

AN EVALUATION OF THREE
LONG-RANGE FORECASTS
FOR THE WINTER OF 1979-80 --
AND A TALK WITH
DR. HURD WILLETT

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Small wonder people were concerned over what kind of weather the winter of 1979-80 would bring. Consider what the previous three winters had delivered.

During the winter of 1976-77 unprecedented snow fell as far south as Miami in January. In that same month, it was so warm in Alaska that bears, thinking it was spring, came out of hibernation. But residents of Buffalo, New York, went into hibernation as the city disappeared under an awesome blanket of winter white. In ironic contrast, an earth-cracking drought stalked California; and the Rockies and Cascades were virtually devoid of snow. Through the Ohio Valley states an acute shortage of natural gas aggravated the social and economic suffering that accompanied the coldest weather on record there.

Wild weather continued in the winter of 1977-78. The drought in California turned into a nightmare of mud and floods as repeated heavy rains soaked the area. Meanwhile, howling blizzards and roof-breaking snowfalls paralyzed various parts of the East at different times. A number of locations approached or surpassed maximum seasonal snowfall marks. A February blizzard in New England left damage totaling at least \$300 million in its wake. Frigid Arctic air gripped much of the Midwest through the winter, and temperature records tumbled for the second straight year.

There was no relief the following winter. Record cold extended from the northern Rockies across the central Plains to the Midwest. Below normal temperatures blanketed virtually the entire nation, and January 1979 garnered the dubious distinction of being the coldest month known on a

national scale (2). Snow and ice cover across North America exceeded all previously observed extents (2). In Chicago, the furor over snow removal cost the incumbent mayor re-election. And in New England, bitter February cold caused fuel oil supplies to dwindle to a frightening 3-day reserve.

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A lot of professional meteorologists were concerned, too, though perhaps from more academic points of view. Long-range outlooks for the coming winter were in great demand as the autumn warmth of 1979 disappeared. There was no dearth of such outlooks, either. Perhaps there were too many. The Lawrence Livermore Laboratory, under contract to the United States Department of Energy, developed a consensus forecast for the winter of 1979-80 based on 11 different experimental forecasts (3). Those 11 outlooks didn't even include those commercially available.

Not having the resources of the Lawrence Livermore Laboratory in my basement office, I thought it would be interesting to take a more modest approach and see how just a few of the outlooks for the winter of 1979-80 worked out. For my "few", I chose three: the outlook of the Climate Analysis Center, National Weather Service, NOAA; the outlook of Dr. Jerome Namias, Scripps Institution of Oceanography; and the outlook of Dr. Hurd Willett, Professor Emeritus of Meteorology at Massachusetts Institute of Technology. I consider the NWS, Dr.

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Namias, and Dr. Willett to be the "heavy hitters", the "old pros" in the business. The NWS (and its forefathers) has been issuing extended-range outlooks for over 20 years. Dr. Namias founded the NWS long-range forecast group before moving to Scripps. (Perhaps he was prescient regarding Washington's recent winters.) And Dr. Willett has been studying climate trends for over three decades.

Not only do the three different sources represent a depth of experience, they represent a cross-section of the spectrum of approaches to the problem of long-range forecasting. The NWS uses mainly lag correlations between winter 700mb heights and those of previous periods to predict height anomalies from which precipitation and temperature forecasts are derived (4). Dr. Namias relies primarily on North Pacific Ocean sea surface temperatures and anomalies in Atlantic Ocean circulation to predict, based on correlations and "teleconnections", 700mb height anomalies over the U.S. (5,3). Dr. Willett is of the school that believes there is a connection between solar cycles and weather regimes. His extended-range outlooks are based on atmospheric circulation/solar-cycle analogs (6). I suspect, though, after talking extensively with Dr. Willett over the past five years, that his forecasts rely more heavily on the circulation analogs, and less so on the circulation/solar - cycle analogs. This probably stems from the fact that he believes solar cycles more effectively influence longer-term climatic trends or fluctuations (e.g., over a period of several decades), and that year-to-year weather variations are more the result of change mechanisms working within the climate or general circulation system.

The winter 1979-80 temperature outlooks of the NWS, Dr. Namias, and Dr. Willett are shown in Figures 1, 2, and 3, respectively. Typically the outlooks of the three are readily available to the public, if not in national publications, then at least for the asking. (Dr. Willett's was an exception last year, as business technicalities prevented him from releasing it to the media or upon

request. He was kind enough to give me a copy, however, and it is presented here with his permission.)

The NWS (Fig. 1) gave temperatures in the Midwest, South, and southern Great Plains "a 65 percent chance of falling below normal for a fourth consecutive year", but felt they "need not equal the intense cold of the recent winters". Dr. Namias (Fig. 2) foresaw the area between the Appalachians and Rockies as being "especially cold". And Dr. Willett (Fig. 3) expected temperatures to average "significantly milder than last winter" in most areas east of the continental divide, and thought that the most severe cold would shift to west of the Rockies. However, he anticipated "no recordbreaking monthly departures" such as occurred during the winter of 1978-79 in the Midwest.

The observed temperature departures for the winter of 1979-80 are shown in Figure 4. I have arbitrarily defined temperatures within 2F of normal as being in the normal category. This is not the same as verifying temperature departures against a strict three-category system (normal, above normal, below normal); but it does permit one to make a quick, subjective comparison between forecast and observed temperature departures.

In stark contrast to the winter of 1978-79 in which virtually the entire nation averaged colder than normal, the winter of 1979-80 brought significant mildness to many areas. In particular, the Southwest, the northern Plains, and the upper Mississippi Valley averaged warmer than normal. The biggest positive temperature deviation occurred in northeastern Nevada where the winter mean was over 8F above normal. Much of the country averaged near normal to slightly below normal, but the large negative temperature departures which had been present the previous winters were absent. Nowhere did the winter average as much as, or more than, 4F below normal.

On a purely subjective basis, the NWS outlook for the winter of 1979-80 appears to have been relatively close to the mark. It generally defined the

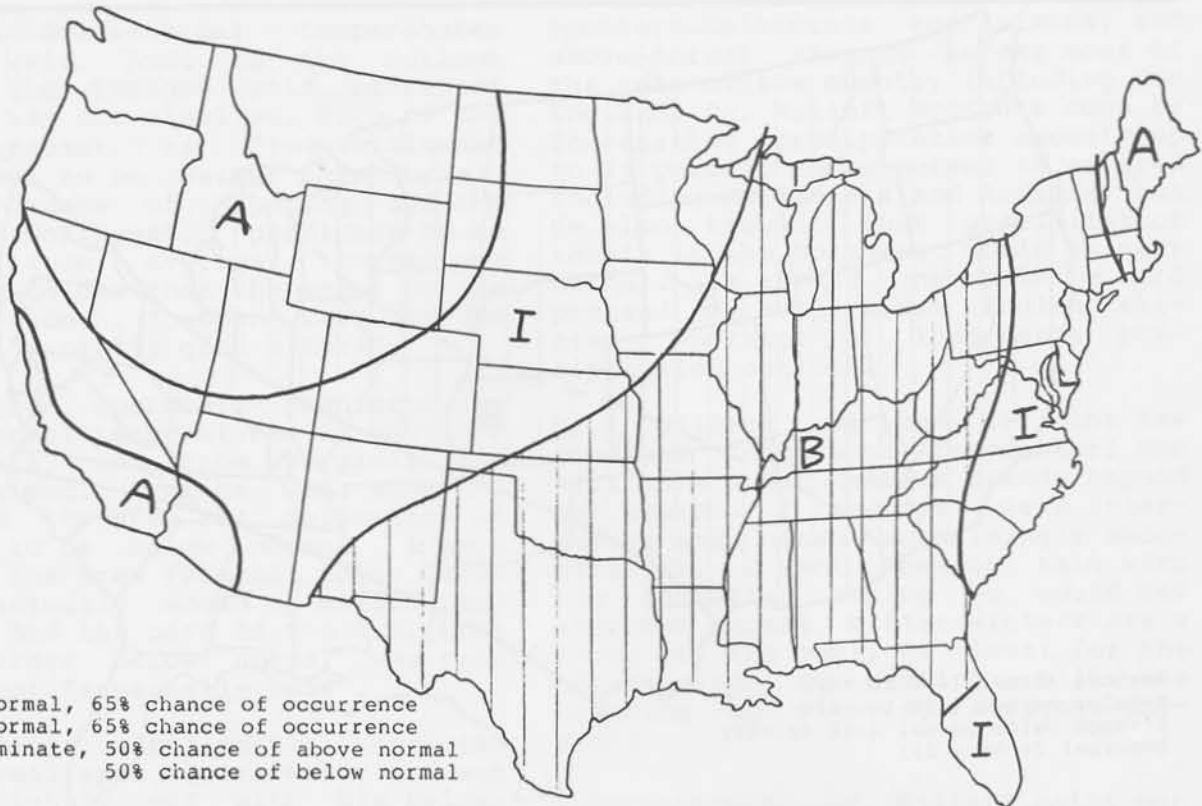


Figure 1. The NWS Climate Analysis Center temperature forecast for the winter (December through February) of 1979-80.

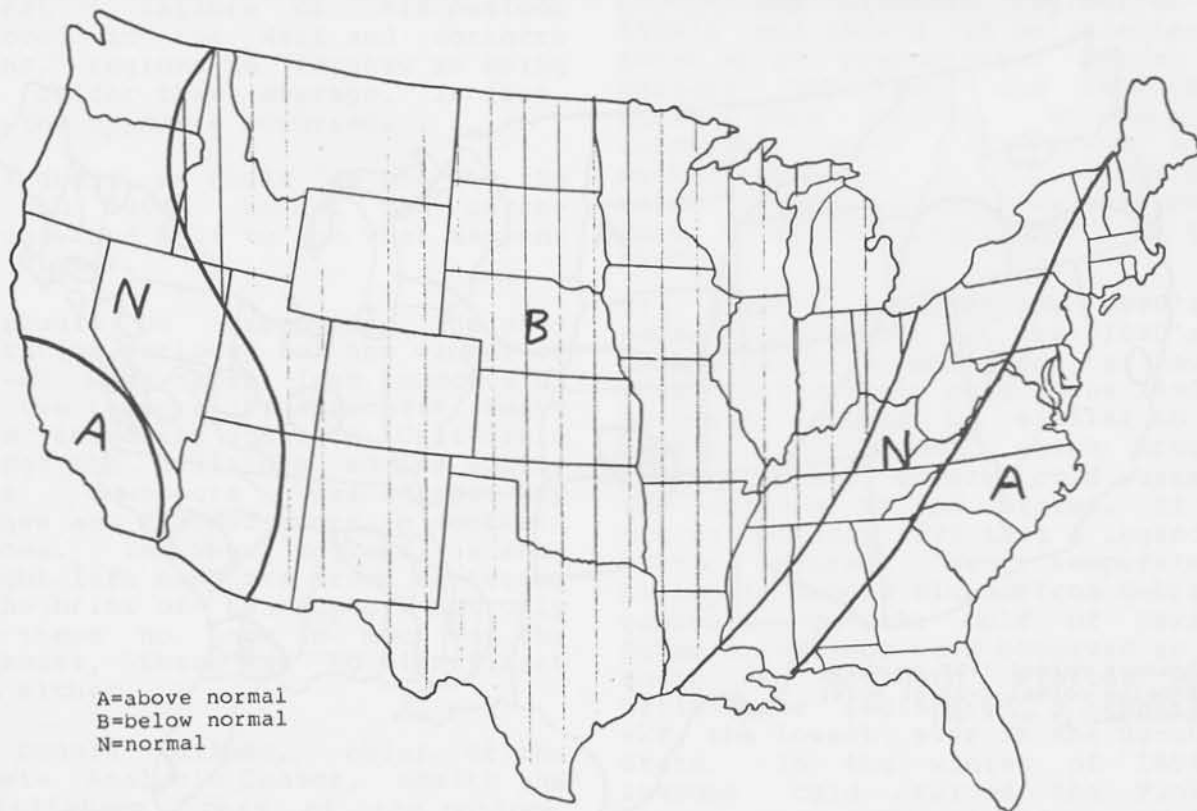


Figure 2. Dr. Jerome Namias' temperature forecast for the winter (December through February) of 1979-80.

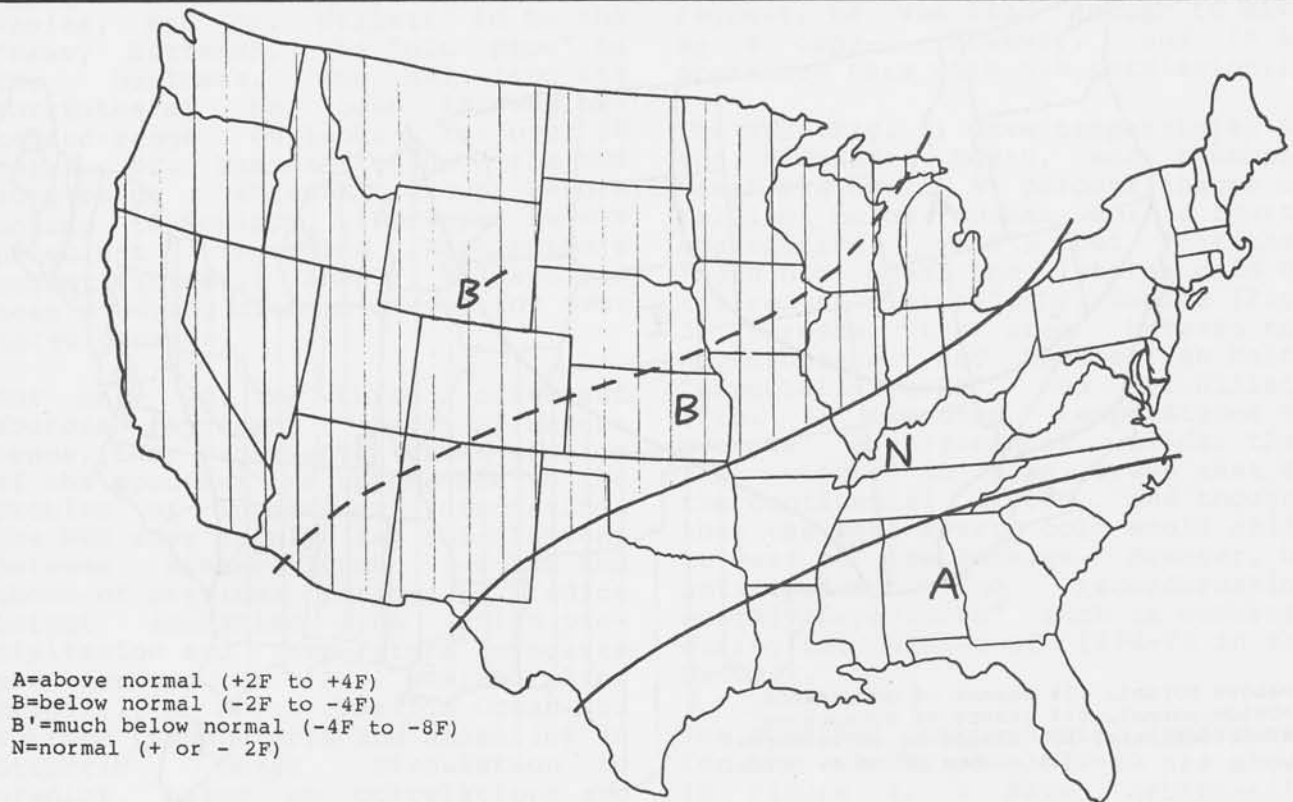


Figure 3. Dr. Hurd Willett's temperature forecast for the winter (December through February) of 1979-80.

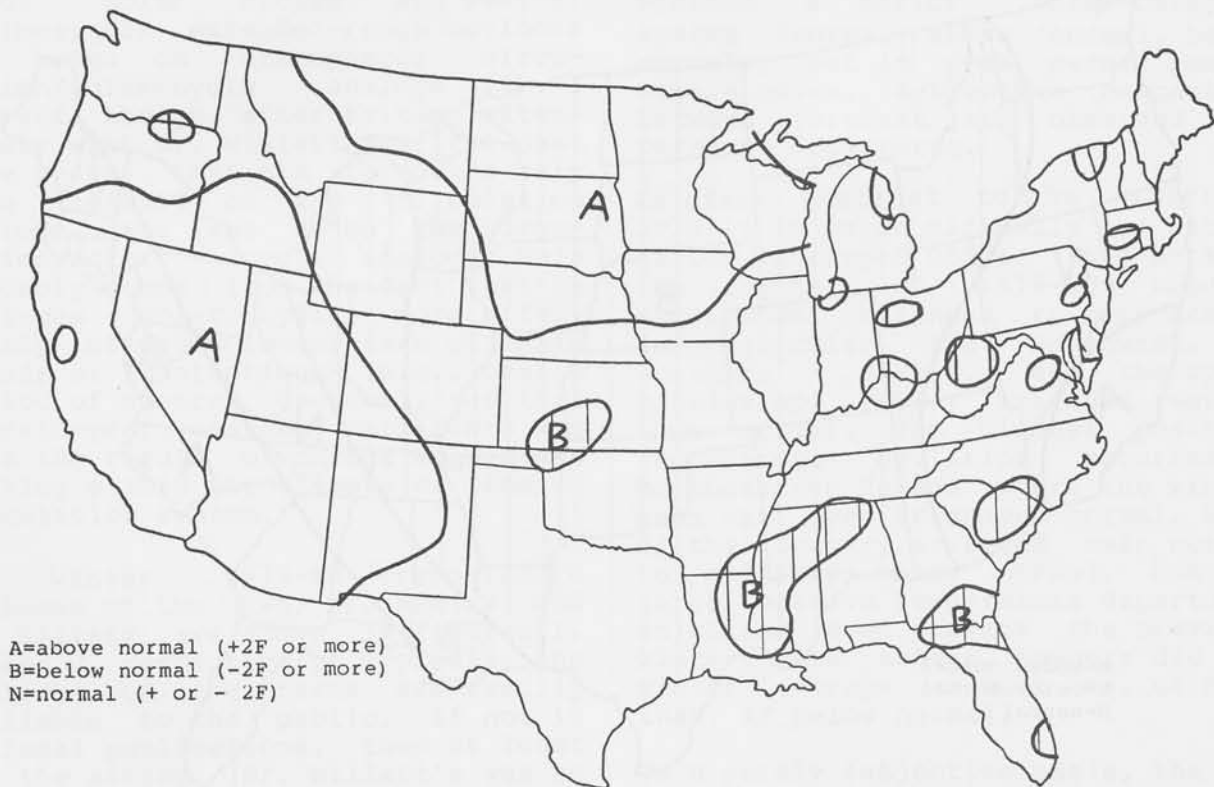


Figure 4. Observed temperature departures for the winter (December through February) 1979-80 (source: NWS).

