RESULTS OF MAGNETIC OBSERVATIONSMADE BY UNITED STATE COAST AND GEODETIC SURVEY IN 1916, NO. 61

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TERRESTRIAL MAGNETISM

RESULTS OF MAGNETIC OBSERVATIONS MADE BY THE UNITED STATES COAST AND GEODETIC SURVEY IN 1916

BY

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Chief, Division of Terrestrial Magnetism

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INTRODUCTION.

In 1882 the results of magnetic observations made by this bureau prior to 1881, together with descriptions of stations, were published as Appendix 9, Report for 1881. From that time to 1902 the results were published only in connection with a discussion of the distribution or secular change of one or more of the three magnetic elements. In Magnetic Declination Tables and Isogonic Charts for 1902 the declination results were given for all stations occupied up to that time and descriptions were given of the stations occupied subsequent to 1881. From 1903 to 1911 there was published annually an appendix to the Superintendent's report, giving the results of magnetic observations made during the fiscal year (July to June) covered by the report.

When in 1912 it was decided to confine the annual report of the Superintendent to administrative matters and to publish separately the scientific results which had formerly appeared as appendices to the report, the time was deemed opportune to change from the *fiscal* year to the *calendar* year in the publication of the results of magnetic observations in the field. Accordingly, Special Publications No. 15 contained the results of observations made between July 1, 1911, and December 31, 1912, Special Publications No. 20 the results for the year 1913, Special Publication No. 25 the results for the year 1914, and Special Publication No. 36 the results for the year 1915.

Five magnetic observatories have continued in operation throughout the year: At Cheltenham, Md.; Sitka, Alaska; near Honolulu, Hawaii; on Vieques Island, P. R.; and near Tucson, Ariz. Their records have furnished the means for reducing to mean of day the values of declination obtained from the field observations. There will be found in the tables the mean values of the magnetic elements for each of the observatories for the year 1916.

DISTRIBUTION OF OBSERVATIONS ON LAND.

The distribution of the stations on land is shown in the following table, from which it will be seen that observations were made in 33 States and Territories. Numerous old stations were reoccupied in order to determine the secular change of the magnetic elements, and many auxiliary stations were occupied where previous observations had indicated the presence of local disturbance. In the case of these auxiliary stations the observing program was usually very much curtailed, being limited to morning or afternoon azimuth, one set of declination with magnet erect, one set of oscillations, and dip with one needle without reversal of polarities. The lettered auxiliary stations (A, B—) are usually within a few hundred feet of the primary, the numbered stations (1, 2, 3—) several miles away.

Summary of results on land.

State	Localities	Stations	Old localities reoccupied	Declination results	Dip results	Intensity results
Alaska	8	8	2	8	3	2
Arizona	3	4	3	5	5	5
Arkansas	7	14	3	14	12	12
California	10	10	1	10	10	10
Colorado	4	4	0	4	4	4
Connecticut	1	2	1	2	2	2
Hawaii	1	1	1	1	1	1
Idaho	21	30	1	30	24	24
Indiana	1	1	1	1	1	1
Iowa	5	6	1	6	5	5
Kansas	2	2	1	2	2	2
Kentucky	6	6	1	6	6	6
Louisiana	4	6	2	6	5	5
Maine	13	22	4	22	21	21
Maryland	2	2	2	6	6	6
Massachusetts	6	7	3	7	7	7
Mississippi	4	4	1	4	4	4
Missouri	34	55	21	55	52	52
Montana	31	57	4	57	38	39
New Hampshire	5	13	3	13	11	13
New Mexico	2	2	0	2	2	2
New York	8	23	2	23	20	20
North Carolina	4	10	4	10	9	8
North Dakota	21	23	1	23	21	21
Ohio	1	2	1	2	1	1
Porto Rico	4	4	4	5	5	5
Rhode Island	2	2	2	2	2	2
South Dakota	7	7	2	7	7	7
Vermont	3	10	0	10	10	10
Virginia	3	12	3	12	10	10
Washington	1	1	0	1	1	1
West Virginia	1	1	1	1	1	1
Wyoming	1	1	0	1	1	1
Total	226	352	76	358	309	310

SECULAR CHANGE OF THE MAGNETIC DECLINATION.

A comparison of the declination results at "repeat" stations occupied during the year with the results of earlier observations in the same localities is presented in the following table. The letter after the name of a station indicates (*a*) that the old station was reoccupied exactly, (*b*) that the new station was very near the old one, and (*c*) that the new station was some distance (a quarter of a mile or more) from the old one. A tabular value of the annual change refers approximately to the middle of the period from which it is derived. A plus sign indicates increasing east declination or decreasing west declination; a minus sign, the reverse.

Comparison of declination results at repeat stations.

State and station	Former observations		Last observations		Average annual change
	Date	Declination	Date	Declination	
Maine:		° ′		° ′	′
Fort Kent (*a*)	1910, Au	21 07.8 W	1916, Jy	21 30.0 W	− 3.7
Calais (*b*)	1906, Se	[a] 17 58.2 W	1916, Je	18 56.0 W	− 5.9
Eastport (*b*)	1910, Au	20 04.8 W	1916, Je	20 33.3 W	− 4.9
New Hampshire:					
Hanover (*a*)	1905, Se	12 48.4 W	1916, Jy	13 50.6 W	− 5.7
Rochester (*a*)	1910, Au	16 45.9 W	1916, Je	17 18.5 W	− 5.2
Chesterfield (*a*)	1890, Se	11 12.7 W	1916, Au	13 10.1 W	− 4.5
Massachusetts:					
Newburyport (*b*)	1905, Oc	13 22.0 W	1916, My	14 21.0 W	− 5.6
Boston (*a*)	1913, Je	13 47.4 W	1916, My	14 00.4 W	− 4.5
Provincetown (*c*)	1895, Jy	12 59.2 W	1916, My	14 42.0 W	− 4.9
Connecticut:					
New Haven (*a*)	1910, My	10 40.4 W	1916, Ap	11 21.6 W	− 7.0
New Haven (*b*)	1910, My	10 40.4 W	1916, Ap	11 06.6 W	− 4.4

[a] Observations by the Department of Terrestrial Magnetism, Carnegie Institution of Washington.

Comparison of declination results at repeat stations—Continued.

State and station	Former observations		Last observations		Average annual change
	Date	Declination	Date	Declination	
		° ′		° ′	′
Rhode Island:					
Providence (*a*)	1910, My	12 41.7 W	1916, My	13 14.4 W	− 5.4
Kingston (*a*)	1910, My	12 16.2 W	1916, My	12 41.8 W	− 4.3
New York:					
Dannemora (*b*)	1907, Se	8 14.8 W	1916, Au	9 34.8 W	− 9.0
Ithaca (*b*)	1909, Je	7 43.6 W	1916, Au	8 41.3 W	− 8.0
Maryland:					
Cheltenham Obs'y (*a*)	1914, year	5 59.8 W	1916, year	6 07.6 W	− 3.9
Oakland (*a*)	1910, Oc	3 56.8 W	1916, Ap	4 08.7 W	− 2.2
Virginia:					
Palmyra (*a*)	1901, Se	5 22.3 W	1916, Mh	6 27.8 W	− 4.5
Palmyra N. M. (*a*)	1901, Se	4 28.0 W	1916, Mh	5 36.2 W	− 4.7
Richmond (*a*)	1901, Au	3 45.6 W	1916, Ap	4 51.8 W	− 4.6
Emporia (*b*)	1897, My	3 29.2 W	1916, Ap	4 43.9 W	− 4.0
North Carolina:					
Halifax (*c*)	1906, Jy	2 19.7 W	1916, Ap	3 34.7 W	− 7.7
Chapel Hill (*b*)	1906, Au	1 54.0 W	1916, Ap	2 26.1 W	− 3.3
Salisbury (*b*)	1912, My	0 57.8 W	1916, Ap	0 57.4 W	+ 0.1
Morganton (*a*)	1906, Au	0 38.8 W	1916, My	1 11.3 W	− 3.3
West Virginia:					
Parkersburg (*a*)	1910, Oc	1 49.2 W	1916, Ap	2 02.2 W	− 2.4
Ohio:					
Cincinnati (*b*)	1907, Je	0 57.4 E	1916, Ap	0 41.1 E	− 1.8
Indiana:					
Indianapolis (*a*)	1909, Je	1 09.2 E	1916, No	0 57.5 E	− 1.6
Mississippi:					
Holly Springs (*a*)	1901, Fe, Mh	5 30.6 E	1916, My	5 45.2 E	+ 1.0
Louisiana:					
Tallulah (*b*)	1910, My	6 14.2 E	1916, My	6 26.8 E	+ 2.1
Ruston (*b*)	1910, My	6 55.8 E	1916, My	7 12.5 E	+ 2.8
Arkansas:					
Little Rock (*a*)	1912, Je	6 54.3 E	1916, Jy	7 02.5 E	+ 2.0
Malvern (*a*)	1912, No	6 22.2 E	1916, Je	6 27.0 E	+ 1.3
Rison (*a*)	1911, Mh	1 49.2 E	1916, Je	1 53.4 E	+ 0.8
Missouri:					
Bloomfield (*a*)	1908, Se	7 19.6 E	1916, Jy	7 23.0 E	+ 0.4
Kansas City (*a*)	1913, Oc	9 14.6 E	1916, Oc	9 14.6 E	0.0
Mexico (*a*)	1908, Jy	6 36.4 E	1916, Oc	6 33.0 E	− 0.4
Kansas:					
Winfield (*a*)	1911, Jy	9 38.8 E	1916, My	9 50.7 E	+ 2.5
Iowa:					
Oskaloosa (*a*)	1908, Au	7 56.4 E	1916, My	7 54.0 E	− 0.3
South Dakota:					
Huron (*a*)	1911, Au	11 34.8 E	1916, No	11 27.4 E	− 1.4
Yankton (*a*)	1912, Se	11 23.6 E	1916, My	11 17.8 E	− 3.2
North Dakota:					
Portal (*c*)	1906, Jy	17 41.5 E	1916, Je	17 43.6 E	+ 0.2
Montana:					
Sweetgrass (*a*)	1906, Jy	22 31.1 E	1916, Jy	22 41.2 E	+ 1.1
Browning (*a*)	1906, Au	20 46.4 E	1916, Jy	20 57.9 E	+ 1.2
Glendive (*c*)	1903, Jy	17 10.1 E	1916, Se	17 20.1 E	+ 1.0
Livingston (*a*)	1910, Jy	19 37.7 E	1916, Se	19 45.4 E	+ 1.2
Idaho:					
Pocatello (*a*)	1910, Jy	18 29.9 E	1916, Se	18 34.3 E	+ 0.7
Arizona:					
Tucson Obs'y (*a*)	1914, year	13 39.9 E	1916, year	13 44.6 E	+ 2.3
Ash Fork (*b*)	1908, Se	15 13.4 E	1916, My	15 00.8 E	− 1.6
Ash Fork (*b*)	1902, De	15 07.2 E	1916, My	15 34.4 E	+ 2.0
Holbrook (*b*)	1903, Mh	13 35.5 E	1916, My	14 22.3 E	− 1.0
California:					
Goat Island (*a*)	1912, My	18 02.7 E	1916, Au	18 18.0 E	+ 3.6
Alaska:					
Sitka Obs'y (*a*)	1914, year	30 22.9 E	1916, year	30 23.9 E	+ 0.5
Hawaii:					
Honolulu Obs'y (*a*)	1914, year	9 39.6 E	1916, year	9 43.8 E	+ 2.1
Porto Rico:					
Vieques Obs'y (*a*)	1914, year	3 00.4 W	1916, year	3 19.4 W	− 9.5
Ponce (*b*)	1911, Jy	2 03.0 W	1916, Se	2 49.0 W	− 8.9
San Juan South Base(*b*)	1911, Jy	2 17.6 W	1916, Se	3 07.7 W	− 9.7