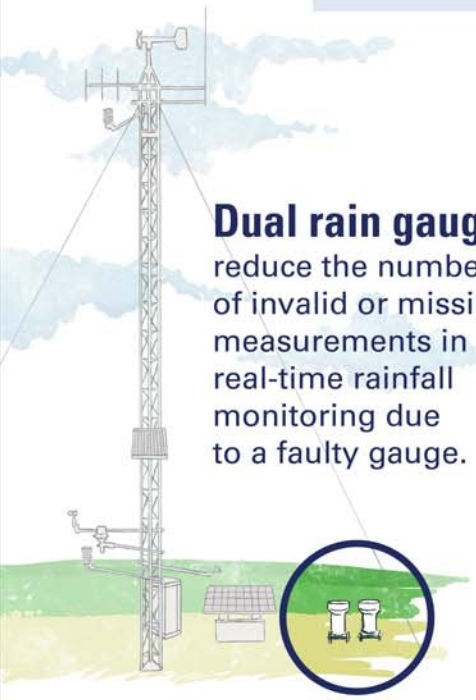
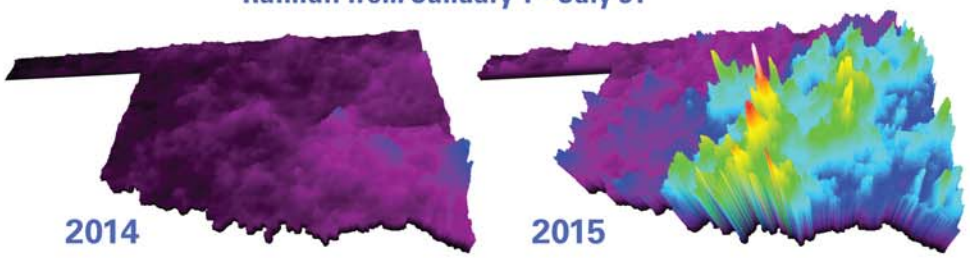
Understanding Precipitation Changes in Oklahoma
and Contributions of the Oklahoma Mesonet

Reuben Reyes, Rafal Jabrzemski, Michael D. Klatt, and Christopher A. Fiebrich



Dual rain gauges
reduce the number of invalid or missing measurements in real-time rainfall monitoring due to a faulty gauge.

Rainfall from January 1 - July 31



Data visualization
gives users multiple ways to access and view rainfall accumulation maps and animations, ranging from 5-minute to multi-year timescales.

mesonet.org

facebook.com/mesonet

twitter.com/okmesonet

OKLAHOMA CLIMATOLOGICAL SURVEY | Mesonet

Acknowledgements: 3D-magine's Hub, One University Store at The University of Oklahoma, and continued funding for maintenance of the Oklahoma Mesonet is provided by the taxpayers of Oklahoma.

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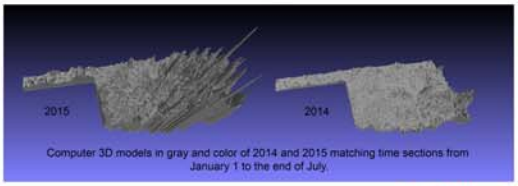
Oklahoma Climatological Survey

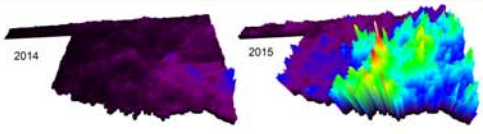
Developed Software to process dual-gauge observations at all Mesonet sites

A key component of the presented research is new software developed with the aim of automatically recording and storing weather data at all Mesonet sites. Due to the high importance of precipitation measurements, the Oklahoma Mesonet recently added a backup rain gauge to all stations to allow for redundant rainfall observations and ensure data consistency. The presented software makes it possible to process dual-gauge observations at all Mesonet sites, which reduces the number of invalid or missing measurements due to a faulty gauge. The software is crucial for maintaining accurate and continuous delivery of rainfall totals for the state of Oklahoma.

Dual rain gauges from Oklahoma Mesonet site



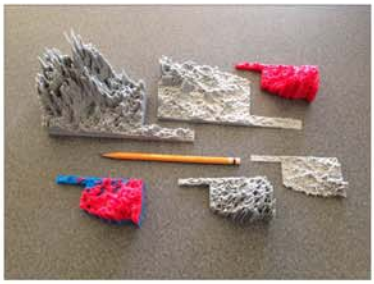
Computer 3D models in gray and color of 2014 and 2015 matching time sections from January 1 to the end of July.



Abstract

Oklahoma Mesonet, the statewide weather monitoring system, has been taking high-frequency (every 5 minutes) rainfall observations across the state for over 20 years. Precipitation is among the most important indicators used to define droughts. It is also crucial for determining appropriate irrigation amounts in the agricultural sector, and thus make agricultural production more cost-effective. During flooding events, real-time rainfall observations are vital for forecasters and decision makers. Since the establishment of the Oklahoma Mesonet, researchers and staff have developed sophisticated models to represent and analyze different weather variables and make them freely accessible to the general public, researchers, and stakeholders. This research presents new and innovative additions to the Mesonet's methodology that allow for a more comprehensive analysis of precipitation across Oklahoma.

Volumetric 3D rain models based on Mesonet rain totals and radar estimates across the Oklahoma



3D physical printed models.

Dynamic animation of recent rain amounts across Oklahoma

Part of the new methodology is a dynamic animation of recent rain amounts based on data from up to 120 Mesonet sites located across the state. The animations include radar estimates of rainfall between Mesonet sites. Included in the software are increased time resolution and flexible changes of time intervals for any selected recent or past time period.

Higher resolution images (x4) per frame at 1 hour time intervals. We also have the ability to dynamic change the date window ranging from one day to 30 days or more. Each frame represents rain totals from up to 120 Mesonet sites and radar estimates of rainfall between Mesonet sites The example animations presented here are of one week, two weeks, and one month (30 days) rain across Oklahoma. The full animation is from January 1, 2015 to August 13, 2015 encompassing a total of 5,376 frames. Each second in this animation represents one day. We set the animation rate to 24fps and each image (frame) representes1hour change in time.

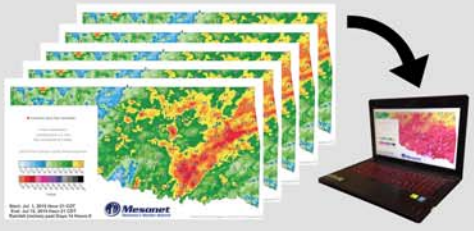


Illustration of animation rain totals and radar estimates of rainfall between Mesonet sites. Movie / animation available for viewing at https://www.facebook.com/mesonet/

We created volumetric 3D rain models based on Mesonet rain totals and radar estimates across the state. The models allow for a comparative analysis of precipitation changes that have been occurring over time at each Mesonet site in Oklahoma. The 3D models can be useful both for research purposes and outreach activities, as they facilitate an easy understanding of otherwise very complex precipitation data sets. The 3D perspective further promotes a geographical precipitation analysis, which is important for better comprehension and comparisons of two or more 3D models from equal time periods.

The presented methods provide an improved and more accurate representation of precipitation changes occurring across Oklahoma.

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Mesonet
Oklahoma's Weather Network