direct ratio to the amount of rain and snowfall at Niigata and Akita, on the Japan sea coast. The curves for earthquake frequency in Japan show that these disturbances gradually increase in number over a period of years, and then undergo a corresponding decline, and in accordance with a recognized principle, destructive earthquakes are most likely to occur in a period of minimum earthquake frequency. Such minima occurred in 1883, 1893, and 1903, and very violent earthquakes took place in 1884 and 1894. These periods, it is noted, corresponded to a conspicuous freedom from rain and snowstorms in the north, while in the years of maximum earthquake frequency at Tokyo, i. e., with no violent shocks, the amount of rain and snow falling in the north was much above the average.

In the Journal of the College of Science, Tokyo Imperial University (vol. xli, Art. 5), Prof. Terada, in a paper devoted mainly to another topic (see *Nature*, vol. 105, pp. 599–600, July 8, 1920), describes the above correlation between earthquake frequency in some districts and precipitation in others as a case of parallelism rather than one of cause and effect; he prefers to attribute both phenomena to barometric changes rather than to associate the instability of the soil with percolation.—*E. W. W.*

ON THE PROPORTIONALITY BETWEEN EARTHQUAKE FREQUENCY AND RAINFALL.

By G. ZEIL.

[Abstract from Comptes Rendus, Paris Academy, t. 171, pp. 117–119, 12 July, 1920.]

Upon comparing a chart of the seismic belts of the globe with a chart of the distribution of rainfall, striking similarities are found. Regions of heaviest rainfall, such as Assam, east coast of Madagascar, Dalmatian coast, east coast of Mindanao, western Norway, etc., are also the most frequently and severely shaken by earthquakes. That this relation is due to sudden readjustments following the accumulation of stress caused by erosion and deposition is confirmed by the fact that the rainy Amazon Valley is almost free from earthquakes, because the heavy forest covering prevents denudation. The restoration of equilibrium in a lithospheric arch previously unloaded by erosion would give rise to what may be termed a centrifugal quake, and an upward movement of the arch; the restoration of equilibrium in a deep basin previously loaded by deposition would give rise to a centripetal quake, and a sinking of the basin; simultaneous restoration of equilibrium in two such regions adjacent to one another would cause an antagonistic quake. Actual tectonic quakes appear to conform to this classification (G. Zeil, "Les mouvements ascensionnels de l'écorce terrestré et les tremblements de terre tectoniques," *Bull. Soc. Géol. de France*).

Discussion.—The above may possibly be a factor in the explanation of the apparent connection between rainfall and earthquakes, but the abstractor desires to point out that the theory upon which G. Zeil bases his views of geodynamics seems to be, as expounded in a series of papers (*Comptes Rendus*, 169, 1406–1408, 1919; 170, 397–399, 597–600, 1920), a somewhat superficial combination of generally recognized geologic facts into a theory which can be attacked at several points. Although rejecting the doctrine of isostasy, Zeil presents views which practically amount to an acceptance of it. The whole ground covered by him has previously been subjected to a truly profound analysis by Chamberlin, Barrell, and others (see, e. g., Barrell, "Strength of the Earth's Crust," *Jour. Geol.*, vols. 22–23; Chamberlin, "Diastrophism and the Formative Processes," *Jour. Geol.*, vols. 21–22; and other recent writers on geodynamics.)—*E. W. Woolard.*

BIBLIOGRAPHY.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

C. FITZHUGH TALMAN, Professor in Charge of Library.

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies:

Alt, Dr. E[ugen].
Die Wettervorhersage, ihre Geschichte, ihe gegenwärtiger Stand und die Richtung ihrer Fortentwicklung. München. 1919. 70 p. 20 cm.

Ångström, Anders.
Studies of the frost problem. 1. Stockholm. 1920. p. 20–32. 24½ cm. (Reprinted from Geografiska Annaler, 1920, H.–1.) [Abstract in later REVIEW.]

Baba, Nobuyori.
Kisho-gaku [Meteorology]. Tokio. 1917. 4, 520, 109 p. 22½ cm. [In Japanese.]

Bianchi, D. Filippo.
Nuova sistema di difesa contro la grandine e le scariche elettriche atmosferiche. Pontedera. 1919. 49 p. 24 cm.

California University.
Semicentenary celebration of the founding of the Univeristy of California, with an account of the Conference on internal relations. Berkeley. 1919. 563 p. 25 cm. ["Oceanographic problems of the North Pacific," p. 414–454, contains papers by Dr. C. F. Marvin. Mr. T. A. Blair, Dr. C. F. Brooks, and Dr. A. H. Palmer, all of the U. S. Weather Bureau.]

Coblentz, W. W., & Kakler, H.
A new spectropyrheliometer and measurements of the component radiations from the sun and from a quartz-mercury vapor lamp. Washington. 1920. p. 233–245. 25 cm. (Scientific papers of the Bureau of standards, No. 378.)

Douglas, Capt. C. K. M.
Temperatures and humidities in the upper air: Conditions favorable for thunderstorm development, and temperatures over land and sea. London. 1920. p. 110–139. 24½ cm. (Meteorological office, London. Professional notes No. 8.) [Abstract in later REVIEW.]

Ficker, Dr. Heinrich.
Untersuchungen über die meteorologischen Verhältnisse der Pamirgebiete. (Ergebnisse der Expedition des Deutschen und Österreichischen Alpenvereines nach Ostbuchara.) Wien. 1919. 105 p. 31 cm. [Aus den Denkschriften der Akademie der Wissenschaft. in Wien, mathem.-naturw. Klasse, 97. Band.]

Fisher, Willard J.
Low-sun phenomena in Luzon. Manila. 1920. p. 151–164. 27 cm. (Separate from the Philippine journal of science, vol. 16, No. 2.)

Gold, E.
Aids to forecasting: types of pressure distribution. With notes and tables for the fourteen years 1905–1918. London. 1920. p. 149–174. 33 cm. (Meteorological office. Geophysical memoires, no. 16.)

Gruner, P.
Anleitung zur Beobachtung der Dämmerungsfarben. Braunschweig. 1917. p. 415–424. 29½ cm. (Separat-Abdruck aus der Meteorologischen Zeitschrift, Heft 12, 1917.)

Hurst, H. E.
Short report on Nile gauge readings and discharges. Cairo. 1920. 43 p. 28 cm. (Ministry of public works, Egypt. Physical department paper, no. 1.)

Inagaki, Dr. Otohei.
Kisho-gaku Kyokasho [Textbook of meteorology for the Agricultural academy.] Tokio. 1920. 1, 142, 5 p. 22 cm. [In Japanese.]

Lindholm, F.
Sur l'insolation dans la Suède septentrionale. Stockholm. 1919. 24 p. 31 cm. (Kungl. Svenska vetenskapsakademiens handlingar. Band 60. No. 2.)

Lyons, Col. H. G.
Meteorology during and after the war. London. 1919. p. 167–180. 25 cm. [In Journal of the Royal society of arts, vol. 67. No. 3455.] [Excerpts reprinted in this REVIEW, Feb., 1919, 47:81–83.]

Millikan, Robert Andrews, & Gale, Henry Gordon.
Practical physics ... being a revision of the authors' "A first course in physics" done in collaboration with Willard R. Pyle. Boston. [1920.] 462 p. 19½ cm.

Moore, Henry L.
Forecasting the crops of the Dakotas. New York. 1920. p. 204–233. 23 cm. (Reprinted from Political science quarterly, vol. 35, no. 2, June, 1920.)

Mrazek, Dr. J.
Windverhältnisse in Prag nach den Pilotvisierungen in der Zeit vom Nov. 1916 bis Nov. 1917. Prag. 1920. 14 p. 30 cm.

Nakagawa, Gen'saburo.
Nippon Kisho-gaku [The meteorology of Japan]. Tokio. 1916. 4, 338, 64 p., 22½ cm. [In Japanese.]

Okada, Takematsu.
Ame [rain]. Tokio. 1916. 1, 361, 5 p. 19 cm. [In Japanese.]

Pollak, Dr. Leo Wenzel.
Ergebnisse der anemometrischen Aufzeichnungen des meteorologischen Observatoriums auf dem Donnersberge (Böhmen) in den Jahren 1905–10. Prag. 1919. 104 p. 30 cm. (Aus dem Institut für kosmiche Physik der deutschen Universität in Prag.)

Rolf, Bruno.
Tables psychrométriques portatives, calculées selon la formule Svensson-Ekholm. Stockholm. 1919. 30 p. 22½ cm.

St. Xavier's college, Calcutta. Meteorological observatory.
Meteorological observations at St. Xavier's college, Calcutta, ... by E. Francotte, S. J. Calcutta. 1918– n. p. 30 x 32 cm.

San Salvador. Observatorio meteorológico.
Anales del Observatorio meteorológico San Salvador, Central America, años de 1917 y 1918. San Salvador, 1919. 113 p. 32 cm.

Schmid, Dr. Bastian, *ed.*
Deutsche Naturwiss enschaft, Technik u. Erfindung im Weltkriege. München. 1919. xi, 1007 p. 27 cm. ["Meteorologie im Kriege" von Siegmund Günther, p. 81–109.]

Sweden. Meteorologiska centralanstalten.
Haglets frekvens i Sverige 1865–1917. Uppsala. 1919. 50. p. 31 cm. (Bihang till Meteorologiska iaktagelser i Sverige. Band 59, 2:dra serien, vol. 45.)

Tscheuschner, Hubert.
La prevision du temps sans instrument. Système pour la prévision de tous les météores de deux à quatre jours d'avance. 10. ed. Paris. 1919. 18 p. 24½ cm.

U. S. Air service.
Altimeters for aerial navigation. Washington. 1919. 9 p. 23 cm.

Uruguay. Instituto meteorológico nacional.
Eclipses de sol del 3 de Diciembre de 1918 y 29 de Mayo de 1919. Montevideo. 1920. 93 p. 28½ cm.

Valdiguié, A.
Climat de Salonique. Salonique. [1918]. 102 p. 21 cm. (Cahiers d'orient (Ancienne Revue Franco-Macédonienne). No. 2.)

Wade, E. B. H.
Report on psychrometer formulae based on observations in Egypt and the Sudan. Cairo. 1920. 72 p. 28 cm. (Ministry of public works, Egypt. Physical department paper No. 2.)

Wallén, Axel.
Les prévisions des niveaux d'eau et des débits en Suède. Stockholm. 1919. p. 340–352. 25 cm. (Separate from Geografiska Annaler 1919, H. 3–4.)

RECENT PAPERS BEARING ON METEOROLOGY AND SEISMOLOGY.

C. F. TALMAN, Professor in Charge of Library.

The following titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers and other communications bearing on meteorology and cognate branches of science. This is not a complete index of all the journals from which it has been compiled. It shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau.

American society of civil engineers. Proceedings. New York. v. 46. April, 1920.
Vilar y Boy, S. Notes on the Guatemala earthquakes, and earthquake-proof construction. p. 559–569. [The ability of different materials to withstand earthquake strains.]

Aviation. New York. v. 8. June 15, 1920.
Jones, Melville. Over-cloud flying and commercial aeronautics. p. 402–408. [Abstract in later REVIEW.]

Ecology. Brooklyn. v. 1. January, 1920.
Huntington, Ellsworth. The control of pneumonia and influenza by the weather. p. 6–23. [Abstract in later REVIEW.]
Douglass, A. E. Evidences of climatic effects in the annual rings of trees. p. 24–32. [Abstract in Mo. WEATHER REV. Dec., 1919, p. 881.]

Engineering news-record. New York. v. 85. 1920.
Fleming, R. Wind loads on miscellaneous structures. p. 66–68. (July 8.)
Henry, A[lfred] J[udson]. Mississippi river floods of 1920. p. 71. (July 8.)
Lenth, George C. D. Storm water run-off diagram for rational method. p. 151–152. (July 22.)

Geographical teacher. London. v. 10. no. 54.
Fairgrieve, J. The upper air. p. 67. (Summer, 1919.)
Storey, Harold E. An apparatus for teaching the climatic effects of the system of major winds. p. 160–161. (Spring, 1920.)

Great Britain. Advisory committee for aeronautics. Technical report. London.
Dines, J[ohn] S[omers]. Vertical motion in the free air. 443–448. (1913–14.)
Shaw, W[illiam] N[apier]. Formulas and tables of constants for use in the discussion of the results of soundings with registering balloons and pilot balloons. p. 449–457. (1913–14.)
O'Gorman, Mervyn. Photographing the smoke trail of rockets. p. 458. (1913–14).
Bairstow, L. Discussion of the action of different types of air-speed indicator. p. 461–466. (1913–14.)
Rayleigh. Note on the formula for the gradient wind. p. 381–382. (1914–15.)
Pannell, J. R. Calibration of tube anemometers at high velocities. p. 529–532. (1915–16.)
Taylor, G. I. Report on the accuracy with which the temperature error in determining heights by the barometer may be corrected. p. 576–578. (1915–16.)

Japan. Imperial earthquake investigation committee. Bulletin. Tokyo. v. 8. 1920.
Omori, F. The Sakura-jima eruptions and earthquakes. IV, V. p. 323–351; 353–466. (Nos. 4, 5.)

Japan. Imperial earthquake investigation committee. Bulletin. Tokyo. v. 9. 1920.
Omori, F. The Usu-san eruption and the earthquake and elevation phenomena. III. p. 41–76. (No. 2.)

Meteorological magazine. London. v. 55. June, 1920.
Ellison, W. F. A. The ventilation of instrumentsh elters. p. 81–83.

Meteorological society of Japan. Journal. Tokyo. 39th year. June, 1920.
Fujiwhara, S., & Nakano, H. Notes on iridescent clouds. p. 1–9. [Abstract in this REVIEW, pp. 333.]

Nature. London. v. 105. 1920.
Dines, W[illiam] H[enry]. Attainment of high levels in the atmosphere. p. 454. (June 10.) [On an unusually high pilot balloon ascent.]
The thunderstorms of May 29 and the Louth disaster. p. 468. (June 10.) [See May REVIEW, p. 293.]
Bemmelen, W[illem] van. High rates of ascent of pilot balloons. p. 485–486. (June 17.) [Note in later REVIEW.]
Wedderburn, E[rnest] M[aclagan]. The importance of meteorology in gunnery. p. 492–494. (June 17.)
Bjerknes, V[ilhelm.] The meteorology of the temperate zone and the general atmospheric circulation. p. 522–524. (June 24.) [Abstract in later REVIEW.]
Dines, J[ohn] S[omers]. The rate of ascent of pilot-balloons. p. 581. (July 8.) [Note in later REVIEW.]
Douglas, C. K. M. Temperature variations at 10,000 feet. p. 614. (July 15.)

Physical review. Lancaster. v. 15. June, 1920.
Mauchly, S. J., & Thomson, Andrew. Results of atmospheric-electric observations made during the solar eclipse of May 29, 1919. p. 525–526. [Abstract.]
Bauer, L[ouis] A., & Peters, W. J. Effects of differential refraction in the earth's atmosphere upon observed light deflections. p. 527. [Abstract.]
Colvin, Charles H. An air distance recorder. p. 562–564. [Anemometer used on aircraft.]