VII. *On the Meteorology of the Lake District of Cumberland and Westmoreland; with a continuation of the Results of Experiments on the Fall of Rain at various heights, up to* 3166 *feet above the sea level.*

By John Fletcher Miller, *F.R.S., F.R.A.S., Assoc. Inst. C.E.*

Communicated by Lieut.-Colonel Sabine, *For. Sec. R.S.*

Received March 7,—Read May 30, 1850.

Introductory Remarks.

THE Roman numerals at the head of the Tables refer to the same stations as in former years. The gauge at Round Close near Whitehaven has been discontinued, and a new station has been established on the top of Lingmell (which mountain forms the lower part of Sca Fell facing the village of Wastdale Head), so that the number of instruments is the same as in the year 1848.

During the spring, summer and autumn, the mountain gauges are emptied on the last day of each month, whatever may be the state of the weather at the time; but in the winter months, they are of course only examined when accessible, or when the contents are judged to be in a state of partial or entire liquefaction. These gauges have been frozen up since the end of October last; and at the close of the year the higher stations were inaccessible from ice and snow. On the 31st of January, 1850, the whole of the receivers were brought down into the valley, and their contents liquefied by artificial heat.

In severe winters, like the present, I find it difficult to get parties to attend to these instruments, for almost any pecuniary recompense; indeed, so great is the risk of fractured limbs, and the sacrifice of life itself, that even the hardy shepherds shrink from the task of ascending such elevated and rugged peaks as Sca Fell Pike and the Gabel, at this season; and when there is a considerable accumulation of snow on the summits, an occurrence by no means unusual, it is quite impracticable. On the 31st of January, as the person who has charge of the gauges was ascending the Gabel, with two large empty copper receivers fastened together, his foot slipped and he slided down the precipice, a distance of several hundred yards, but fortunately escaped without any material injury. The receivers parted company in the descent, and both of them were literally dashed to pieces. On the same day a shepherd met with a similar accident on Sca Fell, and the injuries he sustained were of so serious a nature as to endanger his life.

I regret that my endeavours to obtain the monthly extremes of temperature on the summit of Sca Fell Pike have hitherto failed.

The indications for 1849 are apparently so erroneous, that I cannot place any dependence upon them. The instruments are slightly inclined in the box, which is riddled with small circular holes, and it is supposed that strong currents of air passing through them have shaken the thermometers, and caused the indices to descend in the tubes. The instruments are now fastened in the case, and I hope to secure correct readings during the current year.

TABLE I.—Synopsis of the Fall of Rain in the Lake District of Cumberland and Westmoreland, in the year 1849.

No.	I.	II.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.	XVII.	XVIII.	XIX.	XX.	Prevailing winds.		
	Whitehaven.										Eskdale.			Westmoreland.			Borrowdale.					
																	Seathwaite.					
1849.	High Street, 90 feet above the sea.	St. James's Church Steeple, 78 feet above the street, and 168 feet above the sea.	The Flosh, three miles south-east of Whitehaven.	Cockermouth. 126 feet above the sea,	Bassenthwaite Halls, 210 feet above the sea.	Keswick, 258 feet above the sea.	Vale of Gillerthwaite, Ennerdale, 396 feet above the sea.	Loweswater, 336 feet above the sea.	Foot of Crummock Lake, 283 feet above the sea.	Gatesgarth, 326 feet above the sea.	Centre of Vale.	Head of Vale.	Wastdale Head, 247 feet above the sea.	The How, Troutbeck, 300? feet above the sea.	Ambleside, 190 feet above the sea.	Langdale Head, 250? feet above the sea.	In Garden, 6 inches above the surface.	In Field, 18 inches above the surface.	Stonethwaite. 330 feet above the sea,	At Crummock Lake, two observations daily.	At Seathwaite, one observation daily.	At the Coast*, two observations daily.
January.....	in. 5·683	in. 3·517	in. 6·82	in. 7·18	in. 7·36	in. 11·028	in. 14·20	in. 10·545	in. 12·17	in. 17·54	in. 8·97	in. 9·89	in. 21·35	in. 16·858	in. 12·80	in. 25·61	in. 24·96	in. 23·96	in. 20·02	s.w. to w.	s.w. to w.	s.w.
February ...	2·045	1·414	2·63	1·85	2·10	2·260	3·25	2·744	3·38	4·65	3·72	5·57	6·27	4·539	2·92	6·31	7·55	7·25	5·47	s.w. to w.	s.w. to w.	s.w.
March	·837	·435	1·12	1·47	1·94	1·692	3·00	2·135	2·48	3·53	2·07	3·34	4·94	1·641	1·93	4·88	5·51	5·32	3·41	s.w. to w.	s.w. to w.	s.w. & N.W.
April	1·488	1·104	1·60	1·91	2·74	2·358	1·80	2·209	2·91	2·69	2·48	3·03	3·55	1·837	1·72	3·22	3·88	3·78	3·01	E.	var.	E.
May	3·037	2·340	3·17	2·34	2·08	2·364	4·68	3·210	4·21	5·42	3·85	4·56	5·60	3·223	2·92	5·94	6·52	6·07	4·24	s. to s.w.	s. to s.w.	s.w.
June	1·224	·760	1·51	1·41	1·52	1·028	2·80	1·720	2·13	2·24	1·58	1·72	3·29	1·653	1·50	2·86	3·97	3·93	2·64	s.w. to w.	s.w. to w.	s.w.
July	5·478	3·622	6·34	3·91	4·04	5·104	10·07	8·147	9·53	13·94	7·21	8·83	14·29	6·350	6·56	11·01	16·64	16·60	11·18	s.w. to w.	s.w. & N.W.	N.W. var.
August	3·771	4·042	4·27	3·85	4·71	6·126	7·08	4·900	5·38	6·19	5·55	5·84	7·65	5·396	6·92	8·01	9·92	9·27	7·65	s.w. to w.	s.w. to w.	s.w.
September...	2·814	2·043	2·89	2·33	2·04	2·990	4·00	3·220	3·30	3·89	3·42	4·47	4·22	3·793	2·96	4·90	4·08	3·98	3·63	E.	E.	N.E.
October.....	5·252	3·940	6·19	5·43	4·66	5·854	11·60	7·060	11·64	18·25	8·13	9·56	14·84	12·957	11·36	12·79	16·14	15·88	12·54	s. to w.	s. to s.w.	s.w.
November...	4·974	3·462	5·90	4·83	4·80	5·620	9·60	6·270	8·84	13·02	8·54	9·51	14·39	11·023	8·93	15·36	18·75	18·46	14·20	s. to s.w.	s.w. to w.	s.w.
December...	2·396	1·538	2·69	1·88	2·01	2·378	4·33	3·120	4·24	5·73	3·86	4·90	6·83	6·155	4·86	6·94	7·55	7·07	6·28	E.	var.	s.w.
1849.	38·999	28·217	45·13	38·39	40·00	48·802	76·41	55·280	70·21	97·09	59·38	71·22	107·22	75·425	65·32	107·83	125·47	121·57	94·27	s.w. to w.	s.w. to w.	s.w.
1848.	47·342	36·344	60·82	52·37	47·06	66·407	97·73	76·668	98·07	133·55	70·38	86·78	115·32	91·347	77·58	130·38	160·89	157·22	130·24	s.w.	s.w.	s.w.
1847.	42·921	30·713	47·80	42·55	44·45	58·286	80·13	66·296	82·32	106·25	58·66	74·93	96·34	78·004	.....	112·95	129·24	126·80	106·21	westerly.	s.w.	s.w.
1846.	49·134	35·422	55·16	52·41	.....	67·678	83·87	79·249	96·47	121·90	.....	.....	106·93	77·719	.....	127·40	143·51					
1845.	49·207	33·489	53·00	46·93	.....	62·202	76·88	69·542	87·48	124·13	.....	.....	108·55	76·305	.....	136·00	151·87					
1844.	36·723	27·862	39·31	.....	.....	40·629	54·62	49·829	61·46	.....	.....	.....	80·01	51·986								

* The prevailing wind at the coast, in 1849, is between the S. and W.S.W. points inclusive; in the Lake District it appears to have been rather more westerly, or between the S.W. and W. points inclusive; but in these confined narrow valleys, an approximation to the true direction of the under current is all that can be looked for.

Table II.

Wet Days.

1849.	Whitehaven.	The Flosh.	Cockermouth.	Bassenthwaite Halls.	Keswick.	Loweswater Lake.	Crummock Lake.	Eskdale.	Wastdale Head.	Ambleside.	Troutbeck.	Langdale Head.	Seathwaite.	Stonethwaite.
January ...	20	21	20	19	20	22	19	20	22	21	20	22	20	22
February...	12	14	14	12	15	15	14	13	21	12	16	16	17	15
March.....	12	10	12	10	16	11	11	13	20	11	9	12	13	11
April	16	15	21	18	22	21	18	16	25	13	17	18	19	17
May	14	14	15	13	16	17	14	14	18	10	14	15	15	15
June	10	10	8	11	8	9	7	8	12	6	11	9	10	9
July.....	18	19	19	15	17	15	16	17	20	12	16	16	18	15
August ...	19	18	19	17	18	17	17	16	22	13	17	20	18	16
September..	12	10	11	13	14	11	12	11	13	9	11	13	10	12
October ...	17	17	17	18	19	18	22	17	20	16	18	20	18	18
November..	24	22	21	20	20	18	19	18	22	22	22	22	20	19
December..	15	15	14	16	20	17	16	17	21	14	15	18	15	14
1849.	189	185	191	182	205	191	185	180	236	159	186	199	193	183
1848.	210	207	228	196	229	217	207	205	243	.....	201	212	232	224
1847.	191	183	210	199	204	190	199	.....	226	.....	188	209	202	195
1846.	200	208	234	.....	213	198	216	.....	234	.....	194	213	219	
1845.	193	175	212	.....	195	195	202	.....	211	.....	180	.....	211	

Table III.

Showing the Quantity of Rain received by the Mountain Gauges in thirteen months, between the 1st day of January 1849, and the 31st day of January 1850.

No.	XXI.	XXI.[2]	XXII.	XXIII.	XXIV.	XXV.	XIV.	XIII.	XXVI.	XIX.
	Sca Fell.						The Valley.		Borrowdale.	
1849.	The Pike, 3166 feet above the sea.	Top of Lingmell, 1778 feet above the sea.	Great Gabel, 2925 feet above the sea.	Sparkling Tarn, 1900 feet above the sea.	Stye Head, 1443 feet above the sea.	Brant Rigg, about 924 feet above the sea.	To the west, Wastdale, 247 feet above the sea.	To the south-east, Eskdale, height unknown.	Seatollar Common, 1388 feet above the sea.	The Valley, Seathwaite, 368 feet above the sea.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January ...	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	21·35	9·89	19·00	23·96
February...	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	6·27	5·57	Frozen.	7·25
March.....	15·53	17·78	17·24	27·17	23·64	18·13	4·94	3·34	7·40	5·32
April	1·48	3·21	1·86	4·14	3·40	4·00	3·55	3·03	2·18	3·78
May	4·42	4·96	4·37	6·20	6·00	4·72	5·60	4·56	3·84	6·07
June	2·75	3·15	3·30	3·71	3·49	2·11	3·29	1·72	2·74	3·93
July.....	11·99	11·85	11·60	13·04	14·50	10·03	14·29	8·83	12·58	16·60
August ...	8·98	7·14	8·10	11·70	10·20	9·14	7·65	5·84	8·60	9·27
September..	4·54	3·30	4·10	4·40	4·87	3·70	4·22	4·47	3·98	3·98
October ...	14·00	15·50	15·00	19·48	15·23	10·93	14·84	9·56	18·30	15·88
November..	Frozen.	12·52	Frozen.	Frozen.	Frozen.	Frozen.	14·39	9·51	12·73 part frozen.	18·46
December..	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	6·83	4·90	Frozen.	7·07
1850.										
January ...	19·52	12·49	19·35	31·26	23·82	24·54	7·26	5·68	17·62	6·46
Inches.....	83·21	91·90	84·92	121·10	105·15	87·30	114·48	76·90	108·97	128·03

TABLE IV.—For the Summer Months.

No.	XXI.	XXI.[2]	XXII.	XXIII.	XXIV.	XXV.	XIV.	XIII.	XXVI.	XIX.
1849.	Sca Fell.		Great Gabel, 2925 feet above the sea.	Sparkling Tarn, 1900 feet above the sea.	Stye Head, 1443 feet above the sea.	Brant Rigg, about 924 feet above the sea.	The Valley.		Borrowdale.	
	The Pike, 3166 feet above the sea.	Top of Lingmell, 1778 feet above the sea.					To the west, Wastdale*.	To the south-east, Eskdale.	Seatollar Common, 1388 feet above the sea.	The Valley, Seathwaite, 368 feet above the sea.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
May	4·42	4·96	4·37	6·20	6·00	4·72	5·60	4·56	3·84	6·07
June	2·75	3·15	3·30	3·71	3·49	2·11	3·29	1·72	2·74	3·93
July	11·99	11·85	11·60	13·04	14·50	10·03	14·29	8·83	12·58	16·60
August ...	8·98	7·14	8·10	11·70	10·20	9·14	7·65	5·84	8·60	9·27
September..	4·54	3·30	4·10	4·40	4·87	3·70	4·22	4·47	3·98	3·98
October ...	14·00	15·50	15·00	19·48	15·23	10·93	14·84	9·56	18·30	15·88
Inches.....	46·68	45·90	46·47	58·53	54·29	40·63	49·89	34·98	50·04	55·73

TABLE V.—For the Winter Months.

1849.	Sca Fell.		Great Gabel.	Sparkling Tarn.	Stye Head†.	Brant Rigg.	The Valley.		Borrowdale.	
	The Pike.	Lingmell.					To the west, Wastdale.	To the south-east, Eskdale.	Seatollar Common.	Valley. Seathwaite.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
January ...	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	21·35	9·89	19·00	23·96
February...	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	Frozen.	6·27	5·57	Frozen.	7·25
March ...	15·53	17·78	17·24	27·17	23·64	18·13	4·94	3·34	7·40	5·32
April	1·48	3·21	1·86	4·14	3·40	4·00	3·55	3·03	2·18	3·78
November..	Frozen.	12·52‡	Frozen.	Frozen.	Frozen.	Frozen.	14·39	9·51	12·73 part frozen.	18·46
December..	Frozen.	Frozen§.	Frozen.	Frozen.	Frozen.	Frozen.	6·83	4·90	Frozen.	7·07
1850. January ...	19·52	12·49	19·35	31·26	23·82	24·54	7·26	5·68	17·62	6·46
Inches.....	36·53	46·00	38·45	62·57	50·86	46·67	64·59	41·92	58·93	72·30

* Sca Fell is situated between the heads of the valleys Wastdale and Eskdale.

† There is a marked deficiency at this station in the winter months, whilst in the summer months the *proportion* is above the average at this altitude.

‡ The receiver was brought into the valley and its frozen contents melted.

§ January 31, 1850. The whole of the receivers were brought down into the valley and their contents liquefied.

TABLE VI.—Temperature at Seathwaite in Borrowdale, in 1849.

1849.	Absolute.		Mean of Max.	Mean of Min.	Approximate mean Temperature.	Mean at 9 A.M.	On Grass.				Prevailing winds.
	Max.	Min.					Min.	Mean.	Radiation.		
									Max.	Mean.	
	°	°	°	°	°	°	°	°	°	°	
January	50	16	40·95	32·82	36·88	36·91	5	29·20	13·2	4·16	s.w. to w.
February	49·8	26	44·85	37·46	41·15	41·07	20	34·77	7·5	3·08	s.w. to w.
March.....	52	26	46·35	36·51	41·43	41·00	21	32·74	12·0	3·54	s.w. to w.
April	60	26	45·98	36·45	41·21	40·71	17·3	32·09	10	4·36	Var.
May	69	36	58·03	45·32	51·67	50·05	27	37·73	15	7·59	s. to s.w.
June	71	40	61·40	48·50	54·95	54·40	28	39·41	15	9·08	s.w. to w.
July	76·3	46	63·11	53·05	58·08	56·79	33	44·85	17	8·19	s.w. and N.W.
August	71·5	44	61·99	53·32	57·65	57·00	32	46·72	13	6·60	s.w. to w.
September	71	39	59·64	46·91	53·27	52·75	26	37·26	15·5	10·03	E.
October	62	30	50·38	40·29	45·33	44·59	21	33·88	11·5	6·41	s. to s.w.
November	59	25	48·35	38·30	43·32	42·10	15	32·16	10	6·13	s.w. to w.
December	50	20	40·35	32·85	36·60	36·80	13	27·25	10	5·60	Var.
1849.	61·8	31·1	51·78	41·81	46·79	46·18	21·5	35·67	12·4	6·23	s.w. to w.
1848.	62·4	30·5	52·15	42·06	47·10	46·76	20·5	35·18	12·9	6·91	s.w.
1847.	62·7	29·9	52·89	42·04	47·46	47·21	.....	.....	.....	.....	s.w.
At Whitehaven.											
1849.	62·3	33·7	53·24	44·15	48·69	.....	18·8	35·05	18·4	9·09	s.w.
1848.	62·9	32·6	53·77	43·79	48·78	.....	20·2	35·73	15·9	8·06	s.w.
1847.	62·2	33·7	53·85	43·50	48·68	.....	21·4	36·05	15·1	7·45	s.w.

Remarks.

As regards the fall of rain, the years 1848 and 1849 have been of a totally opposite character; for, whilst 1848 was by much the wettest, the year 1849 is the driest which has occurred since these experiments were begun in the summer of 1844. In 1849, the vales of Seathwaite, Langdale, Gatesgarth, Buttermere and Loweswater, have received less rain than the average of the four previous years by 20·90 inches, 18·85 inches, 24·36 inches, 20·88 inches, and 17·65 inches respectively; and 35·42 inches, 22·55 inches, 36·46 inches, 27·86 inches and 21·38 inches respectively, less than in the excessively wet year 1848.

It is a remarkable fact, that whilst from one-fourth to one-seventh less rain than usual has descended in the valleys generally, Wastdale Head has obtained nearly half an inch *more* than its average quantity*. It will be observed that the south-west wind has prevailed to an unusual extent in the past year. The south-west is the predominant wind in nine months of 1849, and in the other three months it has been the same current which brought the rain. Now, whereas the valleys in general open out towards the north-west, the Vale of Wastdale directly faces the south-west, and a cur-

* The rain was read off and recorded by the same registrar as in former years, and there can be no doubt of the correctness of the returns. That this instrument must have been attended to with the greatest regularity, is evident from the fact of there having been 236 measurements of rain at Wastdale Head in 1849, a number considerably exceeding the wet days at any other station, so that the smallest appreciable portions must have been recorded.

rent from that quarter flows freely up the valley without any intervening object to obstruct its progress; so that an extraordinary prevalence of south-westerly winds might be expected to increase the amount of rain at Wastdale, and to diminish it in the other valleys; and *vice versâ*, with a long continuance of north-westerly winds. Troutbeck, which is similarly situated to Wastdale, has only received about 5 inches, or one-sixteenth less than the average quantity.

The wet days at Wastdale are generally about sixteen more than at Seathwaite, the wettest of the stations; but in 1849, they are forty-three in excess, and thirty-one more than have been recorded in any other part of the Lake District.

This may be accounted for from the fact, that the mountains surrounding the Head of Wastdale are both the highest and the nearest to the sea; their elevated peaks attract the clouds, and occasionally deprive them of the *whole* of their water; and such appears to be more particularly the case in dry seasons and periods. Hence Wastdale is visited with many showers which never reach the more inland valleys. The increase in the annual depth of rain from this cause is, however, very trifling.

Gatesgarth, which usually obtains about one-fifth more rain than Wastdale, in 1849 has received nearly 10 inches *less*; and in the latter half of the exceedingly dry year 1844, I find that the excess was also in favour of Wastdale.

These abnormal results are evidently the effect of the position or bearing of the respective valleys in regard to the prevalent wind. Wastdale may be said to receive the south-west wind with open arms; but, at Gatesgarth, it traverses the narrow valley and its mountain ridges nearly at right angles.

The wettest days in 1849 were the 24th of January and the 24th of October; on the former there fell 4·30 inches at Seathwaite, and on the latter 4·37 inches at Wastdale Head. In four days, between the 22nd and 25th of October, the fall at Wastdale was 9·94 inches, and at Seathwaite 10·79 inches.

The average depth of rain in the different valleys throughout the Lake District during the last five years, is as under:—

	inches.
High Street, Whitehaven	45·52
St. James's Church Steeple, Whitehaven	32·84
The Flosh, three miles south-east of Whitehaven	52·38
Cockermouth	46·53
Bassenthwaite (three years)	43·83
Keswick	60·67
Gillerthwaite, Ennerdale	83·00
Loweswater Lake	69·40
Crummock Lake	86·90
Gatesgarth	116·58
Eskdale, middle of vale (two years)	64·88
Eskdale, head of vale (two years)	79·00

	inches.
Wastdale Head	106·87
Ambleside (two years)	71·45
The How, Troutbeck, Westmoreland	79·76
Langdale Head, Westmoreland	122·91
Seathwaite, Borrowdale	142·19
Stonethwaite, Borrowdale (two years)	112·25

In my last paper I stated that the inhabitants of the Lake District valleys enjoyed a milder and more equable climate than the residents in the open country, and particularly in the winter months. This remark is confirmed by the thermometrical results of the present winter, as will be seen by inspecting the following comparative table:—

1849.	Seathwaite.				The Flosh, Whitehaven.				Cockermouth*.	
	Mean of max.	Mean of min.	Mean temperature.	Absolute min.	Mean of max.	Mean of min.	Mean temperature.	Absolute min.	Mean of min.	Absolute min.
November ...	48°·35	38°·30	43°·32	25°	45°·56	35°·50	40°·53	20°	37°·73	22°
December ...	40·35	32·85	36·60	20	39·39	29·32	34·35	18	31·55	20
1850.										
January	36·88	28·42	32·65	19	34·45	25·48	29·96	14	27·16	14
Means.....	41·86	33·19	37·52	19	39·80	30·10	34·94	14	32·14	14

Seathwaite is about fourteen miles inland. The Flosh is three miles south-east of Whitehaven, and the same distance from the sea in the direction of the mountains. Cockermouth is about six miles from the nearest part of the coast, and eight miles nearer to the sea than Seathwaite. Now places situated on the west coast of England are generally warmer than more inland localities; and, were the whole country a vast plain, the temperature would probably be found to diminish with some regularity in proportion to the distance from the western ocean; but from the operation of causes referred to in a former paper, the mountain district of Cumberland is an exception to the general fact.

At Seathwaite, the thermometer on the grass has been below the freezing-point in every month of 1849, except July, when it was 1° above it; and the mean of the whole absolute minima is 10°·5 below the point of congelation.

In January, this thermometer was at or below 32° on seventeen nights; in February, on ten nights; in March, on fourteen nights; in April, on fifteen nights; in May, on eight nights; in June, on six nights; in July, on 0 nights; in August, on two nights; in September, on nine; in October, on sixteen; in November, on fifteen; and in December, on twenty-four nights. The thermometer used for showing the temperature at the surface is a common RUTHERFORD; had a more delicate instru-

* The maximum thermometer was not recorded at Cockermouth in 1849.

ment been employed for the purpose, the mean of the terrestrial radiation would probably have been about a degree higher than the result shown in the table. A naked thermometer under pretty similar circumstances, at Whitehaven, has been below 32° in every month of last year, viz. in January, on nineteen; in February, on fourteen; in March, on thirteen; in April, on eighteen; in May, on eleven; in June, on eight; in July, on one; in August, on two; in September, on five; in October, on sixteen; in November, on thirteen; and in December, on twenty-four nights. The mean of the whole minima is 18°·8.

The Mountain Gauges.—On the whole, the results are similar to those of the three preceding years, but, as might be looked for in a dry year like the past, the quantities deposited at the various stations are more nearly equal than usual; in other words, the differences are not so great or striking as obtain in either wet or average periods.

A trifling change in the position of the gauge on Seatollar Common in Borrowdale, has led to some rather startling results, which promise in time to guide us to the proximate cause of the enormous excess of rain in this valley over every other in the Lake country. It is expected that this gauge (Seatollar, supposed to be 1300 feet above the sea), which has hitherto obtained about one-fifth *less*, will in future impound quite as much, or even more rain than the noted vale of Borrowdale.

The year 1849 has not enabled me to add any new fact of importance to those already communicated to the Royal Society in reference to this part of the inquiry; and as the past annual period has evidently been of an anomalous character, I think it better to avoid drawing any inference or conclusion from the results which it has afforded. I am the more inclined to defer deductions to a future time, from the circumstance of my having been compelled to estimate the heights of some of the mountain stations, which have never been measured; and because I hope to have an opportunity of taking the altitudes myself in the course of the ensuing summer. These scanty remarks must therefore be regarded as a mere supplement to the papers previously printed in the Philosophical Transactions.

The Observatory, Whitehaven,
February 11, 1850.