IC4.3: Tucson to Phoenix I-10 Dust Corridors

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Overview: Dust storms along Interstate 10 between Tucson and Phoenix have resulted in several fatalities. Most recently on 10/4/11 a sudden reduction in visibility took the life of an elderly man when the vehicle he was traveling in was lodged under a semi-tractor trailer. In 2009 three individuals lost their lives after visibility was reduced in a dust storm that resulted in a series of crashes near Casa Grande. In a 2009 Arizona Daily Star article Dustin Krugel, and the Arizona Department of Transportation spokesman was quoted in an email, "Dust-related accidents make up a small portion of traffic fatalities in the state. But in the past decade, 36 people have died in them."

Anthropogenic factors have contributed to the already fragile nature of the desert soils and therefore have enhanced the dust production regions. Soils are dominated by loose clays that are easily broken up by mechanical means such as vehicle traffic and wind erosion. Agriculture operations and general land use have cleared the natural desert vegetation and thereby eliminating natural bonding mechanisms. Plowing operations also contribute to the break-up of soils and if conducted during peak wind events can initiate dust storms. In 2009, plowing operations along Interstate 10 were indicated as a major contributor to a blowing dust event that led to one fatality.

Synoptic Factors: 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) Thunderstorms, (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.

These four weather patterns can be further combined to two main types; monsoonal thunderstorms and frontally or synoptically induced. Strong Thunderstorms are associated with cold pool interactions as displayed in figure 1. Frontal or synoptic driven storms are associated with tight pressure gradients and can be further enhanced by evaporative cooling common when precipitation and virga accompany the associated trough or front.

Diagnosis and Prognosis:

Monsoonal convective activity can produce individual thunderstorm cells over a broad region. Model solutions are of limited use in forecasting where thunderstorms may develop and produce the associated cold pools necessary for dust storm production to take place. However knowledge of known dust production regions is essential to anticipate areas of limited visibility

for both monsoonal and synoptic driven events. The Wilcox Playa and the Tucson to Picacho Peak to Phoenix I-10 corridor are two well-known areas in SE Arizona that have and will continue to be dust production areas.

In synoptic driven events, forecasters can generally consider that the lower limit for dust production to be surface winds greater than 20mph. As mentioned previously gusts due to virga during marginal events can also lower this sustained minimum threshold to less than 20mph.

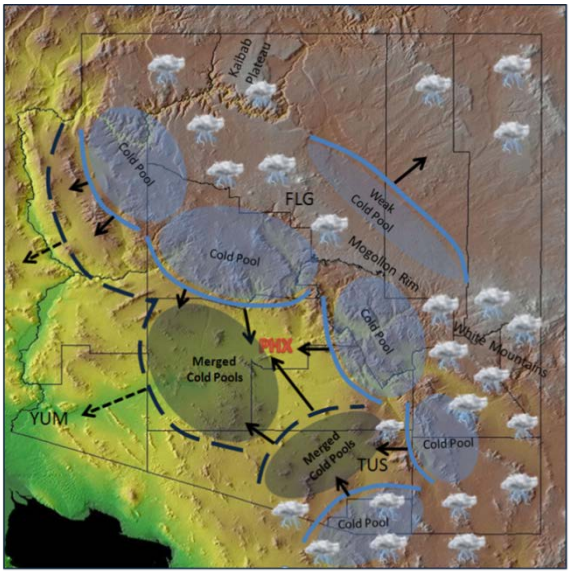

Figure 1 Cold Pool interactions and Movement

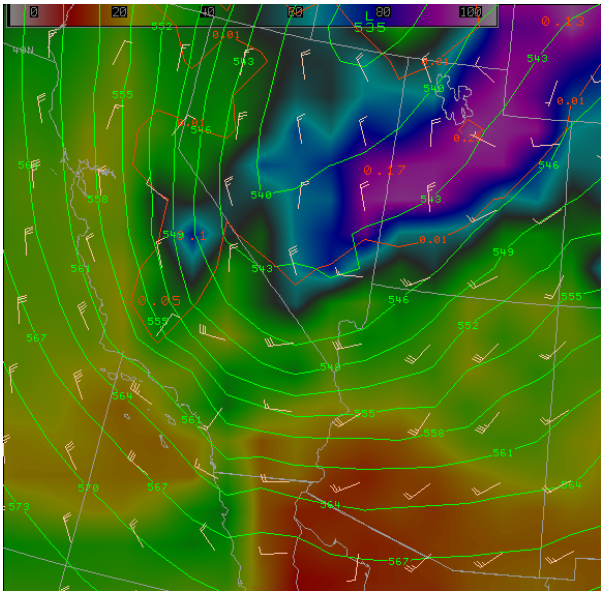

Figure 2 500mb Heights and Sfc Winds