# Weather Product Latency Versus Data Age Differences and Impacts on Aviation

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## The Issue

There has been confusion among users between weather product latency and data age. Weather products such as satellite imagery or radar mosaics of precipitation contain a valid time stamped on the product. This time stamp is usually the time the data within the product were processed or the time the product was actually produced and disseminated.

## Product Latency

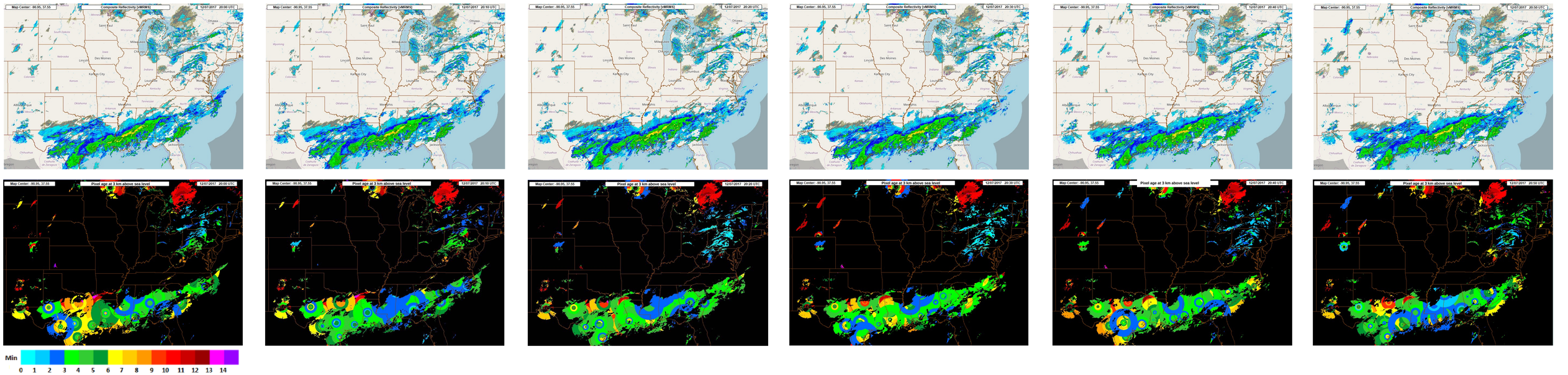
Product latency is the length of time elapsed between the time stamp on the product and the time the product is viewed or used. Generally users comprehend product latency and take the difference into account.

## Data Age

Less understood or considered by users is data age. Data age refers to how old the data is within the product. The actual data making up these products are rarely measured or collected exactly at those valid times indicated on the product, and may in fact be many minutes or even hours old. It is difficult to assign a representative data age to a radar mosaic since the composited data comes from multiple NEXRADs that are operated asynchronously. A volume scan is not a snapshot, but takes several minutes to complete, with different volume scanning strategies having different completion times. As a consequence, the pixels in the digital display of a radar mosaic represent data from a limited but complex range of observation times.

## Impact

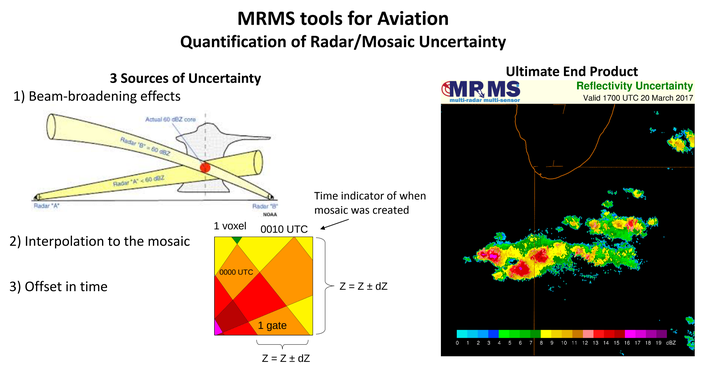
The misunderstanding between product latency and data age has produced fatal consequences in aviation. The National Transportation Safety Board has documented several instances where pilots misinterpreted a radar image received in their cockpit via tablets or other devices. Basing their decisions on the time stamp of the product and not knowing the radar data was actually much older than the time listed, the pilots inadvertently flew directly into thunderstorms with catastrophic results.




Time stamp mosaics (bottom) created by NSSL using the Multi-Radar Multi-Sensor (MRMS) system, and their associated Composite Reflectivities (top) from 20:00 to 20:50 UTC on 7 December 2017 in 10 minute increments. Data age is currently for one level at 3km above sea level. Data age varies by radar and range depending on the scan strategies employed at the time . Note at 20:00 data age ranges from 3-4 minutes in central LA to over 13 minutes in the ARKLATEX area. Note also how data age improved from over 6 minutes to less than 2 minutes from 20:40 to 20:50 UTC over west-central AL due to an update from the Columbus AFB, MS radar.

## Research Efforts

The Federal Aviation Administration (FAA), National Severe Storms Lab (NSSL) and others are researching ways for users to determine data age inside a product. Concepts such as allowing a user to move their curser over a pixel to display the age of the information or producing another product that illustrates data age are being considered. The FAA's Weather Technology in the Cockpit program is researching how to timestamp radar images so the timestamp properly informs the pilot of the latency of the information in the cockpit presentation.




## Conclusion

The goal is a product that depicts uncertainty on the reflectivity in the mosaic so that decision makers can decide for themselves whether the echo presents a threat for their activities. The MRMS prototype on the left shows a hypothetical map of the uncertainty to the reflectivity. The actual reflectivity is displayed +/- the uncertainty. Other sources of uncertainty, such as beam broadening and the blending together of multiple range bins in a given pixel will also eventually be included in this product.