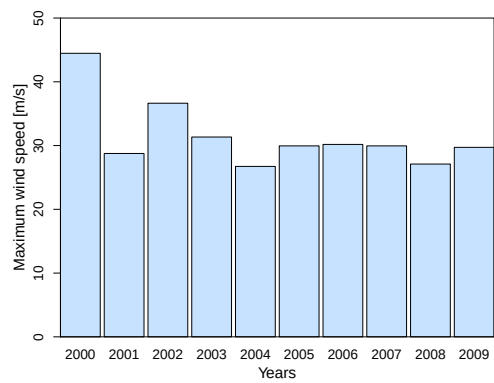


Figure 19

2.8 Nuuk

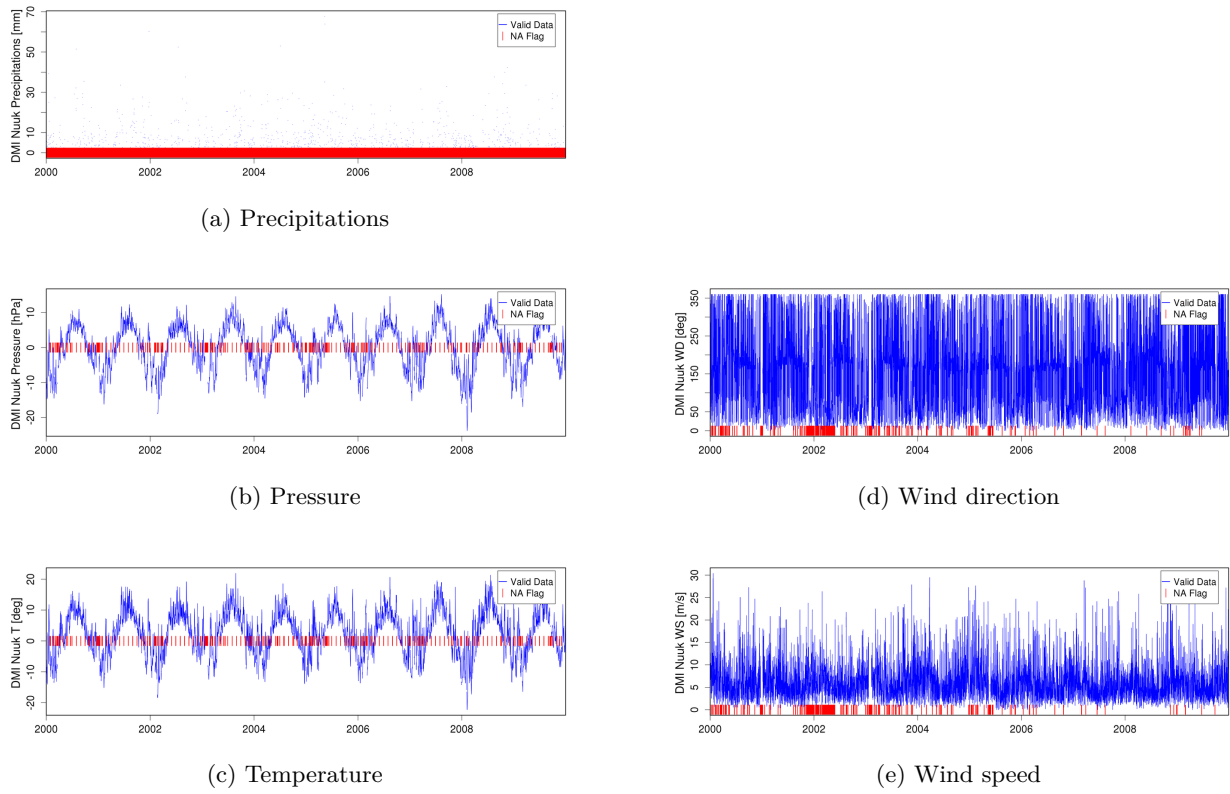


Figure 20: Data overview for:Nuuk

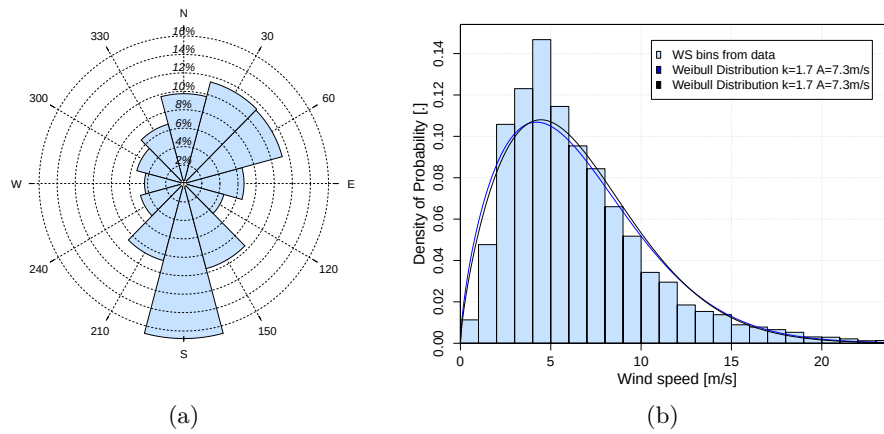


Figure 21: .

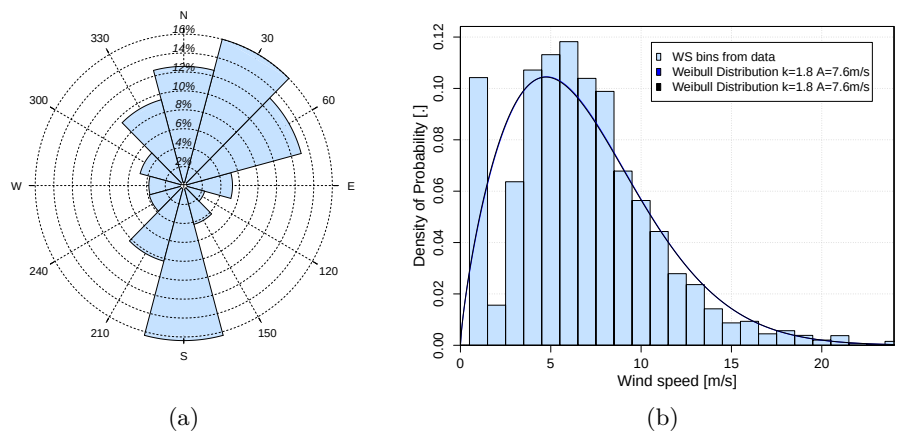


Figure 22: TAB.

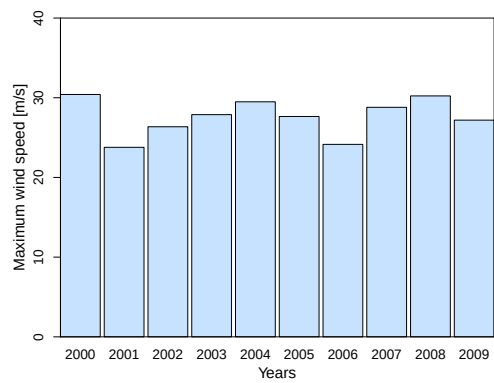


Figure 23

2.9 Paamiut

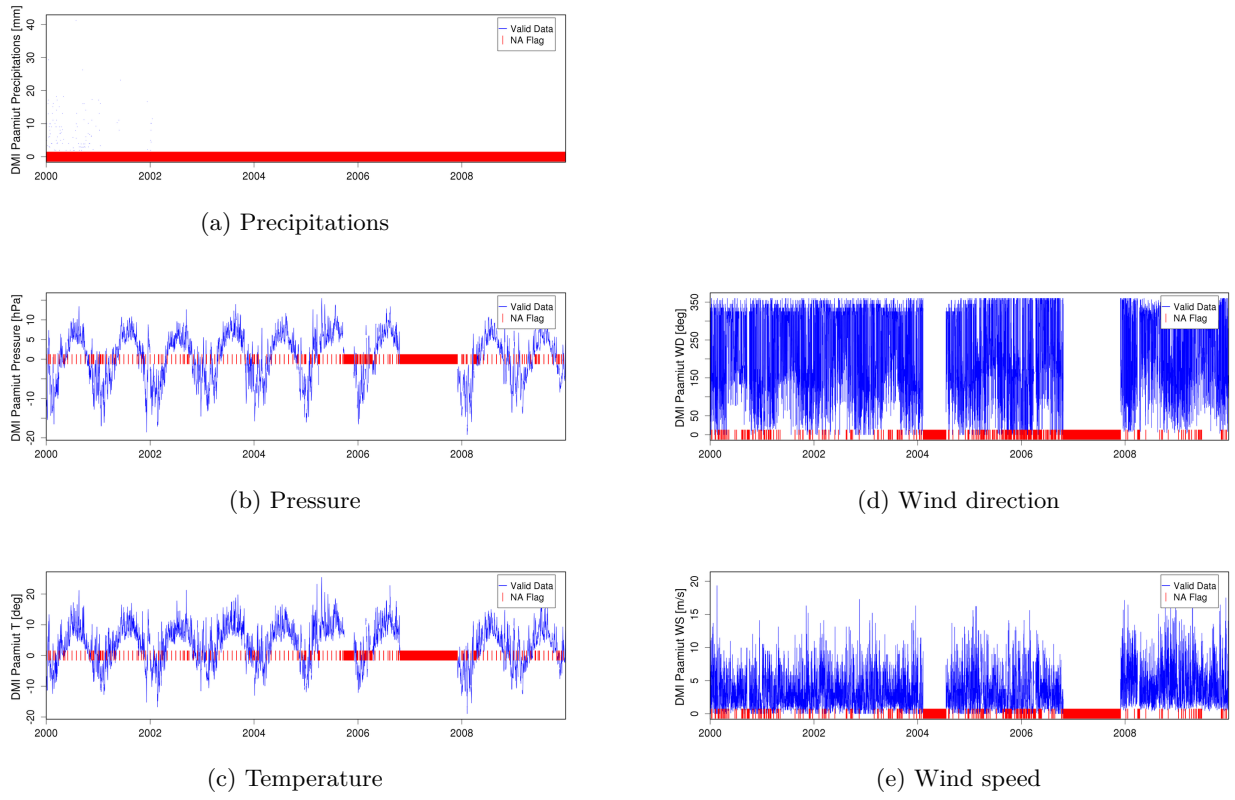


Figure 24: Data overview for:Paamiut

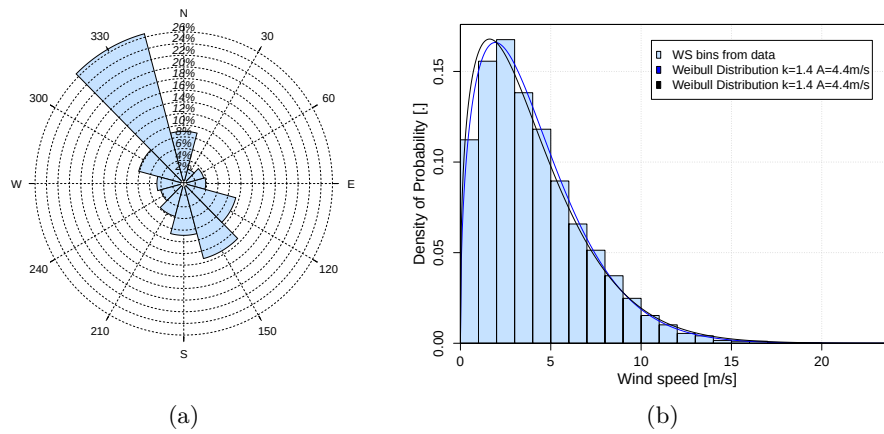


Figure 25: .

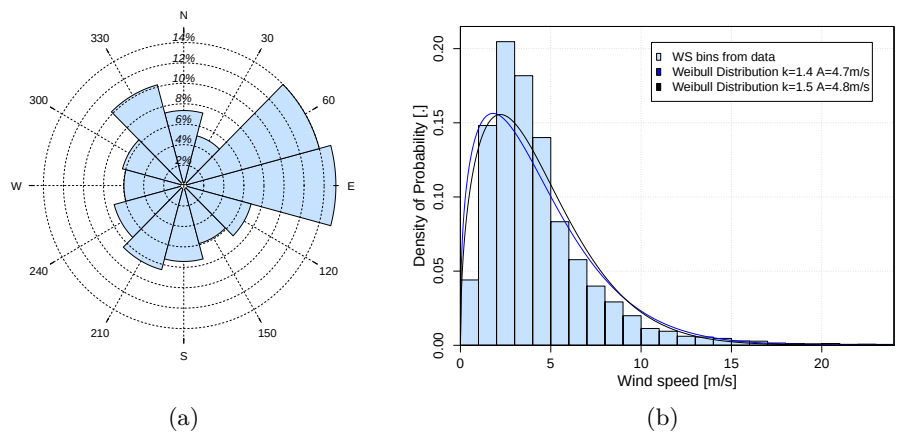


Figure 26: TAB.

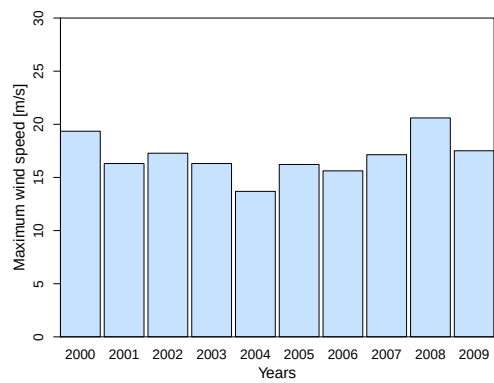
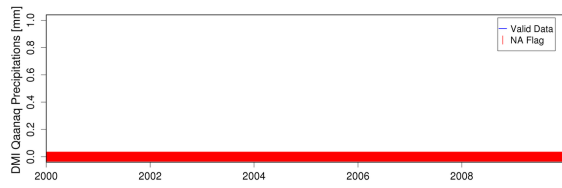
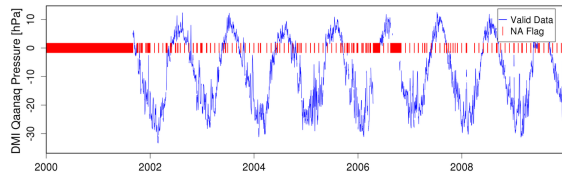


Figure 27

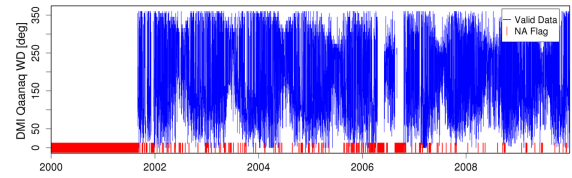
2.10 Qaanaq



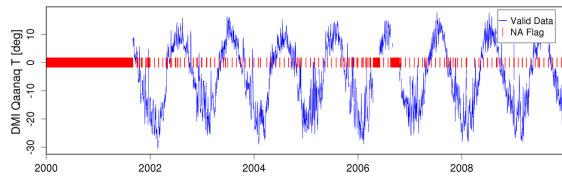
(a) Precipitations



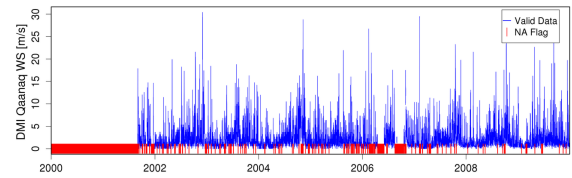
(b) Pressure



(d) Wind direction

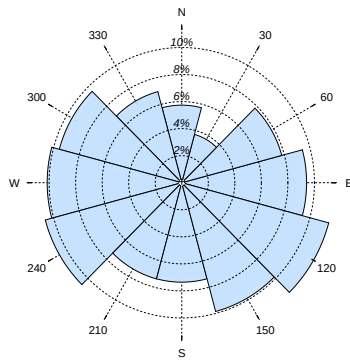


(c) Temperature

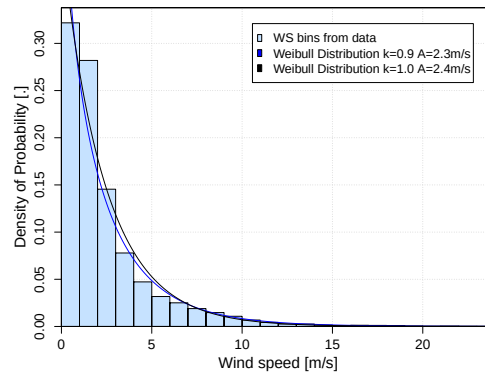


(e) Wind speed

Figure 28: Data overview for:Qaanaq



(a)



(b)

Figure 29: .

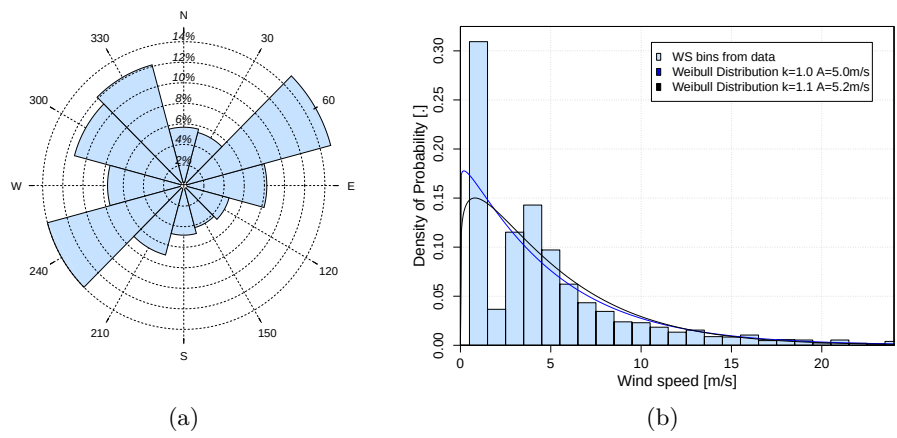


Figure 30: TAB.

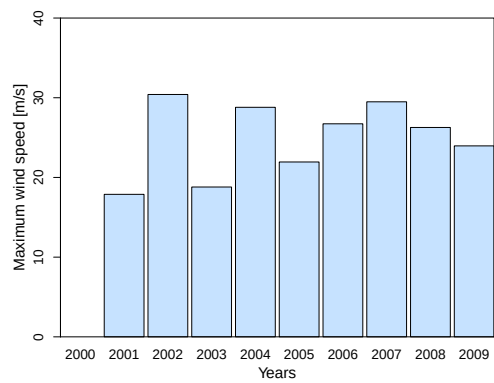


Figure 31

2.11 Qasigiannnguit

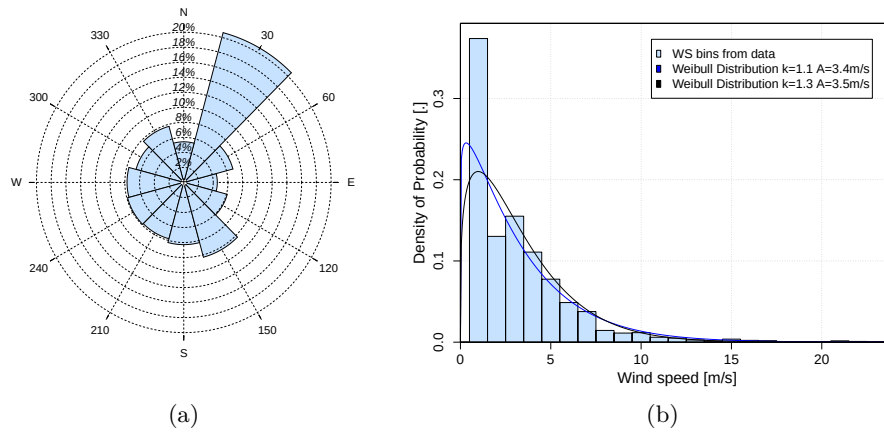


Figure 32: TAB.

2.12 Qeqertarsuaq

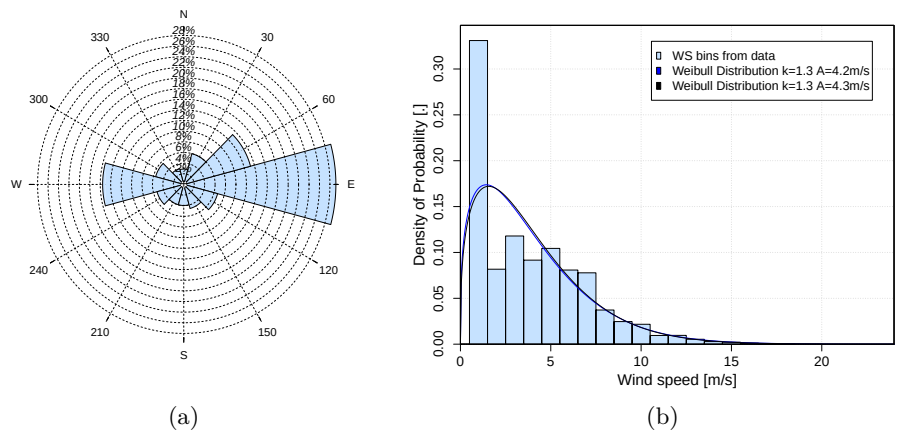
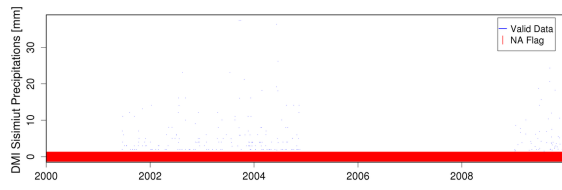
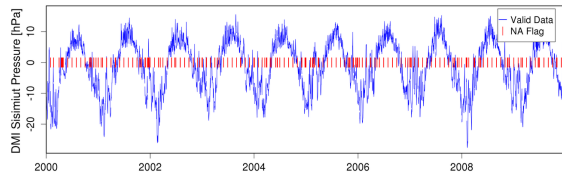


Figure 33: TAB.

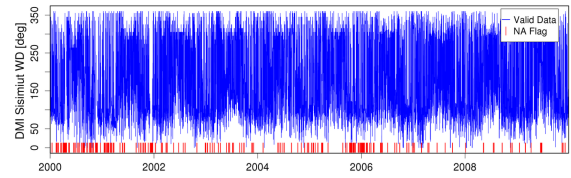
2.13 Sisimiut



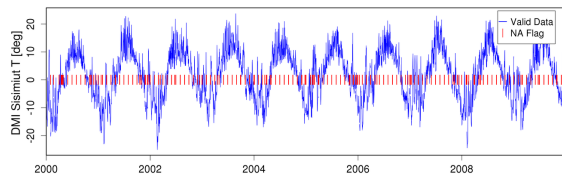
(a) Precipitations



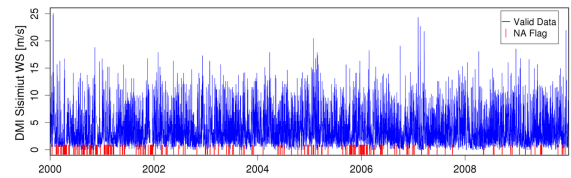
(b) Pressure



(d) Wind direction

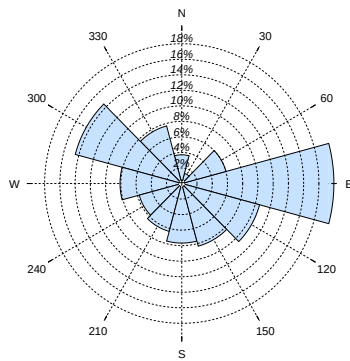


(c) Temperature

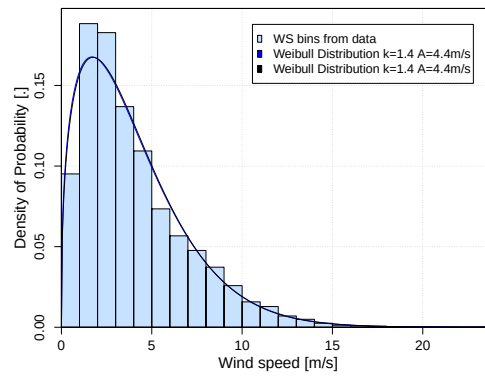


(e) Wind speed

Figure 34: Data overview for:Sisimiut



(a)



(b)

Figure 35: .

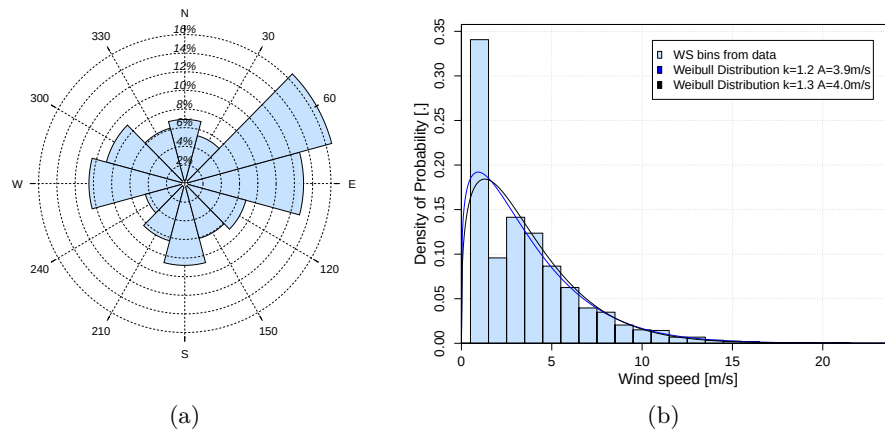


Figure 36: TAB.

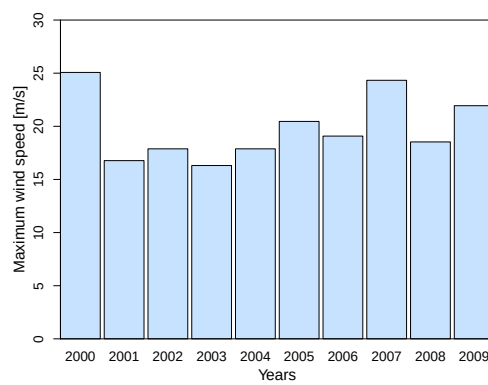
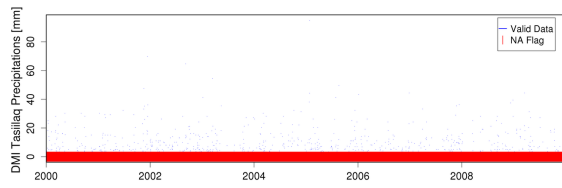
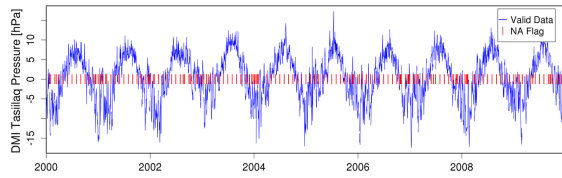


Figure 37

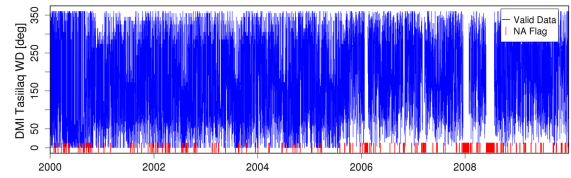
2.14 Tasiilaq



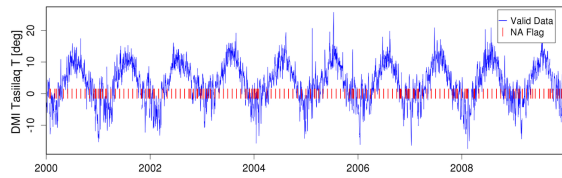
(a) Precipitations



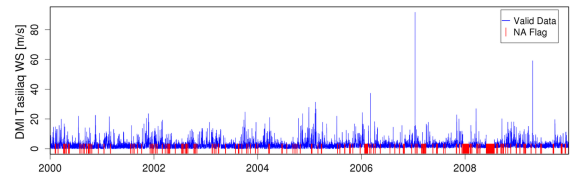
(b) Pressure



(d) Wind direction

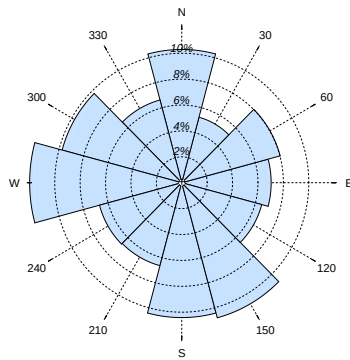


(c) Temperature

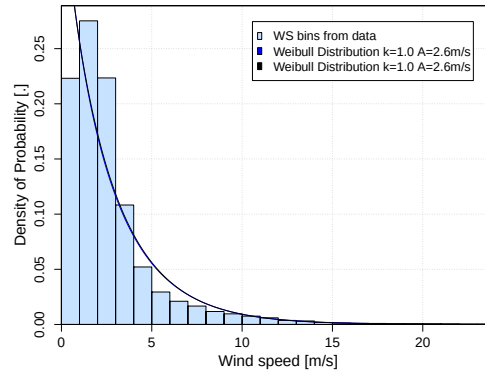


(e) Wind speed

Figure 38: Data overview for:Tasiilaq



(a)



(b)

Figure 39: .

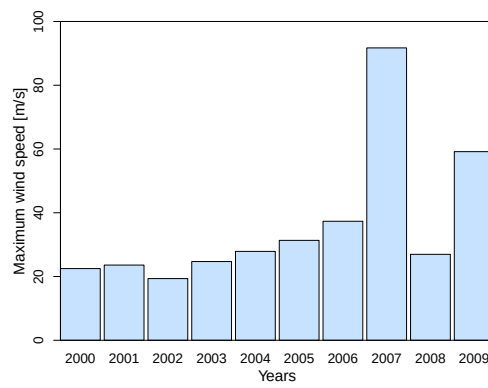


Figure 40

2.15 Uummannaq

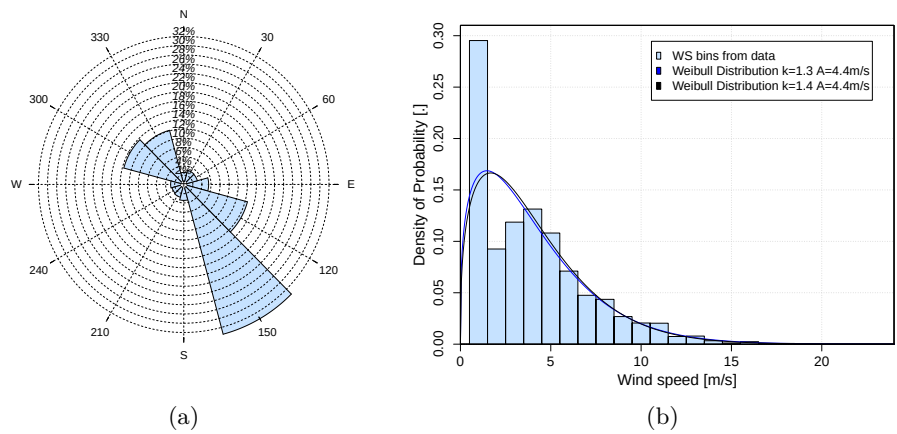
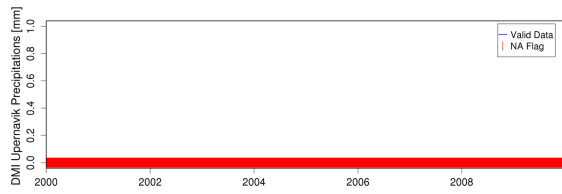
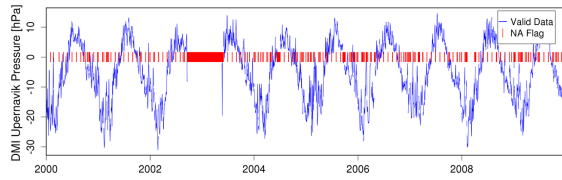


Figure 41: TAB.

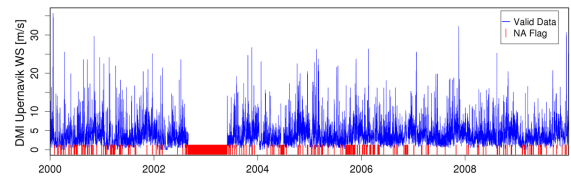
2.16 Upernavik



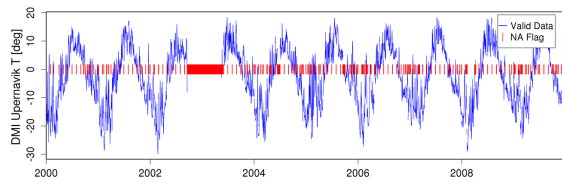
(a) Precipitations



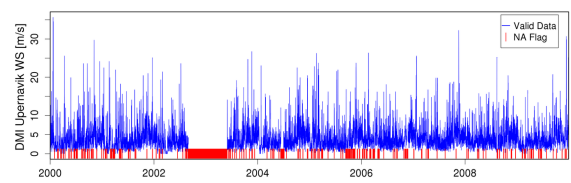
(b) Pressure



(d) Wind direction

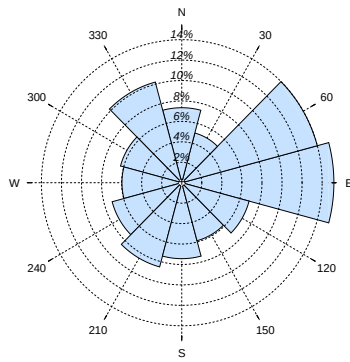


(c) Temperature

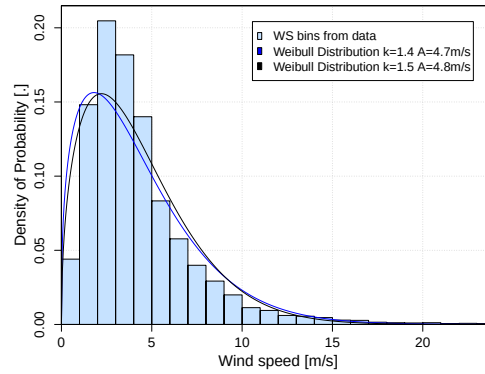


(e) Wind speed

Figure 42: Data overview for:Upernavik



(a)



(b)

Figure 43: .

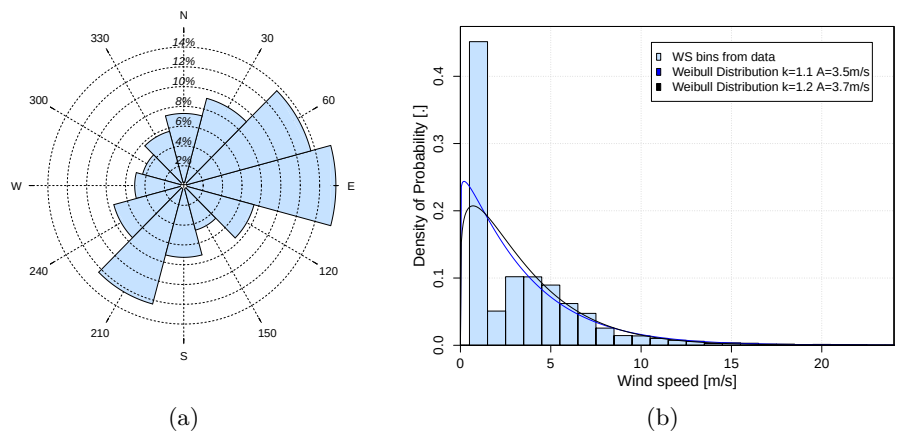


Figure 44: TAB.

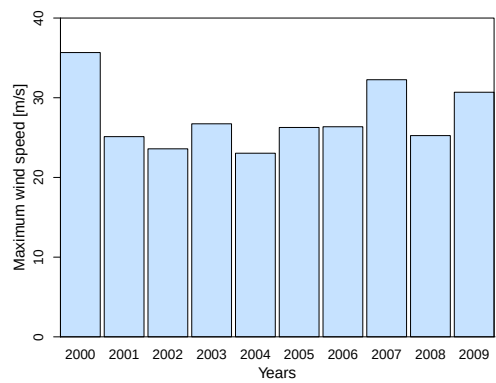


Figure 45