CORRESPONDENCE

Reply

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It is certainly true that the large degree of persistence present in arctic stratosphere temperature series causes difficulty in the statistical treatment of the inadequate data samples above the 200-mb level. Following the procedures outlined by Brooks and Carruthers [1, p. 322–28] for the treatment of persistent series, a number of computations were carried out using the rather complete 100-mb temperature record at Resolute for the months of December, January and February of the winters of 1956–57 through 1958–59. The persistence factor, s, was computed from the series of autocorrelation coefficients and found to be equal to 10.5 days. From s and the sample size, the standard error of the mean was found to be about 2.5C. When many observations are missing from a series, and when the available observations are not scattered randomly through the period, it is usually advisable to subdivide the observations into groups of size m, where $m = 2s - 1$, and then to compute the grand mean from the equally-weighted submeans. Messrs. Ward and Shapiro have suggested allowing for the high autocorrelations and the variable sample sizes in the earlier years of record by forming the grand mean from equally-weighted monthly means, which is equivalent to setting $m = 31$. It is difficult to say, however, whether or not using an m of either 20 or 31 would actually lead to a better estimate of the long-term mean in the situations under consideration here, for there is considerable evidence to the effect that the small temperature samples taken prior to about 1957 at these levels, particularly the 50-mb level, are highly biased in favor of those periods when warmer than average air was present. Consequently, unless warm-regime conditions were present for the entire month, or nearly so, a handful of observations could easily lead to a monthly mean that was much too high.

It is obvious from the array of data in table 1 of my article that the percentage of possible observations drops off sharply above the 200-mb level in the years prior to 1957 and that this, together with the bias discussed above, makes the means and other statistics of a tentative nature. Nevertheless, until sufficient data samples have accumulated, the author believes that his statistics constitute a considerable improvement over what has been hitherto available. Furthermore, it is his belief that the general bimodal character of the frequency distributions is correct, for, when the 100-mb temperatures at Resolute were compiled for the months of December and February and then combined with those for January ($N = 563$), the frequency distribution still exhibited two distinct and widely-separated modes. Published time series of 010-mb temperatures for stations in this region [2], as well as the series of daily height and temperature analyses that has been published for these levels [3], give strong evidence of persistent warm and cold regimes in this area. This, together with the relative briefness of the transition periods, implies that the temperatures are distributed in some sort of bimodal fashion.

REFERENCES

1. Brooks, C. E. P., and N. Carruthers, 1953: *Handbook of statistical methods in meteorology*. London, H. M. Stationary Office, 413 pp.
2. Godson, W. L., and R. Lee, 1958: High-level fields of wind and temperature over the Canadian Arctic. *Beitr. zur Phys. d. Atmos.*, **31**, 40–68.
3. Behr, K., I. Jacobs, K. Petzoldt, R. Scherhag, and G. Warnecke, 1960: *Tägliche Höhenkarten der 50-mbar Fläche für das Internationale Geophysikalische Jahr 1958, Teil I, 1. Vierteljahr*. Meteor. Abhandl. Inst. f. Meteor. u. Geophy. d. freien Univ. Berlin, Band XII, Heft 1.