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DISTRIBUTION OF THE MAGNETIC DECLINATION
IN THE UNITED STATES FOR
JANUARY 1, 1910.

WITH ISOGONIC CHART AND SECULAR CHANGE TABLES

BY

R. L. FARIS

Inspector of Magnetic Work; Assistant, Coast and Geodetic Survey

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DISTRIBUTION OF THE MAGNETIC DECLINATION IN THE UNITED STATES FOR JANUARY 1, 1910, WITH ISOGONIC CHART AND SECULAR CHANGE TABLES.

By R. L. FARIS,

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INTRODUCTION.

Since the publication of the isogonic chart of the United States for 1905,¹ so much additional data have been accumulated and the secular change of the magnetic declination has undergone such material modification that a new chart is demanded. January 1, 1910, was selected as the epoch for the chart, in order that the reduction of the observations to that epoch might be based on actual observations of the secular change. With that end in view particular attention was paid to the reoccupation of old stations during the years 1909 and 1910.

AVAILABLE DATA.

In the construction of the third (revised) edition of the isogonic chart for 1905, use was made of all magnetic observations by the Coast and Geodetic Survey up to the end of 1906, as well as all other available observations in the United States and adjacent foreign territory. These included observations in the United States and Canada by the United States Lake Survey; in the United States, British North America, Mexico, Central America, and the West Indies by the Department of Research in Terrestrial Magnetism of the Carnegie Institution of Washington; in Mexico by observers of the National Observatory; in various parts of British North America by Canadian officials and others; in Maryland by L. A. Bauer, under the auspices of the State Geological Survey; in Missouri by Prof. F. E. Nipher; and in various parts of the United States at the expense of the "Bache fund" of the National Academy of Sciences. For the extension of the isogonic lines over the adjacent waters use was made of observations on the vessels of the Coast and Geodetic Survey, the United States Navy, the British Navy, and on the Carnegie institution yacht *Galilee*.

The observations were so numerous and so well distributed that it was possible for the first time to construct an isogonic chart of the United States using only such values of the magnetic declination as had been obtained with well-tested instruments. The observed values of declination will be found tabulated in "United States Magnetic Tables and Magnetic Charts for 1905," together with the corresponding values for January 1, 1905, and references to the original publications from which they were collected.

In addition to the above data, there have been used in the construction of the 1910 chart the observations made by the Coast and Geodetic Survey between January 1, 1907, and June 30, 1911, by the Department of Research in Terrestrial Magnetism of the Carnegie Institution of Washington in Canada and Cuba; by Canadian officials; by the United States Lake Survey; and on board the vessels of the United States Navy. These observations constitute an increase of about 25 per cent in the available data and are fairly well distributed over the entire area as will be seen from the following table,

¹ "Distribution of the Magnetic Declination in the United States for January 1, 1905," Appendix 4, Report for 1906, and "United States Magnetic Tables and Magnetic Charts for 1905"; Washington, Government Printing Office, 1908.

DISTRIBUTION OF THE MAGNETIC DECLINATION.

observations having been made in every State but one. The results of the observations by the Coast and Geodetic Survey have been published in the annual reports of the Superintendent. Those by other institutions have nearly all been published in some form.

Summary of results on land, 1907-1911.

State	Localities	Stations	Repeat stations	Declination results		Square miles per station
				1907-1911	Prior to 1907	
Alabama	15	17	7	18	40	1026
Arizona	7	9	7	10	79	1394
Arkansas	14	22	4	22	39	921
California	14	15	10	20	133	1131
Colorado	4	4	4	4	62	1672
Connecticut	13	13	4	13	33	115
Delaware	2	2	1	2	13	141
District of Columbia	2	2	2	2	4	15
Florida	9	9	6	10	73	722
Georgia	26	29	5	31	71	618
Idaho	3	4	3	4	32	2539
Illinois	75	76	6	76	39	514
Indiana	55	57	8	61	32	443
Iowa	54	55	7	57	45	598
Kansas	9	9	7	14	117	687
Kentucky	28	28	3	28	75	402
Louisiana	7	8	7	9	95	473
Maine	25	25	7	26	55	499
Maryland	10	10	6	12	153	64
Massachusetts	12	12	7	13	50	146
Michigan	66	66	13	69	116	340
Minnesota	59	59	5	59	52	763
Mississippi	7	8	5	9	42	1030
Missouri	33	33	8	33	166	360
Montana	5	5	2	5	61	2278
Nebraska	33	33	3	33	64	817
Nevada	0	0	0	0	63	1743
New Hampshire	10	10	2	10	11	475
New Jersey	13	13	4	13	41	150
New Mexico	4	4	3	4	71	1678
New York	53	53	12	57	90	364
North Carolina	10	14	8	14	119	390
North Dakota	16	16	3	16	35	1462
Ohio	9	10	6	12	101	388
Oklahoma	23	23	3	23	36	1240
Oregon	6	7	4	7	75	1226
Pennsylvania	15	17	7	21	80	498
Rhode Island	2	2	2	2	11	97
South Carolina	5	6	4	6	47	622
South Dakota	17	17	4	17	33	1671
Tennessee	39	39	7	40	56	474
Texas	19	20	10	20	183	1360
Utah	2	2	2	2	38	2163
Vermont	9	9	4	9	13	507
Virginia	22	26	8	26	119	294
Washington	11	13	5	18	92	668
West Virginia	11	12	2	13	58	353
Wisconsin	52	52	5	54	47	588
Wyoming	4	4	3	4	47	2033
Total, United States	939	979	255	1028	3207	756
British America	165	170	35	174	488	
West Indies	14	17	8	17	61	
Mexico	0	0	0	0	230	
Total	1118	1166	298	1219	3986	

REDUCTION TO EPOCH.

The great majority of the results utilized have been obtained in the past 12 years and very few refer to an earlier date than 1870. The secular change of declination up to 1905 was discussed so thoroughly in 1906 that a new discussion now is not considered necessary and the results used for the 1905 isogonic chart and tabulated in "United States Magnetic Tables and Magnetic Charts for 1905" have been reduced to the epoch January 1, 1910, by applying the secular change for the period 1905.0-1910.0 to the values reduced to January 1, 1905.

The "repeat" stations occupied during the past four years are so numerous and well distributed that the annual change for the above five-year interval is well determined for every part of the country. For convenience in making the reduction to epoch, the observed values of annual change were plotted on a base map of the United States and the lines of equal annual change were drawn. It then became a simple matter to scale off the desired annual change for any place. These lines of equal annual change are shown in blue on the isogonic chart. While they are more nearly applicable to the middle of the interval—i. e., 1907.5—they are approximately correct for 1910 and are the best values at present available for subsequent years.

CONSTRUCTION OF THE ISOGONIC CHART.

The isogonic chart has been constructed by the graphical method, as in the past. The reduced values of declination were plotted on a large-sized map of the United States and the lines of equal magnetic declination were drawn free-hand to conform as nearly as possible to the plotted values. As the number of stations in a given area becomes greater this process becomes more and more difficult, and in greatly disturbed areas the sinuosities of the isogonic lines are rather an evidence of disturbance than an accurate representation of the distribution of declination. This is especially true of the present isogonic chart. In many places it was impossible to represent the magnitude of the local disturbances by continuous lines and recourse was had to small closed curves inclosing a station or locality where the observations show a large departure from a uniform distribution.

LINES OF EQUAL ANNUAL CHANGE.

The lines of equal annual change, shown in blue on the isogonic chart, were derived in the manner explained above. Their distribution differs materially from that of the lines for 1905, the most marked characteristic being a crowding of the lines toward the line of no change. West declination is increasing much more rapidly in the North Atlantic States than was supposed in 1905, the annual change being now about 6' throughout New England. On the Pacific coast east declination is increasing more rapidly than it was in 1905, but apparently the region of maximum annual change is now some distance inland. So little additional data has been obtained for Mexico that it is not deemed advisable to extend the lines so far south as was done on the 1905 chart.

The north end of the compass needle is moving to the westward at all places east of the line of no annual change and to the eastward at all places west of that line. Accordingly, three regions may be distinguished:

(a) In the region of the United States east of the line of no magnetic declination (agonic line) west declination is increasing at an annual rate of from 2' to 6'.

(b) In the region between the agonic line and the line of no annual change east declination is decreasing at an annual rate of from 0' to 2'.

(c) In the region west of the line of no annual change east declination is increasing at an annual rate of from 0' to 5'.

Under present conditions it is impossible to predict with accuracy what the secular motion will be for even a few years in advance. There appear to be two waves of secular motion progressing across the continent in opposite directions, and it is impossible to state which one will predominate, but interesting developments may be expected in the next few years.

In connection with the present large annual change in New England it may be noted that west declination is increasing about 7' a year in Bermuda and about 9' a year at the Porto Rico magnetic observatory on Vieques Island.

SECULAR CHANGE TABLES.

On the succeeding pages will be found tables showing the secular change of the magnetic declination for one or more places in each State from 1750, or the date of the earliest observations, to 1910. They are based on similar tables which accompanied the isogonic chart for 1905, with only such modifications as were needed to extend them to 1910 and represent more closely the secular motion since 1900 as developed by the observations at repeat stations during the past four years.

A graphical method was employed in constructing the tables. For each repeat station the available results since 1840 were plotted on cross-section paper with time as abscissa and declination as ordinate. The results at all the repeat stations in a given region were combined to obtain a curve representing as nearly as possible the average secular change for the region. From this curve values were scaled at 10-year intervals, and from them in turn a table was prepared showing the change in declination at some place near the center of the region where recent observations had been made.

From this it will be seen that, while a table gives directly the declination at different times for but one place in the specified locality, it represents with almost the same accuracy the *change* in declination at any place in the general region to which the table refers. Somewhat better results may be obtained for a place lying near the border of the specified region by interpolating between the table for that region and the adjoining one. While it is probable that the secular change of declination is affected somewhat by local conditions—e. g., by the presence of local disturbance—our observational data are not as yet sufficiently extensive or detailed to permit more than a representation of the average conditions, and these appear to vary with comparative uniformity in passing across the country. Before finally adopting the secular change table for a particular region, therefore, a comparison was made with similar tables for adjoining regions as a basis for a final smoothing out.

USE OF THE SECULAR CHANGE TABLES.

Whenever the surveyor is called upon to redetermine the boundary lines of a tract of land run out by compass at some previous date and can find in the vicinity a well-defined line known to have been established with the same compass and at about the same time as the lines of the tract under consideration, he can not do better than deter-

mine the amount of the change in the compass bearing of that well-defined line and use it to obtain the present bearings of the boundary lines to be reestablished. In this way he will eliminate possible errors in the two compasses used. Only in the absence of such definite information is the use of the following tables recommended.

In using these tables the surveyor must bear in mind the uncertainties incident to the use of the compass and should not be surprised if, for example, the change in declination for the past 100 years, as given by the tables, differs by half a degree or even more from the value indicated by his own retracing of old lines. Even at the present time many compasses are in error by as much as a quarter of a degree, owing to imperfect construction or lack of proper care, and 100 years ago the state of affairs was still worse. The tables give approximately the actual change in the magnetic declination, eliminating as far as possible the errors of individual instruments.

The figures on any line refer to the 1st day of January of the year given in the first column. A value for any other time must be obtained by interpolation from the tabular quantities. In this operation it is convenient to express the month and day as a fraction of the year, as follows:

Months and days expressed as a fraction of a year.

Jan. 19 to Feb. 24	0.1	July 21 to Aug. 25	0.6
Feb. 25 to Apr. 1	0.2	Aug. 26 to Oct. 1	0.7
Apr. 2 to May 8	0.3	Oct. 2 to Nov. 7	0.8
May 9 to June 13	0.4	Nov. 8 to Dec. 13	0.9
June 14 to July 20	0.5	Dec. 14 to Dec. 31	1.0

The use of the tables may best be explained by a few examples.

(1) What was the change in declination at Mobile, Ala., between August 25, 1805, and June 15, 1911?

In the table for Alabama the values for 1800 and 1810 are $5^{\circ} 24' E.$ and $5^{\circ} 39' E.$, showing an average annual increase of $1'.5$. Hence the value for August 25, 1805, would be $5^{\circ} 24' E. + (1'.5 \times 5.6) = 5^{\circ} 32' E.$ Similarly the table gives for 1910 the value $2^{\circ} 45' E.$ with an annual decrease of $0'.7$. Hence the value for June 15, 1911, would be $2^{\circ} 45' E. - (0'.7 \times 1.5) = 2^{\circ} 44' E.$ Therefore the north end of the compass needle pointed $2^{\circ} 48'$ less to the east on June 15, 1911, than it did on August 25, 1805.

(2) The magnetic declination at Allegheny, Pa., was $2^{\circ} 56' W.$ in August, 1885. What was it at the same place in January, 1800?

From the table for western Pennsylvania are derived the values $0^{\circ} 37' W.$ for January, 1800, and $4^{\circ} 12' W.$ for August, 1885, showing a change of $3^{\circ} 35'$ in the interval. Hence the declination at Allegheny for the earlier date was $2^{\circ} 56' W. - 3^{\circ} 35' = 0^{\circ} 39' E.$

(3) A rectangular piece of land at Santa Barbara, Cal., was surveyed by compass in May, 1832, and the bearings recorded as follows: N. $20^{\circ} 15' W.$, N. $75^{\circ} 30' E.$, S. $18^{\circ} 45' E.$, and S. $78^{\circ} 00' W.$ What bearings should be used in order to retrace the lines in March, 1912?

From the table for southern California the value for May, 1832, is $13^{\circ} 16' E.$, and for March, 1912, $15^{\circ} 46' E.$, showing a change of $2^{\circ} 30'$ in the interval. The desired bearings are, therefore, N. $22^{\circ} 45' W.$, N. $73^{\circ} 00' E.$, S. $21^{\circ} 15' E.$, and S. $75^{\circ} 30' W.$

Secular Change of the Magnetic Declination in the United States.

Region.	Alabama.	Arizona, east.	Arizona, west.	Arkansas.	California, south.	California, middle.
Place	Montgomery	Holbrook	Prescott	Little Rock	Los Angeles	San Jose
Latitude	32 22	34 55	34 34	34 47	34 04	37 18
Longitude	86 18	110 10	112 30	92 18	118 15	121 52
	o /	o /	o /	o /	o /	o /
1750	2 52 E					
1760	3 28					
1770	4 03					
1780	4 34				10 24 E	13 37 E
1790	5 02				10 58	14 03
1800	5 24			8 13 E	11 32	14 32
1810	5 39			8 36	12 07	15 01
1820	5 47			8 51	12 39	15 30
1830	5 46			9 00	13 09	15 57
1840	5 38			8 59	13 36	16 22
1850	5 22	13 33 E	13 19 E	8 51	13 57	16 45
1860	5 00	13 44	13 33	8 34	14 13	17 05
1870	4 32	13 47	13 40	8 14	14 24	17 20
1880	3 54	13 40	13 40	7 38	14 40	17 24
1890	3 15	13 25	13 35	7 01	14 40	17 28
1900	2 49	13 30	13 42	6 38	14 50	17 50
1905	2 48	13 42	14 01	6 42	15 10	18 10
1910	2 45 E	14 05 E	14 25 E	6 49 E	15 35 E	18 32 E
Annual change in 1910	0'.7 decr.	4'.3 incr.	4'.6 incr.	1'.4 incr.	5'.0 incr.	4'.5 incr.

Region.	California, north.	Colorado, east.	Colorado, west.	Connecticut.	Delaware.	District of Columbia.
Place	Redding	Pueblo	Glenwood	Hartford	Dover	Washington
Latitude	40 36	38 14	39 32	41 45	39 09	38 55
Longitude	122 24	104 38	107 20	72 40	75 31	77 02
	o /	o /	o /	o /	o /	o /
1750				5 47 W	3 23 W	1 41 W
1760				5 18	2 46	1 02
1770				4 57	2 16	0 28
1780	14 07 E			4 45	1 52	0 01 W
1790	14 35			4 43	1 37	0 19 E
1800	15 04			4 51	1 33	0 28
1810	15 34			5 08	1 37	0 28
1820	16 04			5 34	1 52	0 19 E
1830	16 33			6 07	2 16	0 01 W
1840	17 01			6 47	2 46	0 28
1850	17 26	13 47 E	16 07 E	7 31	3 23	1 02
1860	17 47	13 50	16 15	8 09	4 03	1 41
1870	18 06	13 46	16 16	8 43	4 41	2 21
1880	18 15	13 31	16 04	9 24	5 20	3 00
1890	18 20	13 00	15 40	9 49	5 51	3 36
1900	18 40	12 53	15 39	10 23	6 29	4 11
1905	19 00	13 04	15 52	10 43	6 48	4 29
1910	19 22 E	13 19 E	16 10 E	11 11 W	7 13 W	4 51 W
Annual change in 1910	4'.5 incr.	3'.0 incr.	3'.7 incr.	5'.8 incr.	4'.8 incr.	4'.5 incr.

Secular Change of the Magnetic Declination in the United States—Continued.

Region.	Florida, east.	Florida, west.	Florida, south.	Georgia.	Idaho, east.	Idaho, west.
Place	Jacksonville	Marianna	Tampa	Macon	Pocatello	Boise
Latitude	30 20	30 47	27 58	32 51	42 51	43 37
Longitude	81 39	85 13	82 28	83 37	112 26	116 12
	0 /	0 /	0 /	0 /	0 /	0 /
1750	2 27 E	4 15 E	5 00 E	3 16 E		
1760	3 04	4 52	5 30	3 53		
1770	3 40	5 28	5 55	4 29		
1780	4 12	5 59	6 15	5 01		
1790	4 37	6 26	6 26	5 26		
1800	4 55	6 47	6 30	5 44		
1810	5 04	7 00	6 26	5 53		
1820	5 04	7 05	6 15	5 53		
1830	4 55	7 00	5 55	5 44		
1840	4 37	6 46	5 30	5 26		
1850	4 12	6 27	5 00	5 01	17 40 E	18 00 E
1860	3 40	6 00	4 28	4 29	17 54	18 30
1870	3 04	5 28	3 53	3 53	18 00	18 45
1880	2 25	4 49	3 16	3 14	17 54	18 45
1890	1 50	4 12	2 48	2 39	17 43	18 39
1900	1 19	3 43	2 19	2 08	17 51	18 51
1905	1 14	3 41	2 11	2 02	18 07	19 08
1910	1 05 E	3 37 E	2 06 E	1 52 E	18 26 E	19 31 E
Annual change in 1910	2'.0 decr.	0'.8 decr.	0'.8 decr.	2'.0 decr.	4'.0 incr.	4'.5 incr.

Region	Illinois	Indiana	Iowa	Kansas, east	Kansas, west	Kentucky, east
Place	Bloomington	Indianapolis	Des Moines	Emporia	Ness City	Lexington
Latitude	40 31	39 47	41 36	38 25	38 28	38 04
Longitude	88 59	86 12	93 36	96 12	99 54	84 30
	0 /	0 /	0 /	0 /	0 /	0 /
1750						
1760						
1770						
1780						
1790						
1800	5 54 E	4 44 E				4 22 E
1810	6 18	4 59				4 31
1820	6 33	5 04	10 09 E			4 31
1830	6 37	4 59	10 24			4 22
1840	6 33	4 44	10 30			4 04
1850	6 18	4 21	10 24	11 34 E	12 24 E	3 39
1860	5 54	3 50	10 09	11 28	12 23	3 07
1870	5 26	3 20	9 44	11 15	12 12	2 33
1880	4 51	2 45	9 06	10 50	11 54	1 57
1890	4 10	2 05	8 21	10 14	11 21	1 17
1900	3 35	1 28	7 52	9 56	11 10	0 42
1905	3 29	1 18	7 53	9 59	11 16	0 30
1910	3 25 E	1 08 E	7 57 E	10 08 E	11 27 E	0 19 E
Annual change in 1910	0'.8 decr.	1'.8 decr.	1'.0 incr.	1'.8 incr.	2'.4 incr.	2'.0 decr.

DISTRIBUTION OF THE MAGNETIC DECLINATION.

Secular Change of the Magnetic Declination in the United States—Continued.

Region	Kentucky, west	Louisiana	Maine, northeast	Maine, southwest	Maryland	Massachusetts, east
Place	Princeton	Alexandria	Eastport	Portland	Baltimore	Boston
Latitude	37 07	31 21	44 55	43 39	39 18	42 20
Longitude	87 53	92 25	67 00	70 17	76 35	71 01
1750	0 /	0 /	12 22 W	8 44 W	3 05 W	7 46 W
1760			12 10	8 25	2 26	7 19
1770			12 10	8 20	1 52	7 00
1780			12 22	8 20	1 25	6 50
1790			12 43	8 25	1 05	6 50
1800	6 32 E	8 04 E	13 15	8 44	0 56	7 01
1810	6 50	8 25	13 55	9 12	0 56	7 20
1820	6 59	8 41	14 40	9 48	1 05	7 47
1830	6 59	8 49	15 29	10 28	1 25	8 22
1840	6 50	8 48	16 19	11 07	1 52	9 04
1850	6 32	8 40	17 15	11 48	2 26	9 48
1860	6 07	8 24	18 00	12 28	3 05	10 28
1870	5 40	8 00	18 30	12 58	3 45	11 01
1880	5 00	7 26	18 50	13 32	4 24	11 30
1890	4 23	6 55	19 00	14 00	5 00	11 58
1900	3 51	6 35	19 16	14 26	5 35	12 33
1905	3 44	6 40	19 31	14 43	5 53	12 52
1910	3 36 E	6 50 E	20 01 W	15 13 W	6 15 W	13 21 W
Annual change in 1910	1'. 0 decr.	1'. 8 incr.	6'. 0 incr.	6'. 0 incr.	4'. 5 incr.	6'. 0 incr.

Region	Massachusetts, west	Michigan, north	Michigan, south	Minnesota, north	Minnesota, south	Mississippi
Place	Pittsfield	Marquette	Lansing	Northome	Mankato	Jackson
Latitude	42 27	46 33	42 44	47 53	44 11	32 20
Longitude	73 17	87 22	84 32	94 17	93 59	90 11
1750	0 /	0 /	0 /	0 /	0 /	0 /
1760	6 21 W					
1770	5 52					
1780	5 31					
1790	5 19					
1800	5 17					
1810	5 25					7 54 E
1820	5 42					8 13
1830	6 08	6 46 E	4 10 E	10 27 E	11 20 E	8 24
1840	6 41	6 46	4 04	10 44	11 36	8 28
1850	7 21	6 32	3 46	10 50	11 42	8 24
1860	8 05	6 06	3 20	10 44	11 36	8 13
1870	8 43	5 29	2 46	10 27	11 20	7 57
1880	9 17	4 42	2 04	9 55	10 54	7 31
1890	9 58	3 51	1 17	9 15	10 22	6 58
1900	10 25	3 04	0 32 E	8 30	9 32	6 25
1905	10 58	2 27	0 01 W	7 56	8 57	6 01
1910	11 13	2 13	0 15	7 58	8 54	6 03
1910	11 42 W	2 05 E	0 27 W	8 03 E	9 00 E	6 08 E
Annual change in 1910	5'. 8 incr.	1'. 6 decr.	2'. 4 incr.	1'. 0 incr.	1'. 2 incr.	1'. 0 incr.

Secular Change of the Magnetic Declination in the United States—Continued.

Region	Missouri	Montana, east	Montana, west	Nebraska, east	Nebraska, west	Nevada, east
Place	Sedalia	Forsyth	Helena	Hastings	Alliance	Elko
Latitude	38 43	46 15	46 37	40 37	42 06	40 51
Longitude	93 14	106 39	112 02	98 24	102 51	115 46
	0 /	0 /	0 /	0 /	0 /	0 /
1750						
1760						
1770						
1780						
1790						
1800						
1810						
1820	10 03 E			11 39 E		
1830	10 13			11 57		
1840	10 13	18 09 E	18 53 E	12 07		
1850	10 04	18 27	19 18	12 07	15 27 E	17 20 E
1860	9 46	18 36	19 36	11 59	15 27	17 36
1870	9 25	18 36	19 45	11 42	15 18	17 41
1880	8 46	18 21	19 34	11 12	14 50	17 44
1890	8 05	17 51	19 23	10 35	14 20	17 38
1900	7 39	17 50	19 31	10 14	14 10	17 49
1905	7 41	18 02	19 45	10 19	14 18	18 04
1910	7 46 E	18 17 E	20 02 E	10 28 E	14 31 E	18 27 E
Annual change in 1910	1'.2 incr.	3'.0 incr.	3'.7 incr.	2'.0 incr.	2'.6 incr.	4'.6 incr.

Region	Nevada, west	New Hampshire	New Jersey	New Mexico, east	New Mexico, west	New York, east
Place	Hawthorne	Hanover	Trenton	Santa Rosa	Laguna	Albany
Latitude	38 32	43 43	40 14	34 56	35 03	42 40
Longitude	118 38	72 17	74 48	104 41	107 24	73 45
	0 /	0 /	0 /	0 /	0 /	0 /
1750		8 02 W	4 43 W			7 35 W
1760		7 28	4 04			6 53
1770		7 03	3 31			6 17
1780		6 47	3 06			5 50
1790		6 42	2 50			5 34
1800		6 49	2 45			5 28
1810		7 06	2 50			5 34
1820		7 32	3 06			5 50
1830		8 11	3 31			6 17
1840		8 56	4 04			6 53
1850	16 16 E	9 46	4 43	12 43 E	13 26 E	7 39
1860	16 37	10 31	5 22	12 47	13 33	8 25
1870	16 52	11 08	6 01	12 43	13 34	9 04
1880	17 00	11 38	6 41	12 25	13 22	9 51
1890	17 02	12 01	7 11	12 00	13 02	10 12
1900	17 17	12 36	7 46	11 54	13 02	10 50
1905	17 33	12 46	8 07	12 10	13 15	11 05
1910	17 58 E	13 16 W	8 33 W	12 29 E	13 36 E	11 31 W
Annual change in 1910	5'.0 incr.	6'.0 incr.	5'.2 incr.	3'.6 incr.	4'.0 incr.	5'.6 incr.

Secular Change of the Magnetic Declination in the United States—Continued.

Region	New York, west	North Carolina, east	North Carolina, west	North Dakota, east	North Dakota, west	Ohio
Place	Elmira	Newbern	Salisbury	Jamestown	Dickinson	Columbus
Latitude	42 07	35 07	35 40	46 54	46 53	39 59
Longitude	76 50	77 03	80 30	98 43	102 46	83 01
1750	0 /	0 /	0 /	0 /	0 /	0 /
1760	4 40 W	0 18 W	1 31 E			
1770	3 57	0 18 E	2 08			
1780	3 18	0 50	2 42			
1790	2 46	1 17	3 12			
1800	2 24	1 35	3 34			
1810	2 13	1 44	3 48			3 13 E
1820	2 13	1 44	3 52			3 22
1830	2 24	1 35	3 48			3 22
1840	2 46	1 16	3 33			3 13
1850	3 18	0 50	3 10			2 53
1860	3 57	0 17 E	2 40	14 10 E	17 40 E	2 24
1870	4 46	0 19 W	2 06	14 00	17 40	1 50
1880	5 23	1 00	1 29	13 42	17 30	1 14
1890	6 16	1 40	0 50	13 13	17 07	0 37 E
1900	6 57	2 16	0 12 E	12 30	16 30	0 02 W
1905	7 32	2 52	0 22 W	12 07	16 18	0 42
1910	7 50	3 08	0 33	12 15	16 30	0 55
Annual change in 1910	8 12 W	3 25 W	0 47 W	12 24 E	16 43 E	1 10 W
	4'. 5 incr.	3'. 4 incr.	2'. 8 incr.	1'. 8 incr.	2'. 4 incr.	2'. 8 incr.
Region	Oklahoma, east	Oklahoma, west	Oregon, east	Oregon, west	Pennsylvania, east	Pennsylvania, west
Place	Okmulgee	Enid	Sumpter	Detroit	Philadelphia	Altoona
Latitude	35 38	36 24	44 45	44 43	39 57	40 31
Longitude	95 56	97 55	118 13	122 08	75 12	78 23
1750	0 /	0 /	0 /	0 /	0 /	0 /
1760					4 47 W	
1770					4 01	
1780					3 19	
1790					2 44	1 16 W
1800					2 21	0 52
1810				16 05 E	2 08	0 37
1820				16 43	2 09	0 31
1830				17 22	2 22	0 37
1840				18 01	2 47	0 52
1850				18 38	3 21	1 16
1860	10 15 E	11 13 E	19 15 E	19 12	4 04	1 48
1870	10 06	11 08	19 40	19 41	4 46	2 26
1880	9 51	10 56	19 58	20 06	5 25	3 06
1890	9 33	10 33	20 09	20 20	6 03	3 50
1900	9 07	10 06	20 11	20 30	6 43	4 28
1905	8 42	9 46	20 26	20 50	7 23	5 05
1910	8 45	9 52	20 44	21 09	7 42	5 24
Annual change in 1910	8 55 E	10 06 E	21 07 E	21 33 E	8 07 W	5 45 W
	2'. 0 incr.	2'. 6 incr.	4'. 6 incr.	4'. 8 incr.	5'. 0 incr.	4'. 0 incr.

Secular Change of the Magnetic Declination in the United States—Continued.

Region	Rhode Island	South Carolina	South Dakota, east	South Dakota, west	Tennessee, east	Tennessee, west
Place	Newport	Columbia	Huron	Rapid City	Chattanooga	Huntingdon
Latitude	41 30	34 00	44 21	44 05	35 01	36 00
Longitude	71 20	81 02	98 14	103 12	85 18	88 23
	0 /	0 /	0 /	0 /	0 /	0 /
1750	7 04 W	2 04 E				
1760	6 37	2 41				
1770	6 18	3 15				
1780	6 08	3 44				
1790	6 08	4 06				
1800	6 19	4 19			5 07 E	
1810	6 38	4 24			5 16	
1820	7 05	4 19			5 16	7 24 E
1830	7 40	4 06			5 07	7 24
1840	8 22	3 44	13 06 E		4 49	7 16
1850	9 06	3 15	13 06	16 26 E	4 24	6 59
1860	9 46	2 41	12 57	16 26	3 52	6 35
1870	10 19	2 03	12 40	16 16	3 16	6 05
1880	10 50	1 25	12 15	15 50	2 36	5 29
1890	11 17	0 47	11 35	15 17	2 01	4 53
1900	11 52	0 12 E	11 08	15 07	1 30	4 24
1905	12 11	0 00	11 18	15 15	1 22	4 20
1910	12 40 W	0 12 W	11 28 E	15 27 E	1 12 E	4 18 E
Annual change in 1910	6'.0 incr.	2'.6 incr.	1'.8 incr.	2'.5 incr.	2'.0 decr.	0'.5 decr.

Region	Texas, east	Texas, middle	Texas, west	Texas, northwest	Utah	Vermont	Virginia, east
Place	Houston	San Antonio	Pecos	Floydada	Salt Lake	Rutland	Richmond
Latitude	29 47	29 29	31 26	33 59	40 46	43 37	37 33
Longitude	95 21	98 32	103 33	101 15	111 54	72 58	77 28
	0 /	0 /	0 /	0 /	0 /	0 /	0 /
1750						7 43 W	1 13 W
1760						7 09	0 37
1770						6 44	0 05 W
1780						6 28	0 20 E
1790						6 23	0 38
1800						6 30	0 47
1810						6 47	0 47
1820	8 55 E					7 13	0 38
1830	9 10	9 37 E	10 46 E			7 48	0 20 E
1840	9 19	9 48	11 00			8 29	0 05 W
1850	9 19	9 53	11 08	11 16 E	16 25 E	9 13	0 36
1860	9 12	9 48	11 07	11 18	16 38	9 59	1 12
1870	8 56	9 37	11 00	11 11	16 43	10 39	1 51
1880	8 29	9 19	10 48	10 56	16 38	11 19	2 29
1890	7 56	8 52	10 24	10 25	16 23	11 42	3 06
1900	7 44	8 43	10 18	10 17	16 28	12 17	3 40
1905	7 53	8 53	10 31	10 28	16 42	12 27	3 55
1910	8 05 E	9 09 E	10 50 E	10 44 E	17 03 E	12 57 W	4 13 W
Annual change in 1910	2'.5 incr.	3'.0 incr.	3'.6 incr.	3'.1 incr.	4'.2 incr.	6'.0 incr.	4'.0 incr.

Secular Change of the Magnetic Declination in the United States—Continued.

Region	Virginia, west	Washington, east	Washington, west	West Virginia	Wisconsin	Wyoming, east	Wyoming, west
Place	Lynchburg	Wilson Creek	Seattle	Charleston	Madison	Douglas	Green River
Latitude	37 25	47 26	47 40	38 21	43 04	42 44	41 32
Longitude	79 09	119 00	122 18	81 38	89 25	105 22	109 28.
	° /	° /	° /	° /	° /	° /	° /
1750							
1760	0 08 E						
1770	0 42						
1780	1 11		17 19 E				
1790	1 33		17 52	2 00 E			
1800	1 46		18 27	2 15			
1810	1 51		19 04	2 20			
1820	1 46		19 41	2 15	8 34 E		
1830	1 33		20 16	2 00	8 40		
1840	1 11		20 49	1 37	8 34		
1850	0 45	21 16 E	21 19	1 05	8 16	15 51 E	16 45 E
1860	0 10 E	21 37	21 45	0 30 E	7 49	15 59	16 58
1870	0 29 W	21 52	22 06	0 12 W	7 14	15 59	17 02
1880	1 09	21 56	22 19	0 51	6 25	15 49	16 50
1890	1 46	22 06	22 32	1 28	5 40	15 19	16 30
1900	2 20	22 22	22 54	2 06	5 05	15 15	16 36
1905	2 36	22 38	23 14	2 23	4 56	15 27	16 49
1910	2 53 W	23 00 E	23 40 E	2 39 W	4 51 E	15 43 E	17 08 E
Annual change in 1910	3'.4 incr.	4'.5 incr.	5'.0 incr.	3'.4 incr.	1'.0 decr.	3'.2 incr.	3'.6 incr.

