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SOLAR OBSERVATIONS

DIFFERENCES BETWEEN AMERICAN AND EUROPEAN RESULTS FOR β AND w

By HERBERT H. KIMBALL, Research Assistant, Harvard University

In the MONTHLY WEATHER REVIEW for November 1936, page 377, I published a brief reference to differences that appear in the values of β , the atmospheric turbidity factor, as obtained at European and at American meteorological observatories, which seemed to be due largely to methods of computation or else to differences in the fundamental data on which the computations are based.

In this note I also called attention to an alleged error in the method that had been followed at the United States Weather Bureau, and later at the Blue Hill Meteorological Observatory, in computing β . Later, it was pointed out (MONTHLY WEATHER REVIEW, December 1936, p. 430) that in reality no error had been made. This confusion of thought on my part was due to the strain of overwork in keeping Blue Hill observations reduced and published on time, in addition to revising methods of reduction.

In the meantime a letter was received from Dr. Feussner, Director of the Potsdam Magnetic and Meteorological Observatory, who had been very helpful in procuring and standardizing the color screens that are used in obtaining measurements of the intensity of solar radiation in certain designated sections of the spectrum. He suggested that in the United States we adopt the system of curves which are used at European observatories and which have been sanctioned by such eminent European scientists as Ångström, Hoelper, and Süring. I readily agreed to this proposal, since a casual examination showed close agreement between these curves and those that had been computed by me, and especially since my curves were made at my home, immediately following my retirement from the Government service, where conveniences for accurate work were meagre.

The use of the European curves was to have begun with the data for January 1937; these data reached me from Blue Hill on February 3. The morning of January 1 at Blue Hill had been unusually clear; the unscreened solar radiation, expressed in units on the Smithsonian Pyrheliometric scale, at solar altitude 22°22' (air mass, 2.61) was 1.356. Reducing this air mass by 0.2 percent on account of the reduced air pressure at the summit of Blue Hill, I found that the measured intensity falls above the curve for $\beta=0$ on the European diagram. At solar altitude 23°28', shortly before noon on this same day, air mass 2.50, the measured intensity was 1.384. Reducing the air mass for air pressure at the summit of Blue Hill to 2.45,

I found this value also falls above the curve for $\beta=0$. The corresponding values of β and w , computed from the curves published by me in the MONTHLY WEATHER REVIEW, March 1933, page 82, are as shown in table 3.

A hasty examination indicates to me that while for $m=1.0$, and $\beta=0$, the American curves for I_m give an intensity of 91.2 percent of the solar constant, the European curves give only 89.8, or a difference of 1.4 percent. The difference increases, of course, with wave length. Measurements at Blue Hill during January are most frequently made with air masses of about 2.5 to 4.0.

It seems necessary, therefore, to continue to use the American curves until an error is shown in them that will explain the above discrepancies.

SOLAR RADIATION OBSERVATIONS DURING JANUARY 1937

By IRVING F. HAND, Assistant in Solar Radiation Investigations

For a description of instruments employed and their exposures, the reader is referred to the January 1935 REVIEW, page 24.

During January 1937 at Washington there were fewer days on which normal-incidence observations were obtained than in any other month during which this type of measurements has been made, that is, since October 1914. As but one observation was made at each air mass, little may be said about the departures from normal at Washington. The observations at Madison and Lincoln were close to normal for the month, as also were those at Blue Hill, for which departures from normal are computed for the first time since the beginning of solar observations there nearly four years ago.

Table 2 shows a deficiency in the total solar and sky radiation at all stations except those on the west coast: Fresno, La Jolla, and Friday Harbor; and also the mid-Plains city of Lincoln.

Neither polarization nor turbidity determinations were made at Washington during January because of the large percentage of cloudiness.

LATE DATA

The values of the total solar and sky radiation expressed in gram calories per square centimeter for the weeks beginning December 3, 10, 17, and 24, 1936, for Fairbanks, Alaska, are 11, 5, 8, and 3 with departures of +4, 0, +2, and -2, respectively. For the year Fairbanks had a minus departure of 2,576 gram calories, or a percentage departure of 5.6.