45 WHAT'S NEW FOR SNOW IN NOAA'S 1981-2010 U.S. CLIMATE NORMALS?

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1. INTRODUCTION

NOAA's U.S. Climate Normals for 1981-2010 include a suite of descriptive statistics for snowfall and snow depth. Three types of statistics are provided: average totals, frequencies of occurrence, and percentiles of both monthly totals and daily observations. Starting with daily reports from the Global Historical Climatology Network - Daily data set (Durre et al. 2010), the snow-related computations utilize either 24-hour snowfall or the depth of snow on the ground at the time of observation.

While the details of the methodology, associated caveats, and detailed results will be provided in forthcoming journal articles, the purpose of the poster to be presented at the 92nd Annual Meeting of the American Meteorological Society (AMS) is to highlight the major changes users of previous releases of the U.S. Climate Normals (e.g., Heim et al. 1996; Owen and Whitehurst 2002) will notice. These changes include the addition of statistics not available in previous releases of NOAA's Climate Normals, enhanced spatial coverage, climatological differences between the 1981-2010 and 1971-2000 epochs, and easier access to the full suite of Normals products. A brief summary of these topics follows. Supporting figures will be provided in the poster.

2. NEW STATISTICS

The 1981-2010 snow-related Normals consist of traditional and new statistics. The traditional ones include average monthly, seasonal, and annual snowfall as well as, for both snowfall and snow depth, the average number of days per month, season, and year on which amounts exceeded various thresholds. On the monthly timescale, the lower quartile, median, and upper quartile of monthly snowfall are added to provide the user with a sense of the variability of monthly snowfall totals around their long-term average. The most significant changes and additions, however, are found on the daily snow depth, whose utility is limited by the typically large fraction of zero amounts, the latest snow-related Normals consist of several statistics designed to address the needs of various user groups. They include average month-to-date and year-to-date snowfall totals, probabilities of occurrence for snowfall and snow depth exceeding various thresholds, and the medians and quartiles of non-zero daily snowfall and snow depth observations. In the poster, plots of these statistics for selected stations will illustrate their utility.

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3. ENHANCED SPATIAL COVERAGE

Statistics for both snowfall and snow depth are now available at approximately 5300 stations, a larger number of stations than was included in previous sets of Normals. For a further 1100 stations, only snowfall statistics are available because their records of snow depth were insufficiently complete. By comparison, the 1961-1990 Normals contained snowfall and snow depth statistics for approximately 3000 stations, while snow-related statistics were limited to a few hundred stations in the 1971-2000 release.

4. CLIMATOLOGICAL DIFFERENCES BETWEEN 1971-2000 AND 1981-2010

Figure 1 shows the percentage difference between average annual snowfall totals during 1981-2010 and those for 1971-2000. Compared to 1971-2000, average annual snowfall for 1981-2010 is lower in a band that extends from Montana through Kansas to the Carolinas as well as in the Pacific Northwest. On the other hand, no coherent pattern of change is apparent when comparing maps of the annual number of days with measurable snowfall for 1981-2010 with those for 1971-2000.

The lower 1981-2010 average annual snowfall totals in some regions thus appear to be the result of less snowfall on days on which it snows rather than due to fewer days with snowfall. The reader is cautioned that these results represent differences between two overlapping 30-year periods and therefore are not necessarily representative of linear trends in snowfall amounts or frequencies during 1971-2010. They are offered for the purpose of comparing climatological conditions between the two most recent Normals periods rather than as an assessment of climate change.

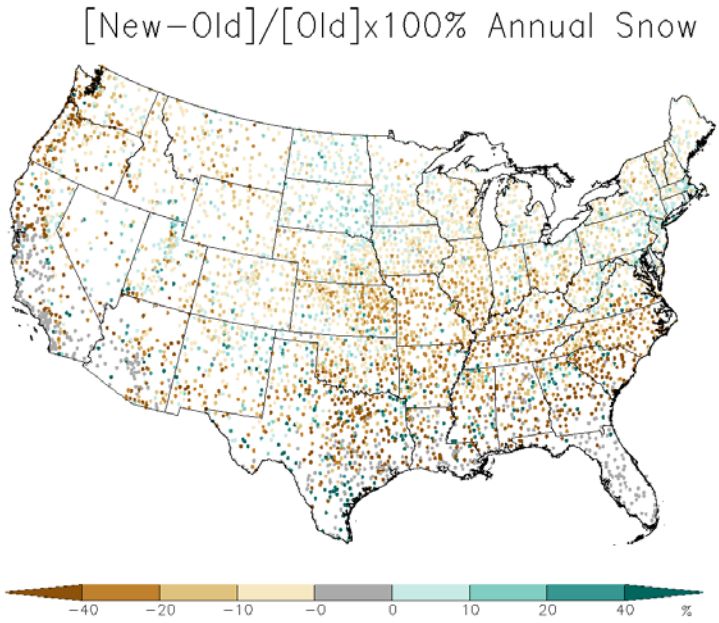

Figure 1: Percent difference between the 1981-2010 and 1971-2000 average annual snowfall totals across the contiguous United States. Both sets of averages are computed from GHCN-Daily using the methods employed for the 1981-2010 normals. At each location, the percent difference is calculated as the difference between the 1981-2010 and 1971-2000 normals, divided by the 1971-2000 normal. A positive difference indicates that the 1981-2010 snowfall normal is greater than the 1971-2000 normal at the same location.

5. EASIER ACCESS

Finally, in previous releases of the Normals product, the snow-related Normals were provided as a supplement to the primary sets of temperature and liquid precipitation statistics. In this latest release, snowfall and snow depth are fully integrated into the primary suite of products. This integration not only allows for consistency in the procedures applied to the liquid equivalent of precipitation, it also makes it easier for users to access the full range of statistics for different variables. The Normals are available at http://www.ncdc.noaa.gov/oa/climate/normals/usnormals.html.

REFERENCES

Durre, I., M. J. Menne, B. E. Gleason, T. G. Houston, and R. S. Vose, 2010: Comprehensive automated quality assurance of daily surface observations. *J. Appl. Meteor. Climatol.*, **49,** 1615-1633.

Heim, Jr., R. R., 1996. An overview of the 1961-90 Climate Normals products available from NOAA's National Climatic Data Center. Preprints, *22nd Conference on Agricultural and Forest Meteorology, Atlanta,* GA, January 28-February 2, 1996. Amer. Meteor. Soc., pp. 193-6.

Owen, T.W., and T. Whitehurst, 2002: United States Climate Normals for the 1971-2000 period: Product descriptions and applications. Preprints, *Third Symposium on Environmental Applications: facilitating the use of environmental information, Orlando,* FL, January 13-17, Amer. Meteor. Soc., J27-J28.