

SIMULTANEOUS OCCURRENCES OF LUNAR HALOS AND CORONAS.

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[Dated: Weather Bureau, Washington, Mar. 5, 1919.]

The simultaneous occurrence of a lunar halo and corona is not such a rarely observed phenomenon as that of a solar halo and corona, for the brilliance of the sun is adverse to frequent observation of the solar corona. The following note appeared in Meteorological Office Circular.¹ (London) 21, February 26, 1918, page 3:

Capt. C. J. P. Cave writes from Stonehenge: "A halo and a corona around the moon were visible here at 11 p. m. on February 21. Rippled clouds had come up from the northwest about 6:15 p. m. and the beginning of a halo had been seen when they reached the neighborhood of the moon; before 7:30 the rippled appearance had disappeared, but the sky was covered with a thin sheet of cirro stratus, through which the brighter stars could be seen; a very striking halo was visible from this time till 11 p. m. About this time a corona also became visible, two red rings being seen. Almost at the same time part of the halo was hidden by low clouds, and in a few minutes these drifted over, and both halo and corona disappeared. The phenomenon was very striking and must be very rare; two thin cloud sheets are necessary for its production; the upper one must be sufficiently thin to allow enough light to pass through to produce a corona, and the lower sheet must be thin enough not to hide the halo; moreover the moon must be of sufficient age to be bright enough for the phenomenon to be seen."

Capt. Cave's conclusion does not seem to apply in two recent observations of mine. At College Station, Tex., September 18, 1918, I made the following note: "At 10 p. m. [90th Meridian 'Summer' time] there was a colored, large, double corona (due to the water-drop A.Cu. clouds), a fine, unbroken halo (due to the snow falling from the A.Cu.), and an annulus (due to the rain-drops formed from the melting snow)." On February 12, 1919, at Washington, D. C., I have this note: "At 10:20 [p. m. 75th Meridian Time] the high clouds [Ci.St. and Ci.Cu.] had thinned appreciably and the halo had become bright colored. There was a corona (single ring, radius about 3") at the same time." In this case, also, the water-drop clouds seem to have been above or in the falling snow which produced the halo, for the texture of the Ci.Cu. elements of the general cloud sheet were indistinct. In both cases the moon was two days before full.

Thus, it seems that another explanation for the simultaneous occurrence of halo and corona is, that the halo forms in a sheet of snow which is falling out of, or through, clouds of (undoubtedly undercooled) water drops, or spheres of clear ice,² and that when an annulus is observed with a halo, there is every reason to believe that the falling snow crystals which make up the Ci.St. sheet are reaching a level where they are melting into fine raindrops.

LUNAR HALO AND PARASELENIC CIRCLE OBSERVED AT COLONY, WYO.

Through the official in charge at Cheyenne, Wyo., Mr. Cola W. Shepard, Cooperative Observer, reports that a lunar halo and a paraselenic circle were observed at Colony, Wyo., on January 10, 1919. Both circles were complete and very distinct. They were brightest at about 9 p. m., but had been visible for some time before this.—*W. R. G.*

¹ The British Meteorological Office Circular is primarily a means of communication between the office and observers. It is an octavo leaflet of 4 pp. issued monthly since June, 1916.

² Cf. G. C. Simpson, Coronae and Iridescent Clouds, Quart. Jour. Roy. Met. Soc., Oct., 1912, vol. 38; and recent discussions in Symons's Met. Mag., 1917, vol. 52, by Simpson, pp. 17-18, and E. C. Barton, pp. 31-32.

NOTES ON THE COMPARISON OF ANEMOMETERS UNDER OPEN-AIR CONDITIONS.*

By A. NORMAN SHAW

[Dated: McGill University, Montreal, Quebec, Feb. 8, 1919.]

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Section 1. Introduction.—The comparison of anemometers has occupied considerable attention especially since the rapid development of aeronautics, and the accuracy of the ordinary instruments is fairly well known. There has, however, been occasional difficulty in correlating tests and calibrations made under the controlled conditions of the "wind tunnel" or the "whirling table," with the practical usage of the instruments in fluctuating open-air conditions. The electrical or "hot-wire" anemometer¹ and the kata-thermometer² as an anemometer do not appear yet to have received the extensive application for which they are apparently fitted, and very little attention seems to have been directed toward their adaptation for use under open-air conditions.

It is the object of these notes to discuss some observations of possible interest in this connection, which were taken at Father Point Experimental Station in September and October, 1917, during the acoustic surveys of Dr. L. V. King. Meteorological observations³ were required in order that the influence of atmospheric structure on the propagation of sound might be studied, and through the kind permission of Sir Frederick Stupart, director of the Dominion meteorological bureau, Mr. J. Patterson of that department joined Dr. King's party and brought with him a supply of standard meteorological instruments and accessories. It was in association with Mr. Patterson at this time that the present writer became interested in these instruments.

The hot-wire anemometer tests were made at the suggestion of Dr. King, with his recently developed portable outfit which had been brought down to the experimental station.

The kata-thermometer was in use by the writer for some humidity investigations, and when this opportunity presented itself it was thought of interest to test the claims of the designers with reference to its application as an anemometer.

It should be pointed out that these notes are the result of observations incidental to another investigation and consequently they are somewhat incomplete, but as the comparisons were not continued it was thought that they were of sufficient interest to be recorded with this explanation.

* These notes were made in connection with work performed under the auspices of the Honorary Advisory Council for Scientific and Industrial Research in Canada, who very kindly gave permission for their publication.

¹ See L. V. King, "The linear hot-wire anemometer and its applications in technical physics," Jour. Frank. Inst., Jan., 1918, pp. 1-25, where a complete list of references is given. Also J. S. G. Thomas, "Hot-Wire Anemometry," Sci. Am. Sup., Feb. 15, 1918, (pp. 106-107); and T. S. Taylor, "A new type of hot-wire anemometer," abs. Phys. Rev. (2nd Ser.) xlii, Feb., 1919 (pp. 146-147).

² Hill, Griffith and Flack, "The measurement of the rate of heat-loss at body temperature by convection, radiation, and evaporation," Phil. Trans. Roy. Soc. London, B., vol. 207, p. 201 (1915).

³ The meteorological observations are discussed by Mr. J. Patterson and the present writer in sections of L. V. King's Report to the Honorary Advisory Council of Scientific and Industrial Research, on "The acoustic efficiency of fog-signaling, Father Point experiments, 1917."