



NOAA Atlas 14 Addendum



Precipitation-Frequency Atlas of the United States

Volume 2 Version 3.0: Delaware, District of Columbia,
Illinois, Indiana, Kentucky, Maryland, New
Jersey, North Carolina, Ohio, Pennsylvania,
South Carolina, Tennessee, Virginia, West
Virginia – Addendum – Update to Version 2.0

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U.S. Department
of Commerce

National Oceanic
and Atmospheric
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National Weather
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Silver Spring,
Maryland, 2004
revised 2006

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Kentucky, Maryland, New Jersey, North Carolina, Ohio,
Pennsylvania, South Carolina, Tennessee, Virginia, West
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Introduction

The Version 3 update represents an enhanced product that has added estimates for the 1-year average recurrence interval. In addition it incorporates some enhanced algorithms based on lessons learned in creating the newest volume, Volume 3 (Puerto Rico and the U.S. Virgin Islands). Each of the additions and enhancements were objectively justified and based on sound science. The enhancements include improved spatial interpolation when using the inverse-distance-weighting function, improved consistency adjustments for co-located daily and hourly stations, and an improvement to the 24-hour confidence limits. Version 3 supersedes information in Version 2.

To facilitate the transition to Version 3, several difference maps between Version 3 and Version 2 are provided below. We recognize the implications of changing the precipitation frequency values, but most of the changes are within the levels of uncertainty previously provided in Version 2.

Table 1 lists the changes. A brief description and justification of each of the changes occurs on the following pages. A complete description of methodology changes will be included in the final NOAA Atlas 14 Volume 1 documentation to be posted here: http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_docs.html.

Action	Type	Description	Impact
1	Addition	Added 1-year average recurrence interval (ARI) precipitation frequency estimates	Expands applicability of NOAA Atlas 14.
2	Enhancement	Improved the computation of upper and lower confidence limits particularly for the 24-hour duration at co-located daily and hourly stations	Primarily 24-hour confidence limits at co-located daily and hourly stations
3	Enhancement	Implemented new co-located adjustment that was developed and used in subsequent Volumes	60-min quantiles at certain co-located stations
4	Enhancement	Implemented new inverse-distance weighting (IDW) algorithm that uses true (meters) distance instead of decimal degree distances	Spatially interpolated grid cells for data sparse areas/durations (especially at <24hr)
5	Miscellaneous Fixes	Miscellaneous minor station corrections: <ul style="list-style-type: none"> Corrected 24-hour confidence limits in daily region 18 (east central Pennsylvania) - the selected best distribution is GLO, but GEV was erroneously used 	24-hour confidence limits at several stations

Table 1. Additions, enhancements and fixes incorporate in NOAA Atlas 14 Volume 2 Version 3.

Explanations of additions, enhancements and fixes

1. Added 1-year average recurrence interval (ARI) precipitation frequency estimates

- 1-year ARIs are now available. 1-year AEPs cannot be theoretically defined, and hence are not available. Details will be available in updated final documentation.

2. Provided improved upper and lower confidence limits for the 24-hour duration at co-located daily and hourly stations

- The 24-hour confidence limits are now obtained from the analysis of the daily regions instead of hourly regions at co-located stations. This has decreased the band of uncertainty at most

co-located stations and more accurately reflects the uncertainty associated with the quantile, which is also derived from the daily region. The enhancements cause the band of uncertainty to be more symmetrical about the mean. Most changes to the confidence limits were within +/- 10% of the Version 2 confidence limits - only 20 stations out of 3,087 stations had changes greater than 10% as a result of this change.

3. Implemented new co-located adjustment for special cases

- An enhanced practical adjustment was applied to the precipitation frequency estimates at co-located daily and hourly stations that presented unique data characteristics where two or more hourly durations at the station shared the same annual maximum or had a very close values which created a very flat slope for quantiles from 5-year through 1,000-year. This coupled with different daily and hourly regional characteristics created discontinuities relative to nearby stations. The adjustment generates hourly quantiles more consistent with each other and with daily stations given different daily and hourly regions.
- Only two hourly stations in the project area (33-4681 London, OH and 33-3375 Greenville Sewage Plant, OH) met the specific criteria and therefore had changes >20% in their 1,000-year 60-minute estimates and smaller changes in the results for the shorter return frequencies. The causes of the unique cases are the data sampling at those stations and the different regional characteristics. The percent change at all other hourly stations was +/- 2.7% as a result of this modification and its impact on regional statistics. This adjustment did not significantly impact other durations at these stations.

4. Implemented new inverse-distance weighting (IDW) algorithm

- Although the IDW still takes place in a “geographic projection,” the distances are computed in true distances (meters) rather than decimal degrees.
- Changes in the updated grids provide a refinement to the estimates but do not exceed previously established confidence limits (although the confidence limits themselves are affected by the update).

5. Miscellaneous minor station corrections

- **Corrected 24-hour confidence limits in daily region 18 (east central Pennsylvania) - The selected best distribution is GLO, but GEV was erroneously used**
 - ✓ Eighty-three stations in daily region 18 (east central Pennsylvania) had incorrect 24-hour confidence limits because the selected distribution was GLO but GEV was erroneously used on the daily data in the computation of the confidence limits. The quantiles themselves were correctly computed and were not affected by this change. The impact on the confidence limits was minimal (<3.5% at 100-year 24-hour).

6. Cumulative impact of enhancements and fixes

In general, the composite change on the 100-year 24-hour map is small, with most areas only seeing less than a +/- 2.5% change, primarily as a result of the new IDW. Likewise, most areas on the 100-year 60-minute map experience a change within +/- 2.5%. Slightly larger changes occurred in the confidence limits, but still most areas experienced a change within +/- 5%. Although some of the individual enhancements to the data caused larger percentage changes, the combined impact of all enhancements lead to a relatively small change to the precipitation frequency estimates. Overall, the largest percentage changes resulted in a slight decrease in the estimate (i.e., version 3 values came in slightly less than version 2). It was determined that most of the cumulative changes were the result of the enhanced spatial interpolation.

The maps posted below graphically indicate the cumulative percent change of all changes/fixes to the 100-year 60-minute and 100-year 24-hour maps. Similar changes occurred at other frequencies and durations.

http://hdsc.nws.noaa.gov/hdsc/pfds/orb/orb_ver2_vs_ver3_100y60m.pdf

http://hdsc.nws.noaa.gov/hdsc/pfds/orb/orb_ver2_vs_ver3_100y24h.pdf