Dust Storms: *One of Arizona's most Underrated Weather Hazards*

Jeff Davis
Senior Forecaster, NWS Tucson AZ

The state of Arizona is home to some of the most spectacular displays of blowing dust in North America. Dangerous dust storms impact the state several times per year causing major vehicle accidents, property damage, injures and loss of life. Most of the causalities occur on state highways when motorists encounter low visibilities and collide either head-on with other vehicles or stop causing a chain reaction. One of the worst blowing dust events in southeast Arizona occurred on April 9th, 1995 and resulted in 10 fatalities and 20 injures on Interstate 10 near Bowie. Strong winds associated with a low pressure system produced a plume of dust from the Willcox Playa which reduced visibilities to a few feet along Interstate 10 between Willcox and San Simon. This deadly event involved 4 separate accidents, totaling 24 vehicles.

While dust storms are extremely hazardous to motorists, exposure to blowing dust can have other affects on human health, both long and short term. Dust has been known to carry with it a variety of pathogens (fungi and bacteria) and chemical contaminants, all of which can affect your health. In addition, dust particles as large as 10 microns can cause breathing problems and finer particles can infect the lung directly. However, little is known about the direct impacts of dust storm events on public health, despite the attention given to the phenomenon called "dust pneumonia" that clamed lives during the Dust Bowl in the 1930s.

In the mid 80s researchers at Arizona State University did a study that identified 4 different weather types that generate dust storms in Arizona. These classifications are (1) Frontal, (2) Thunder-storms, (3) Tropical disturbances, and (4) Upper level cut-off lows or Troughs. Weather types 1 and 4 typically occur during the transition months of fall and spring, with type 3 occurring mainly in late August through early October. Figure 1 shows the monthly frequency of dust storm fatalities in Arizona which peaks in July.

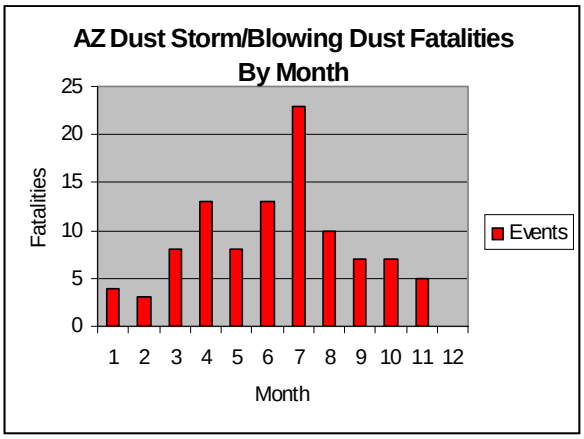

Figure 1: Monthly frequency of dust storm fatalities in Arizona.

The most common dust storm generation type in Arizona is 2, the thunderstorm. The mechanism for generating these dust storms is the organized outflow from downdrafts of decaying thunderstorms. This rain and evaporation cooled outflow results in a cold pool of air at the surface which travels the path of least resistance down the slopes of river basins and valleys. The dust storm takes on the appearance of a solid wall of dust that spans several miles in horizontal extent and several thousand feet vertically.

The largest and most ominous looking of these dust storms is called a "haboob". The name comes from the Arabic word habb, meaning "wind". Haboobs are most common in the central deserts of Arizona during the summer rainy season, with the frequency of occurrence peaking in late July and early August. The city of Phoenix experiences on average about 3 haboobs per year during the months of June through September. Figure 2 shows a classic haboob that moved through the Phoenix area on July 16th, 1971.

** Dust Storm Article Continues on Page 5

** Dust Storm Article Continued from Page 4

Figure 2: A picture of a Haboob that hit Phoenix, Arizona on July 16th, 1971. NOAA Photo Library.

The detection of dust storms is difficult for weather forecasters. Satellite imagery under clear conditions can sometimes detect areas of blowing dust. Figure 3 shows a plume of dust blowing off the Willcox Playa in the enhanced visible satellite imagery.

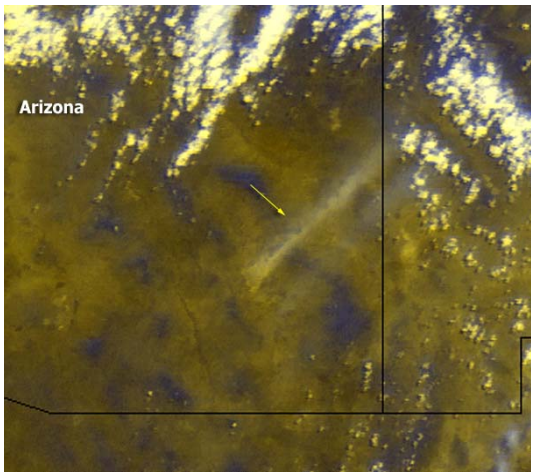

Figure 3: Satellite image of dust plume off the Willcox Playa in April 2004. NOAA Photo Library.

However, clouds associated with thunderstorms and their anvil cloud shields mask the blowing dust in satellite imagery. For cases involving thunderstorms, forecasters turn to Doppler radar velocity and reflectivity images for identifying outflow boundaries that may contain blowing dust. Figure 4 is a radar velocity image overlaid with station reports depicting an outflow boundary approaching Phoenix from the southeast. The current National Weather Service (NWS) radar system cannot discriminate from dust particles versus precipitation. Therefore, forecasters still rely heavily on surface observations from automated weather stations and the SKYWARN spotter network.

As a SKYWARN spotter, you play a very important role in warning the public of these dangerous dust storms. The NWS in Tucson will issue a Dust Storm Warning for visibilities of ¼ of a mile or less. A Blowing Dust Advisory will be issued when observed visibilities are at 1 mile or less, but greater than ¼ of a mile.

As we approach the peak season for dust storms in Arizona, just remember that the NWS relies on your reports of blowing dust to help save lives. If blowing dust is sighted, please contact the NWS as soon as possible and be prepared to give your location, visibility, and time of the event.

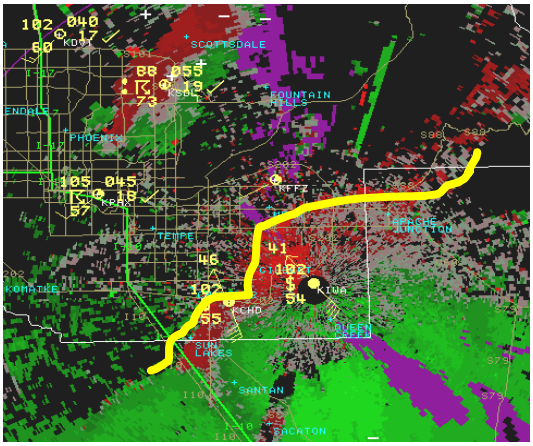

Figure 4: Doppler radar velocity image of the July 14, 2002 dust storm that hit Phoenix. The yellow line depicts the leading edge of the thunderstorm outflow.

Dust Storm Safety Tips:

- If dense dust is observed blowing across or approaching a roadway, pull your vehicle off the pavement as far as possible, stop, turn off lights, set the emergency brake, take your foot off of the brake petal to be sure the tail lights are not illuminated.
- Don't enter the dust storm area if you can avoid it.
- If you can't pull off the roadway, proceed at a speed suitable for visibility, turn on lights and sound horn occasionally. Use the painted center line to help guide you. Look for a safe place to pull off the roadway.
- Never stop on the traveled portion of the roadway.