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# METEOROLOGICAL OBSERVATIONS

TAKEN AT

## ORKNEY;

WITH

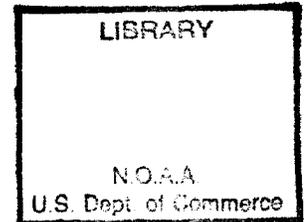
## REMARKS ON THE CLIMATE.

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1827-1859

By

THE REV. CHARLES CLOUSTON,

MINISTER OF SANDWICK, L.R.C.S. EDIN., PRES. ORK. NAT. HIST. SOC., &c.



LONDON:

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INTRODUCTORY NOTES ON SOME METEOROLOGICAL OBSERVATIONS  
AT ORKNEY.

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The Reverend C. Clouston's barometrical observations, extending from 1839 to 1859, are uncorrected for temperature (see heading of Table II.) For the first 17 years the observations were taken at 9.15 A.M. and 8.30 P.M., during the last four years at 9 A.M. and 9 P.M.; the whole have been taken together to form means, without taking notice of the different times at which the observations were made.

There are some very wide extremes in the mean monthly pressures for January; in 1839 the mean pressure was 29.076 in., and in 1855, 30.065 in.

The thermometrical observations extend from 1827 to 1859. The place of observation during the first six years was the Manse of Stromness, and for the last 27 the Manse of Sandwick, which is about 7.5 miles N. of the former; the times of reading the instruments being during the first 12 years 10 A.M. and 10 P.M.; for the next 17 years 9.15 A.M. and 8.30 P.M., and in the last four years 9 A.M. and 9 P.M.

The observations on rain extend from 1841 to 1859.

The wind was observed, for direction only, from 1827 to 1859; for the first sixteen years, only eight points of the compass were noted, for the next 14 years and four months, 16 points were used. The table of the direction of the wind is made out for eight points.

For the year 1857 an abstract of the observations is furnished, in addition to the means given in the tables.

Abstracts of the observations at Orkney for the years 1857 and 1859 are given, with an abstract for all Scotland for 1857.

On page 13 the rain-fall at Sandwick is compared with that in various parts of Great Britain, the amounts being given without stating whence they were obtained. The fall at London is given as 20 in. instead of 25 in.; and at Whitehaven as 54 in. instead of 48 inches in a year.

R. F.

G. H. S.



## METEOROLOGICAL OBSERVATIONS.

TABLE I.—Showing the MEAN MONTHLY and ANNUAL TEMPERATURE of ORKNEY for 33 Years. The Register was kept at the Manse of Stromness for the first six Years, and at that of Sandwick for the last 26. The former is about half a mile from the sea-shore, and nearly 100 feet above its level. The latter is about two miles from the shore, and 100 feet above its level. The thermometer was marked twice a day, at 10 A.M. and 10 P.M., during the first 12 years; at a quarter past 9 A.M. and half past 8 P.M. for 17 years; and at 9 A.M. and 9 P.M. for the last three years. No corrections for diurnal range or altitude.

YEARS.	Jan.	Feb.	March.	April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Annual.
1827	35.09	35.09	38.59	43.83	49.16	53.40	55.61	55.04	54.33	50.95	43.11	43.24	46.45
1828	40.22	38.82	41.45	43.60	45.30	56.04	58.25	57.26	55.41	54.19	45.53	43.24	48.27
1829	36.14	39.46	40.69	41.51	49.99	53.43	57.12	54.36	50.21	45.56	41.40	39.51	45.78
1830	37.96	36.71	41.83	44.80	50.77	51.66	56.14	53.14	53.46	49.41	42.76	36.83	46.24
1831	36.70	37.71	42.65	44.88	48.70	56.13	57.86	58.90	54.73	51.73	40.50	44.07	47.88
1832	41.49	42.22	42.22	46.24	47.31	54.73	54.25	56.07	52.61	49.38	45.43	41.40	47.77
1833	37.14	38.37	38.68	43.23	51.43	51.60	54.73	52.40	52.34	49.20	41.58	39.28	45.83
1834	38.90	40.21	41.11	43.05	48.75	58.02	58.03	56.89	52.90	48.07	44.01	45.17	47.92
1835	39.75	39.48	41.20	42.25	46.01	51.76	53.57	54.77	53.01	45.70	45.68	40.44	46.13
1836	39.14	37.46	39.61	41.39	47.77	52.03	52.51	51.83	48.35	45.91	40.93	38.57	44.62
1837	38.82	39.32	36.54	39.13	45.24	51.06	50.56	53.75	51.58	49.36	41.59	42.44	44.94
1838	33.56	31.31	38.64	39.23	44.75	48.20	53.86	52.28	50.28	45.77	39.71	41.78	43.28
1839	35.99	37.62	36.33	42.11	44.91	50.99	55.57	53.14	52.78	47.64	43.23	40.41	45.06
1840	38.80	37.98	41.35	45.93	44.81	50.24	52.36	55.72	49.73	46.38	42.23	39.82	45.44
1841	34.81	38.42	44.41	43.41	49.48	50.75	51.56	53.23	52.54	43.50	39.65	39.64	45.11
1842	37.69	40.35	41.14	45.32	50.28	53.30	54.39	56.73	52.94	46.51	40.16	44.97	46.98
1843	39.64	33.56	39.02	42.66	46.08	50.04	54.31	56.53	54.75	43.50	41.90	45.45	45.62
1844	40.12	34.18	39.45	46.26	47.94	50.51	52.93	53.51	51.02	46.41	43.55	38.18	45.34
1845	39.45	36.51	37.33	45.18	47.06	53.16	53.31	53.16	50.59	47.98	43.99	38.27	45.50
1846	42.42	43.05	40.19	42.58	48.60	57.30	56.45	58.82	55.43	49.36	46.02	38.16	48.20
1847	39.56	37.91	41.79	42.25	48.15	52.73	57.13	55.54	48.67	48.18	45.28	40.29	46.46
1848	38.39	38.40	41.17	42.15	50.48	52.48	53.75	53.61	52.25	46.57	41.72	41.37	46.03
1849	38.99	41.15	41.96	41.85	48.73	49.42	54.60	53.78	52.84	45.97	43.02	40.79	46.09
1850	37.14	41.89	41.43	44.27	46.89	53.64	56.36	53.95	51.32	45.58	42.58	42.72	46.48
1851	41.72	40.64	40.85	43.53	47.35	51.93	52.48	53.75	51.90	49.14	40.29	44.41	46.50
1852	40.29	39.94	41.95	47.64	50.49	55.33	61.36	60.64	53.45	46.88	41.52	40.74	48.35
1853	38.55	33.74	38.24	44.49	49.07	55.21	58.15	55.98	53.28	48.66	44.87	38.97	46.60
1854	36.47	39.22	45.14	44.68	48.39	52.86	55.25	55.06	55.07	46.39	42.05	39.13	46.64
1855	38.16	31.64	36.61	43.20	43.81	52.23	59.19	56.10	52.74	43.72	43.49	39.41	45.19
1856	38.00	40.84	40.39	44.56	46.83	51.47	54.77	53.22	50.83	48.84	40.22	39.38	45.78
1857	37.63	40.52	39.08	41.61	47.94	53.86	54.77	56.70	55.32	49.30	46.59	46.42	47.49
1858	41.44	38.26	38.64	41.94	47.30	55.02	53.35	56.59	53.73	44.44	41.23	42.51	46.20
1859	40.46	40.21	40.23	39.51	49.54	52.88	54.98	55.20	51.73	46.06	41.05	35.31	45.60
<b>Means</b>	<b>38.50</b>	<b>38.25</b>	<b>40.30</b>	<b>43.28</b>	<b>47.86</b>	<b>52.83</b>	<b>55.14</b>	<b>55.08</b>	<b>52.49</b>	<b>47.52</b>	<b>42.63</b>	<b>40.96</b>	<b>46.24</b>

TABLE II.—Showing the MEAN MONTHLY and ANNUAL STATE of the BAROMETER in ORKNEY for 21 Years. It was marked twice a day at the manse of Sandwick, which is about 100 feet above the sea level and two miles from the sea-shore. Not corrected for temperature or elevation.

YEARS.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual.
	in.												
1839	29.076	29.487	29.740	30.018	29.936	29.869	29.727	29.822	29.436	29.969	29.668	29.587	29.694
1840	29.355	29.770	30.262	29.948	29.897	29.823	29.698	29.795	29.563	29.899	29.492	30.036	29.794
1841	29.677	29.791	29.628	29.716	29.759	29.804	29.754	29.725	29.729	29.554	29.600	29.419	29.687
1842	29.861	29.600	29.510	30.169	29.843	29.964	29.904	29.904	29.896	29.840	29.703	29.635	29.819
1843	29.344	29.779	29.880	29.700	29.923	29.933	29.827	29.814	30.045	29.486	29.529	29.913	29.764
1844	29.575	29.454	29.630	29.903	30.213	29.853	29.845	29.714	30.004	29.586	29.771	30.059	29.767
1845	29.495	29.682	29.524	29.791	29.804	29.883	29.714	29.914	29.930	29.554	29.802	29.740	29.736
1847	29.781	29.728	29.935	29.615	29.815	29.863	29.975	29.871	29.682	29.804	29.636	29.596	29.792
1848	29.811	29.287	29.554	29.720	29.930	29.735	29.717	29.679	29.836	29.768	29.625	29.602	29.689
1849	29.506	29.751	29.854	29.626	29.638	29.734	29.769	29.815	30.008	29.727	29.631	29.910	29.747
1850	29.866	29.447	30.000	29.673	29.778	29.883	29.919	29.695	30.010	29.688	29.548	29.645	29.742
1851	29.394	29.776	29.604	29.852	29.960	29.800	29.756	29.891	30.139	29.598	29.859	29.985	29.801
1852	29.245	29.736	30.139	30.116	29.864	29.621	29.921	29.716	29.883	29.796	29.454	29.334	29.735
1853	29.406	29.743	29.849	29.684	30.014	29.810	29.657	29.857	29.801	29.557	29.838	29.987	29.767
1854	29.493	29.789	30.012	30.033	29.683	29.812	29.877	29.863	29.880	29.629	29.709	29.397	29.765
1855	30.065	29.821	29.575	29.873	29.865	29.888	29.843	29.772	30.002	29.579	29.973	29.626	29.823
1856	29.496	29.833	30.178	29.758	29.869	29.793	29.764	29.852	29.727	30.020	29.900	29.629	29.805
1857	29.588	29.684	29.720	29.721	29.941	29.997	29.731	29.978	29.835	29.722	30.051	29.760	29.811
1858	29.867	29.902	29.707	29.863	29.762	29.754	29.847	29.873	29.766	29.762	29.881	29.551	29.795
1859	29.631	29.550	29.508	29.680	29.970	29.850	29.840	29.777	29.632	29.637	29.762	29.551	29.699
Mean	29.533	29.686	29.795	29.823	29.879	29.835	29.806	29.789	29.836	29.709	29.709	29.677	29.761

TABLE III.—Showing the TOTAL MONTHLY and ANNUAL QUANTITY of RAIN in ORKNEY for 19 Years, with the MEAN MONTHLY and ANNUAL QUANTITY for that Period. Kept at the Manse of Sandwick.

YEARS.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Totals.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1841	5.00	1.93	2.54	1.97	3.52	1.64	3.16	3.31	3.09	4.88	3.51	5.43	39.98
1842	3.28	2.20	3.98	0.51	0.98	2.34	1.88	4.69	3.13	5.68	3.88	4.44	36.99
1843	6.25	1.32	2.46	4.05	2.31	1.04	2.92	1.84	2.00	6.38	4.17	3.70	38.44
1844	4.42	3.22	3.68	1.28	1.60	2.32	1.17	2.86	1.99	4.52	3.25	1.77	32.08
1845	2.97	2.56	3.17	0.94	1.02	2.40	1.69	4.13	2.82	7.82	4.01	7.41	40.94
1846	4.38	3.34	3.47	1.95	1.88	1.60	2.13	2.91	0.60	3.65	3.27	3.97	33.05
1847	1.51	3.48	1.56	3.32	2.28	2.72	2.56	3.20	6.05	4.70	4.15	5.24	40.77
1848	2.80	5.57	2.79	1.15	1.78	2.67	3.37	2.04	1.56	3.97	6.23	3.87	37.80
1849	7.54	4.92	2.71	1.91	0.78	2.33	3.72	3.33	1.76	2.85	4.45	4.22	40.52
1850	3.81	4.98	2.43	2.20	1.84	1.99	1.16	4.61	4.05	7.32	6.81	3.11	44.31
1851	4.29	3.50	2.36	1.52	1.77	2.86	3.32	2.23	0.91	3.96	4.11	2.59	33.42
1852	5.23	3.81	0.78	0.11	1.42	3.05	2.58	0.62	2.64	4.12	5.18	5.04	34.58
1853	5.12	2.50	1.79	3.30	0.71	2.13	1.57	2.83	3.54	5.94	2.62	1.67	33.72
1854	4.72	4.10	1.65	1.42	1.61	1.85	2.52	2.40	4.18	5.21	4.82	7.75	42.23
1855	3.26	1.32	3.58	2.89	1.38	2.64	2.97	3.98	1.74	5.28	1.37	4.64	35.05
1856	2.33	2.42	0.34	0.34	0.89	2.36	3.36	1.40	3.18	1.01	4.61	5.17	27.41
1857	5.45	2.96	4.12	1.37	0.89	0.56	2.77	2.75	2.75	2.81	1.93	3.55	31.91
1858	3.78	0.74	2.71	0.86	2.43	2.24	4.05	2.64	2.80	5.89	2.83	3.40	34.37
1859	5.46	4.20	5.41	4.33	0.38	2.41	2.81	2.27	2.85	6.26	3.66	5.39	44.43
Total	81.60	59.07	51.53	35.42	29.47	41.15	49.71	54.04	51.64	92.05	73.86	82.36	662.00
Mean	4.29	3.11	2.71	1.86	1.55	2.17	2.62	2.84	2.72	4.85	3.89	4.33	36.95

TABLE IV. —Shewing the NUMBER of DAYS that the WIND BLEW from each DIRECTION in ORKNEY each MORNING for 33 Years. During the first 16 years the 8 points of the compass only were recorded, as noted in the Table; but during the next 14 years, and 4 months of 1857, 16 points were registered. Though noted twice a day, to facilitate the tabulation the morning observations only are here given; and to condense and make it comparable with other tables where 8 points only are generally given, the additional 8 points are struck out, and are all added to the cardinal points to which they approximated, thus giving them an advantage over the intermediate points to which they are not fairly entitled.

YEARS.	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Variable or Calm.
1827	40	24	13	76	35	30	77	57	13
1828	31	24	27	84	49	40	45	54	12
1829	47	27	22	61	51	23	57	57	20
1830	53	17	16	73	58	32	51	45	20
1831	29	18	27	93	38	40	55	44	21
1832	36	9	22	60	63	49	69	38	20
1833	29	15	10	74	70	47	63	36	21
1834	28	16	14	31	71	69	76	38	22
1835	32	20	18	74	39	49	73	51	9
1836	27	15	23	59	43	59	83	46	11
1837	39	11	43	61	44	45	52	52	18
1838	31	10	46	93	29	36	55	49	16
1839	32	16	39	93	50	21	66	35	13
1840	43	17	32	77	41	29	63	40	24
1841	40	17	48	79	45	31	57	36	12
1842	30	16	32	72	44	51	61	41	18
1843	39	22	35	69	38	54	48	48	12
1844	34	22	30	74	25	47	56	55	23
1845	30	28	25	76	31	55	41	54	25
1846	18	28	35	100	27	50	51	31	25
1847	37	13	32	73	55	22	71	25	37
1848	38	23	53	40	64	22	74	18	34
1849	41	11	56	46	52	31	70	35	23
1850	49	3	33	57	48	26	93	29	27
1851	47	14	36	36	53	22	94	25	38
1852	44	12	51	45	51	22	68	32	41
1853	40	18	45	54	64	23	68	23	30
1854	32	12	38	31	54	36	107	40	15
1855	43	22	60	25	64	17	74	35	25
1856	54	23	54	39	45	14	91	23	23
1857	21	15	44	63	64	44	72	24	18
1858	22	17	14	74	48	50	82	41	17
1859	30	22	25	64	42	57	67	36	22
Total									
Mean	35.9	17.5	33.3	64.4	48.3	37.7	67.6	39.2	21.4

CLIMATE OF ORKNEY,

TABLE V.—ABSTRACT of METEOROLOGICAL OBSERVATIONS in ORKNEY for 1857, kept uniformly with the other STATIONS of the SCOTTISH METEOROLOGICAL SOCIETY, as published in their Reports.

	BARO-METER. Mean reduced to 32° and Sea Level.	SELF-REGISTERING THERMOMETERS.						HYGRO-METER.			DEDUCTIONS.			WIND.							RAINF. Amount. in.	Tem-perature of Sea.	Tem-perature of Soil at 12 inches.	Tem-perature of a Spring.					
		Highest in Month.	Lowest in Month.	Monthly Range.	Mean of all the Highest.	Mean of all the Lowest.	Mean daily Range.	Mean temperature.	Dry Bulb.	Wet Bulb.	Dew Point.	Elastic Force.	Humidity, Sat. 100.	Number of Days it blew from each Direction.															
														N.	N.E.	E.	S.E.	S.	S.W.	W.					N.W.	Vari-able or Calm.	Mean Pressure on square Foot.	Number of Days it fell.	
January	29.698	50.0	25.0	25.0	41.5	34.4	7.1	38.0	37.6	36.2	34.3	198	88	4	1	3½	4½	5½	3½	5½	2½	1	1.77	25	5.45	44.50	38.0	45.00	
February	29.744	50.0	28.0	22.0	44.6	36.9	7.7	40.7	40.5	39.2	37.5	224	90	...	...	6	10½	5	5	...	1	2.15	16	2.96	44.50	40.0	45.00		
March	29.775	50.0	29.0	21.0	43.7	34.7	9.0	39.2	39.0	37.8	36.2	214	90	1½	8	7½	3½	3	5½	½	1	1.84	22	4.12	43.80	39.2	45.00		
April	29.796	56.5	28.0	23.5	47.4	36.7	10.7	42.0	41.6	40.0	38.0	210	81	1½	8	8	2	1	4	2½	2½	1	1.47	15	1.37	44.00	42.2	44.50	
May	30.036	60.0	37.0	23.0	53.4	43.4	10.0	48.4	47.9	45.5	42.8	275	84	1½	2½	6	9½	3	2	3	2½	1	1.41	10	0.89	46.75	48.2	44.65	
June	30.042	69.0	41.0	28.0	55.9	48.4	7.5	52.1	53.8	51.0	48.3	336	81	2½	2	4½	7½	1½	2	6	4½	4½	1	1.08	5	0.56	50.75	52.7	45.90
July	29.816	67.0	45.0	22.0	58.5	51.3	7.2	54.9	54.7	52.9	51.1	376	88	2½	2	...	1½	5½	5	12	1½	1	1.43	21	2.77	52.83	55.4	48.00	
August	30.030	69.5	48.5	21.0	60.9	53.0	7.9	56.9	56.7	54.3	52.0	390	84	1½	½	1	9½	2½	2	6	4½	3½	1	1.48	11	2.75	55.84	57.6	48.75
September	29.888	64.0	40.0	24.0	59.5	51.0	8.4	55.2	55.3	54.0	52.2	399	91	1	3	9	4½	2	4½	2½	1½	2	1.60	19	2.75	56.25	56.2	48.75	
October	29.785	57.0	39.0	18.0	52.9	45.1	7.7	49.5	49.3	47.5	45.5	306	88	2	2	2	6½	3½	5	6	1	3	1.46	17	2.81	54.54	49.1	48.85	
November	30.120	57.0	31.5	25.5	49.6	43.3	6.4	46.4	46.5	45.1	43.5	283	90	2½	3½	1½	3½	6½	2½	5	1½	3½	1	1.30	14	1.93	52.04	46.2	48.00
December	29.837	54.0	37.0	17.0	49.8	42.1	7.7	45.9	46.4	44.2	41.8	264	85	1	...	...	2½	8½	9	7½	1½	1	1.85	23	3.55	49.81	43.6	48.00	
Totals	358.567	70.40	429.0	275.0	615.7	520.3	97.3	569.1	569.3	547.7	523.2	347.5	1040	21.5	175	44	71	54.5	44.5	68	20	25	18.54	198	31.91	595.63	568.4	560.40	
Means	29.881	58.7	35.7	22.9	51.3	43.4	8.1	47.4	47.4	45.6	43.6	289	86	1.8	1.5	3.7	6.0	4.5	3.7	5.7	1.6	2.1	1.54	16	2.66	49.63	47.4	46.70	

TABLE VI.—ABSTRACT of METEOROLOGICAL OBSERVATIONS for all SCOTLAND in 1857, as published in the REPORTS of the SCOTTISH METEOROLOGICAL SOCIETY.

	BARO-METER. Mean reduced to 32° and Sea Level.	SELF-REGISTERING THERMOMETERS.							HYGRO-METER.			DEDUCTIONS.		WIND.										RAIN.		Temp-erature of Sea.	
		Highest in Month.	Lowest in Month.	Monthly Range.	Mean of Highest.	Mean of Lowest.	Mean daily Range.	Mean Tempe- rature.	Dry Bulb.	Wet Bulb.	Dew-point.	Elastic Force of Vapour.	Humidity, Sat. 100.	Number of Days it blew from each Direction.						No. of Days.	Amount.						
														N.	N.E.	E.	S.E.	S.	S.W.			W.	N.W.	Calm or variable.	Force.		
January	29.698	55.0	4.9	50.1	39.8	31.6	8.2	35.7	35.6	34.3	32.3	.184	87	3½	3½	2	1½	2	6	7	4	2	2	1.23	16	in. 2.77	40.5
February	29.840	60.0	4.0	56.0	44.3	34.3	10.0	39.3	39.2	37.8	35.9	.211	89	½	...	1	2½	5	10½	5½	1	2	2	1.77	11	1.54	42.4
March	29.804	62.0	12.5	49.5	44.0	34.5	9.5	39.2	38.9	37.2	35.0	.205	86	1	3	7	4	3	5	5	2	1	1	1.88	16	2.94	43.0
April	29.767	66.0	20.0	46.0	48.7	36.7	12.0	42.7	42.8	40.7	38.2	.231	84	2	3	7	4	3	3½	3½	2	2	2	1.18	16	2.38	44.5
May	29.959	75.0	28.0	47.0	57.0	42.6	14.4	49.8	49.7	47.0	44.1	.290	80	1½	4	8½	4½	3	4½	2½	1½	2	2	0.79	13	1.66	48.9
June	30.020	95.0	28.5	66.5	66.0	48.8	17.2	57.4	57.6	54.4	51.7	.384	81	2	4	6	4	3	4	2½	1½	3	3	0.65	9	2.79	53.3
July	29.832	78.0	31.5	46.5	65.1	51.0	14.1	58.0	58.1	54.8	51.9	.386	80	1½	1	½	2	9½	10½	3½	3½	2	2	1.55	15	2.17	54.7
August	30.014	87.0	34.0	53.0	67.1	53.0	14.1	60.0	59.7	57.2	54.9	.433	85	2½	3	3½	3½	3	5½	4½	2	4	4	1.04	10	1.87	55.9
September	29.882	77.9	30.0	47.9	62.5	49.7	12.8	56.1	56.0	54.0	52.1	.391	87	1½	3½	3½	2	3½	6	5½	1½	3	3	1.38	15	3.82	57.3
October	29.803	71.0	24.0	47.0	55.3	43.9	11.4	49.6	49.4	47.9	46.4	.315	90	1½	3	3½	3½	3	7	6	1½	2	2	1.29	16	2.36	53.8
November	30.115	66.0	16.0	50.0	48.3	39.2	9.1	43.7	43.5	42.3	40.9	.256	90	2½	3½	4½	3½	2	5	3	2½	3½	3½	1.10	12	2.89	50.0
December	29.989	60.0	22.0	38.0	49.2	40.7	8.5	44.9	45.0	43.4	41.6	.261	88	½	...	...	1	3	15	8	2	1½	2	2.32	14	3.37	47.0
Totals	358.723	852.9	255.4	597.5	647.3	508.0	141.3	576.4	575.5	551.0	525.0	.3547	1027	20.5	31.5	47.0	34.5	35.5	81.5	63.5	24.0	28.0	16.20	163	30.56	591.3	
Means	29.894	71.1	21.3	49.8	53.9	42.2	11.8	48.0	48.0	45.9	43.7	.296	86	1.7	2.6	3.9	2.9	3.0	6.8	5.3	2.0	2.3	1.35	14	2.55	49.3	



## REMARKS ON THE CLIMATE OF ORKNEY,

By the Rev. CHARLES CLOUSTON, Minister of SANDWICK, L.R.C.S. Edin., Pres. Ork. Nat. Hist. Soc., &c.

STRANGERS have hitherto formed a wrong and unfavourable opinion of the climate of Orkney; and some of its peculiarities are only beginning to be understood by even the best informed of its own inhabitants.

Situated farther north than any part of the mainland of Scotland, or the Naze of Norway, nearly in the same latitude as Stockholm and St. Petersburg on the east, and Cape Farewell and Hudson's Bay on the west, buffeted by the Atlantic on one side and the North sea on the other, they are apt to think that its climate must be similar, or worse, than that of those hyperborean regions; Orkney is, however, more highly favoured, and the consideration of its peculiarities and their causes may be interesting.

Meteorological observations for the last 32 years have been made in Orkney; at the manse of Stromness for the first six, and at the manse of Sandwick for the last twenty-six of that period. From these it has been ascertained that the mean annual temperature of Orkney is not only equal to that of the north and middle of Scotland, but even to that of the southern border; for on comparing the Orkney table of temperature for the last 32 years, with one for 20 years, kept by that accurate observer, Dr. Dunbar of Applegarth, Dumfries-shire, we find the mean temperature of Orkney to be  $46^{\circ}26'$ , and that of Applegarth  $46^{\circ}24'$ , the difference being so minute that the mean temperature may be considered equal. While, however, this station in Dumfries is between  $4^{\circ}$  and  $5^{\circ}$  colder than Orkney in December and January, its temperature gradually rises, till, in July, which is the warmest month in both places, it is above  $3^{\circ}$  warmer than Orkney. This greater equability of the temperature of Orkney than that of the southern and interior parts of Scotland, which was thus proved by careful meteorological observations, was no doubt believed before, as continued frost in winter, and considerable heat in summer, are little known in Orkney; but that the mean annual temperature of these northern islands is equal to that of the southern border, is a fact which astonished many, and was little anticipated by the observers themselves. The mildness of the Orkney winter is indeed so great, that the mean temperature of December, January, and February there, is higher than that of several parts of England. "This arrangement may be pleasant or favourable to animal life, but it is far from favourable to vegetation, as the luxuriance of the common crops depends on the temperature of three or four months in summer, while they are in the ground, and not at all on that of the rest of the year; and if Orkney could gain a few degrees of temperature in these months, by sacrificing as many in winter, its agriculturists would greatly gain by the exchange." If this equability of temperature is injurious to the growth of common annual crops, it is doubly so to such perennials as trees, as there is neither such extreme heat in summer as to mature the wood of the young branches, which are therefore killed in winter, nor such extreme cold in winter as to lay vegetation completely asleep. Evergreens are particularly sickly in Orkney; the sea spray in winter, which frequently loads the air, and falls and crystallizes on their leaves, rendering them much more liable to be killed than other kinds of trees, some of which grow under shelter to the height of 20 or 30 feet.

It will be seen from the table of temperature for 33 years (No. I.), that the difference between the mean temperature of February, which is the coldest month ( $38^{\circ}25'$ ), and that of July, which is the warmest ( $55^{\circ}14'$ ), is only about  $17^{\circ}$ , and that during all that period the mean temperature of any month never fell so low as the freezing point, except in February 1838 and February 1855, when it was respectively  $31^{\circ}31'$  and  $31^{\circ}64'$ , and that it never rose so high as  $60^{\circ}$ , except in July and August 1852, when it was  $61^{\circ}36'$  and  $60^{\circ}64'$ .

That the Atlantic moderates the extremes, and that it elevates the temperature of winter more than it depresses that of summer, will be evident, when we consider that in 1857, when observations were first regularly noted, the Atlantic was about  $6^{\circ}$  warmer than the mean temperature of the air in January and February, and continued warmer for seven months, being nearly equal in April and August, and colder only in May, June, and July, when the difference did not amount to  $2^{\circ}$  at an average. In 1858 these differences were still more strongly marked, the mean

temperature of the Atlantic being  $49^{\circ}66'$  or  $3^{\circ}46'$  above that of the air, which it exceeded during ten months, and only fell below it during June and August. This explains also, how there is never frost and snow with west wind, and how, if the wind change to the west during frost, the thermometer speedily rises to  $40^{\circ}$  and upwards, because we have never yet found the Atlantic to be colder than  $43^{\circ}$ .

Another peculiarity of the Orkney climate is the way in which the temperature is distributed among the months; but this only becomes apparent from the result of our long series of observations. In Britain generally, and particularly in the inland parts, the greatest heat occurs about the middle of July, and the greatest cold about the middle of January, and the months equidistant from these are most nearly of equal temperature, as February and December. In Orkney, however, February is the coldest month, though only ( $0^{\circ}25'$ ) colder than January, and August is only a decimal of a degree colder than July, viz.  $0^{\circ}6'$ . Indeed in the course of these 33 years January has been colder than February 16 years, and August has been hotter than July 14 years, so that January and February may be considered equally cold, and July and August equally warm, and the months equidistant from them on each side will be found to correspond most nearly in temperature, as March and December, and again June and September. These facts are undoubted, and meteorologists agree in ascribing this retardation of the period of extreme heat and cold to the influence of the surrounding ocean, which is neither so quickly heated in summer, nor cooled in winter, as the surface of the land. The observations of the temperature of the sea are only completed for three years, and therefore we cannot speak decidedly, but we believe it will be found that its highest temperature does not occur till during or after August, nor its lowest, till during or after February, probably in September and March, and this is sufficient to account for the retardation of the extremes in islands so completely surrounded by the open sea. Whether the transparency of the water has any influence in producing this effect, as some allege, we shall not now inquire. During these 33 years, the thermometer was once observed as low as  $14\frac{1}{2}^{\circ}$  (on 16th March 1845), and once as high as  $75^{\circ}$  (on 5th June 1846), but this was without the aid of self-registering thermometers, which have only been used for about three years.

In Table No. II. will be found the mean monthly atmospheric pressure for the last 21 years. This has been registered as long as the temperature, and at the same times and places; but this is noted from a better barometer than was used during the first 12 years, and as that former record was published in the statistical account of Sandwick it need not be repeated here.

Typographical errors, however, crept in there, making the mean height for January for all that period  $29^{\circ}939$  inches instead of  $29^{\circ}689$ , and of August 1834,  $28^{\circ}736$  instead of  $29^{\circ}736$  inches.

On this table few remarks are necessary, as it does not seem to indicate any great peculiarity. The mean state of the barometer for the last 21 years is  $29^{\circ}761$  inches, as noted, or when corrected to  $32^{\circ}$ , and sea level to enable us to compare it with other places,  $29^{\circ}836$  inches. This does not differ materially from its mean height in other parts of Scotland, the mean of about 50 places published by the Scottish Meteorological Society being, for—

	in.	Mean for Sandwick.	Difference.
	in.	in.	in.
1856	29'869	29'898	- '029
1857	29'894	29'881	+ '013
1858	29'916	29'880	+ '036
Means	29'893	29'886	+ '007

the mean of all being  $29^{\circ}886$  inches, or a minute decimal '007 below the other districts.

So far as yet ascertained, therefore, they may be considered equal.

In examining the monthly means of this table, it will be seen that the barometer generally attains its greatest height in May, and gradually descends on each side, the only exception being September, when it takes a rise upward, probably indicating the period of the Orkney "little summer." The gradual descent from the maximum height becomes prominent only in a long series of observations. The same tendency may be perceived in the tables published in the "New Statistical Account" of Sandwick and of St. Andrew's, in Orkney, though the descent is not so regular, and in the latter the greatest height is in June. On the 24th January 1840 the mercury was as low as  $27^{\circ}69$  inches, and on 1st February 1841 as high as  $30^{\circ}76$  inches, giving a range during these 20 years of  $3^{\circ}07$  inches.

In Table No. III. will be found the total quantity of rain at Sandwick Manse for each month during the last 19 years, from which it will be seen that the average annual quantity for that time

is 36·95 inches. This is more than 10 inches above Dr. Barry's estimate, which had been assumed as correct by others without actual measurement. The paucity of observations in other places renders it impossible to say at present whether this is above or below the average for Scotland, and indeed much would depend on the situation of those places from which that average was struck. It will probably be found equal to the average fall in the interior of Scotland and England; below what is stated to fall on the west coast, and above that on the east. If an extensive table now before us is to be relied on, it is about equal to the fall in Applegarth, Liverpool, and Swansea, which is 34 inches; Dumfries and Manchester 36; Langholm, Dover, and Selborne 37; Aberdeenshire 38; while it is decidedly above Edinburgh, which is 26 inches, York 22, and London 20; and below Glasgow, which is 40 inches, Ayrshire 42, Whitehaven 48, Keswick 67, and Eastwaite 86. From the reports of the Meteorological Society, published for 1856, 1857, and 1858, it appears that the average of all their stations for these three years was 32·49 inches, while the average for Orkney for the same years was only 31·23 inches, which makes Orkney appear particularly dry; but it would be unfair to found such a conclusion on so limited a period of observation. They must rather be considered as exceptional years, the two first being the driest in Orkney during the period of registration, so that the crops were injured by excessive drought, while there was excessive rain in more southerly districts, from which the crops there suffered severely.

As in the former tables, so in this of the rain, may be observed in the monthly means a gradation from the minimum to the maximum quantity, which may perhaps be more regular in a longer series of years. Thus May has the least rain, as well as the highest barometer, and the preceding months, embracing the previous December, have more rain the more they precede it. Again, the quantity gradually increases in the succeeding months till October, which is decidedly the wettest, only indicating the "little summer" in September by a somewhat smaller fall than during what are called the "lammas speats" in August. In a table for 15 years, kindly furnished by Dr. Dunbar of Applegarth, this gradation is not so marked. April is rather the driest month there, and the fall is greater in May and the four succeeding months, than in Orkney, but less in the remaining seven. It should be observed, however, that the parish of Sandwick, where these observations have been made, seems to have a greater fall of rain than any other station in Orkney where it has been measured, probably owing to the place of observation lying within two miles of the west coast, where the precipitous hills that bound the islands condense into heavy and frequent showers the vapours of the Atlantic, or of the warm Gulf stream. Thus at the lighthouse in Graemsay, which is about as far west as Sandwick, and in the neighbourhood of the high hills of Hoy, the fall during the last six years, of which I am favoured with a return, is only about half an inch less than that of Sandwick, three years being more and three years less. Again, at the Start lighthouse on the eastern extremity of Orkney, from which I am favoured with a return for 9 years, the mean fall is nearly 12 inches less than in Sandwick. And in Shapinshay, at the residence of David Balfour, Esq., of Balfour and Trenaby, which is about 12 miles E. of Sandwick, and twice as far S.W. of the Start lighthouse, the return which that gentleman has kindly furnished for the last two years shows a fall of only 13·55 inches in 1857, and 23 inches in 1858. The period of observation is yet very short, but it seems to indicate a smaller fall than in almost any other part of Britain.

The direction and force of the wind have also been noted every morning and evening for 33 years, and from the table which we give, No. IV., the number of days that it blew in any direction any of these years, or the prevailing winds for that period, may at once be seen. The west used to be considered the most prevalent wind in Orkney, but from this it appears not to have been so for the period noted. It blew from the W., S.W., S., and S.E. 7,194 days, while from the opposite four points it blew little more than half that time, or 4,154 days. The west wind indeed prevails more than that from any other cardinal point, but the S.E. prevails above it, for if we do it equal justice with the west, by adding 236 days of E.S.E. which were given to the E., and 250 days of S.S.E. which were given to the S., we find 2,612 days of S.E. wind, against the 2,230 days of W., or 382 days in favour of the S.E. There seems to be a group of years when the S.E. is in excess, and then a group when the W. is so. In the first decade it exceeds the W. very little; in the second a great deal; in the third the W. not only seems to prevail, but the restoration of the intermediate points to the S.E. still leaves it in the minority.\*

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\* As nothing is said of the magnetic variation, which is large at the Orkney Islands (nearly  $26^{\circ}=2\frac{1}{2}$  points), and as seafaring communities usually refer to the magnetic compass, a re-consideration of these winds, and their relative prevalence, seems advisable.—R. F.

Does Orkney owe much of the mildness of its climate to this prevalence of S. and W. winds? This is not the place to discuss the question, but much light will be thrown on it and other subjects by examining the table, and comparing it with the others.

The institution of the Scottish Meteorological Society, and the publication of their reports, promise to illustrate the meteorology of Scotland, from the great number of observers using similar instruments, placed in similar positions, and at the same hours, thus furnishing excellent means of comparison. The register at Sandwick has been kept uniformly with their other stations for the three years of their publication, and we shall add the table No. V., being an abstract of meteorological observations in Orkney for 1857, along with a similar one for the same year (No. VI.), condensed from all their stations, to allow a comparison to be made between the climate of Orkney and that of Scotland in general. It would indeed be absurd to form a decided opinion from the observations of one year; but it would be as absurd to shut our eyes to the light which they afford us, when they corroborate and illustrate our former observations, and throw much light on other points not previously observed.

The difference in the state of the barometer, by these tables, is too trifling to deserve notice. Orkney was a little below the average for Scotland in 1857, but it was more above it the previous year.

The columns for self-registering thermometers prove the equability of the Orkney climate much more clearly than the previous table of temperature by the common thermometer. It may be seen that in one part of Scotland the greatest heat of summer was  $25\frac{1}{2}$  degrees above that of Orkney, and the greatest cold of winter 21 degrees below it, thus showing a much wider range of temperature; but that is not a fair comparison, as it refers to only a single observation at one place only. The columns, however, showing the "means of all the highest" and lowest, with the mean daily range, may be consulted with advantage; for though the extremes of different districts are reduced by being thus taken together, yet they show that June, July, and August are at an average  $7\cdot6^{\circ}$  hotter during the day, and seven months are colder during the night, throughout Scotland, than in Orkney, while the latter has a smaller daily range of temperature every month, and in June the difference is  $10^{\circ}$ .

By these tables the temperature of Orkney seems to be about half a degree lower than the other districts, but it was at least equal in 1856. The mean temperature of Orkney for 1857 is proved to be  $47\cdot4^{\circ}$ , by the entire agreement of the self-registering thermometers, the dry bulb one and that 12 inches deep in the soil. The temperature of the deepest spring may also be considered a proof of its correctness, and of that of the mean annual temperature formerly stated, for though it is not much influenced by the remarkable mildness of the latter months of that year, yet it is nearly half a degree higher than the mean annual temperature.

The hygrometer, which is Mason's, shows ( $0\cdot3^{\circ}$ ) less evaporation in Orkney than in the other districts. In noticing the deductions, calculated from Glaisher's tables, we may pass without remark the minute differences in the "dew point" and in the "elastic force of vapour," but we cannot thus pass the very unexpected result of this first year's observations, that the humidity of the atmosphere in Orkney is exactly equal to the average of Scotland. These islands have always been characterized as damp; the surrounding water led us readily to believe it; salt and sugar are so apt to become damp, and steel to rust, that few could anticipate such a result. We were, however, in some measure prepared for it, as during the latter half of the previous year, when these hygrometric observations were first made, the humidity in Orkney was only  $84\cdot1$ , while the average of Scotland was  $84\cdot8$ . Perhaps the quantity of salt in the atmosphere from the sea spray may partly account for these effects of humidity. In the column showing the number of rainy days in each month, it appears that the number in Orkney was 198, giving an average of 16 to each month, while in the average of all the districts it was only 163, giving an average of 14 to a month. That the difference should be on this side might be anticipated, from the latitude of Orkney, and the peculiarity of its situation, and we believe that this difference will be rather increased than diminished by a long series of observations, for in 1856 the number was 212 in Orkney, and only 160 over Scotland, giving 52 more to Orkney.

It may be interesting to compare the columns for wind with the others, as it will illustrate the peculiarity of the season. Thus the prevailing W. and S.W. winds in July, along with the fall of the barometer, will explain the cause of the rain which fell then, and saved the crops which had suffered exceedingly from the unprecedented drought of the previous three months. The mean pressure of the wind in Orkney seems to have exceeded that in the other districts by a decimal ( $0\cdot19^{\circ}$ ); but as no anemometer was used, this can only be viewed as an approximation to the truth.

The only column remaining to be considered is that containing the mean temperature of the sea, from observations made at least once a week, and generally more frequently.\* Having already remarked some points regarding it, we now call attention to the fact, that the mean temperature of the sea for the year is  $49^{\circ}6'$ , or  $2^{\circ}2'$  above that of the air and the soil, and nearly  $3^{\circ}$  above that of our best springs. It is even above the mean temperature of any year yet recorded, and a little above the mean temperature of the sea around the coast of Scotland. This seems one of the strongest proofs that the Gulf stream reaches the shores of Orkney, or that some stream from a warmer climate, by whatever name it may be called, raises the temperature of the sea beyond what it could be raised by the power of the sun in Orkney, and higher than it raises that of the air, the soil, or the springs. Without such a stream, we are not aware that the mean temperature of the sea in other places exceeds that of all other things showing the mean temperature of the localities. As this stream carries to Orkney, along with its increased temperature, productions of the West Indies, the gulf weed, bottles thrown overboard on the passage between Britain and America, &c., we think its origin proved, and know no other satisfactory explanation of all the phenomena.

The Aurora Borealis is sometimes very brilliant in Orkney, and frequently gives more or less light during the winter nights.

Sun-pillars are occasionally seen about sunset and sunrise in spring. They were first remarked in 1852, when they were particularly fine, and appeared six times at sunset in April alone.

Waterspouts are very rare. The writer has only seen one, which passed over the sea about a mile east of Stromness on 12th September 1839, and the upper portion caught his attention in Sandwick, six miles off, appearing like a dark funnel-shaped cloud, hanging down from other dark clouds.

From the preceding tables and remarks it appears that the mean annual temperature of Orkney is equal to that on the southern border of Scotland, but much more equable, neither so hot in summer nor so cold in winter; that the mean annual quantity of rain is about  $36\frac{1}{2}$  inches, probably near the average of Scotland, and falling on a greater number of days, though the humidity of the atmosphere is not greater, so far as meteorological instruments have yet ascertained; that winds from the S. and W. and neighbouring points prevail much more than those from the opposite quarters, and probably tend much to promote the mildness of the climate; but this is ascribed principally to the surrounding ocean, the mean temperature of which was in 1857 fully  $2^{\circ}$ , and in 1858 more than  $3^{\circ}$  above that of the air; and much more in winter, so that it greatly elevates the temperature then, and depresses a little that of summer. The Orkney crops of the more hardy kinds of grain, as oats, bere, and barley, are equal to those of other parts of Scotland. Its potatoes are famous in the southern markets for seed; as the Orkney beds, grown in Orkney, are less apt to take the disease, when planted in the south, than any other variety; but green crop is that in which it particularly excels.

The gardens are scarcely behind those in the south for the more hardy kinds of vegetables, fruits, and flowers. Apples do not grow well as standards, but thrive pretty well as wall trees. Pears and cherries grow, but are not very productive. Black currants thrive, even better than in the south. Red and white currants and strawberries grow very well, but gooseberries do not always ripen. All the more hardy annuals, and perennials, met with in the south, also adorn the Orkney gardens.

In short, the climate of Orkney is such that it might form a pleasant retreat in summer from the sultry and dusty atmosphere of large towns, and might even be beneficial to some invalids.

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\* I beg to acknowledge my obligations to Mr. William Watt, who resides near the sea shore, for these observations on the temperature of the Atlantic, and to Mr. J. M. Aim, for much assistance in calculating monthly means and copying reports, which are sent monthly to the Scottish Meteorological Society, and to the Austrian and Belgian Governments.