

IC 4.3 Micro Climate: Terrain Influences on the Del Rio Wind Forecast

Christopher Morris WFO Austin/San Antonio

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Overview: A clear microclimate within the Austin/San Antonio CWA is the effect terrain has on the wind direction at the Del Rio ASOS (KDRT). The city of Del Rio is located in the Rio Grande River Valley at approximately 1,000 ft msl. To the north is the Texas Hill country and to the west are the Mexican mountains (see Figure A). Due to this geographic location the wind direction is mainly from two directions, north to northwest and southeast.

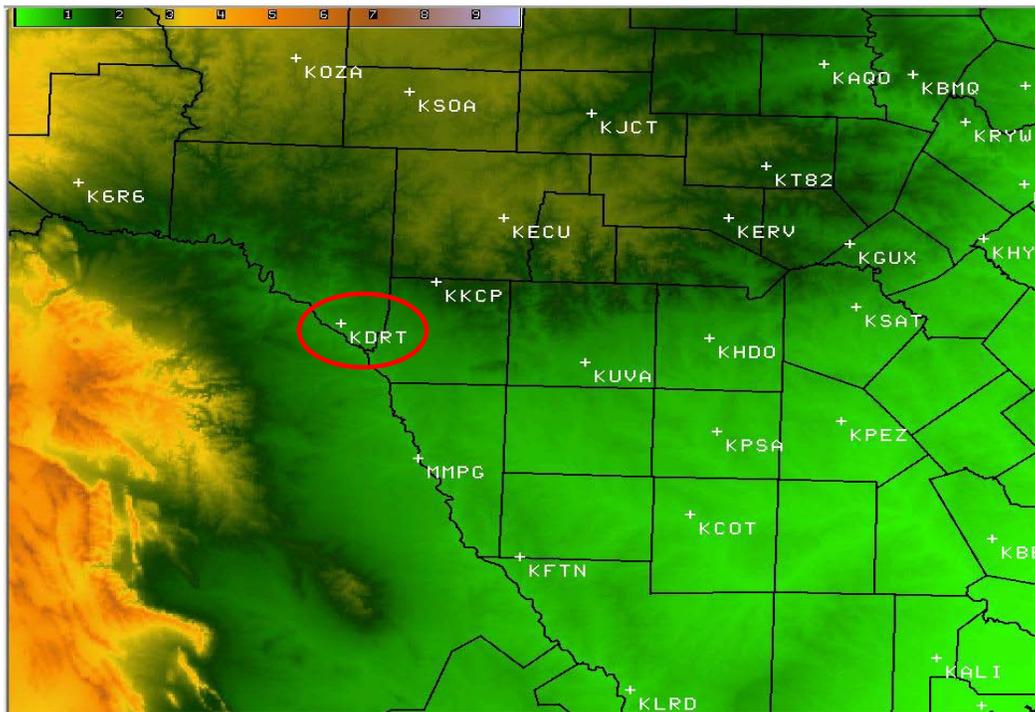


Figure A. A topographic map of the San Antonio County Warning Area is shown where higher altitudes are represented by warmer colors. Del Rio (KDRT) is highlighted by the red circle.

Data: Figure B (shown below) is a wind rose of two minute averaged wind over a full year for over a 27 year period. Comparing the wind direction to the terrain you can clearly see that the wind is funneled up and down the valley even through the elevation change is not dramatic. This funneling along the Rio Grande River Valley creates two directional maximums seen on the wind rose. Further inspection of the wind rose reveals that the wind blows from a southeasterly direction more frequently than any other direction. This is more likely due to synoptic and seasonal features rather than topography.

Breaking the data down by month shows there is not a month where the wind is purely from a northerly direction. Rather, there is a month where a southerly wind direction is maximized and a month where a northerly or southerly wind direction is near equally possible. July (Figure C) is the month with the maximized southerly wind, and December (Figure D) is the month with the near equal chances of a northerly or southerly wind direction.

Synoptic Setup: The most common synoptic setup to get a southerly wind at KDRT is with high pressure over south central Texas or over the western Gulf of Mexico. The clockwise circulation around the high funnels the wind up the Rio Grande valley and through KDRT. The weak pressure gradients associated with this type of setup also explains why the sustain winds are generally 12kts or less.

A northerly wind at KDRT is most common with the passage of a surface cold front. As the front progresses southward, the winds filter down the various valleys and river channels of the Rio Grande River Valley and Texas Hill Country through KDRT. The ability of a cold front to progress far enough south to create this setup is maximized in December and minimized in July, which is reflected by the wind roses. December also showed the highest frequency of the higher end winds (+20kts), which is due to the stronger pressure gradients associated with the front.

Forecasting: The GFS and NAM MOS both do a good job on forecasting the wind direction at DRT due to the localized climatology. The NAM is more accurate verses the GFS which is most likely due to the higher model resolution. However there is some underperformance by the models on the timing of wind shifts on poorly forecasted frontal passages. Because of this, model performance should be evaluated when forecasting the frontal passage for both the zones and TAF.

Figure B

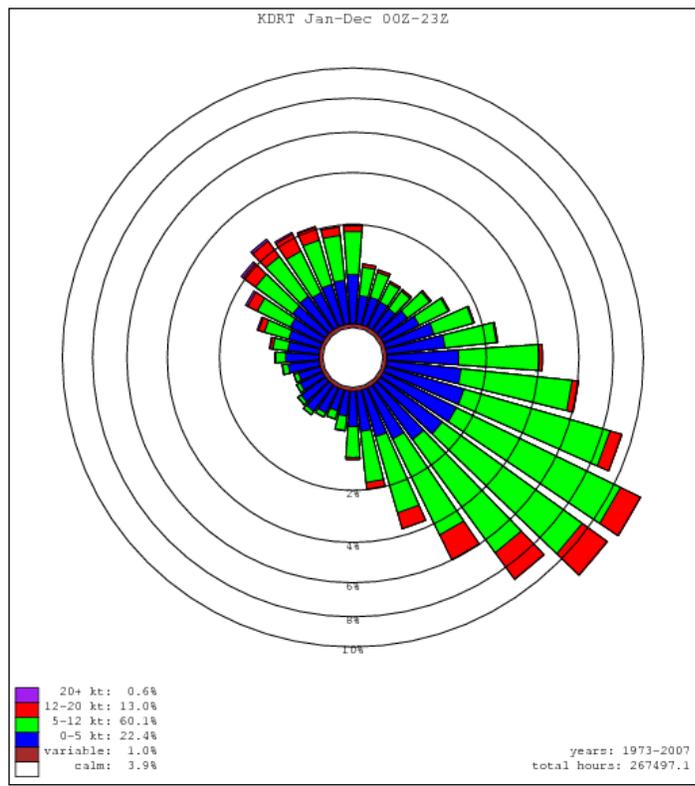


Figure C July 00z-23z

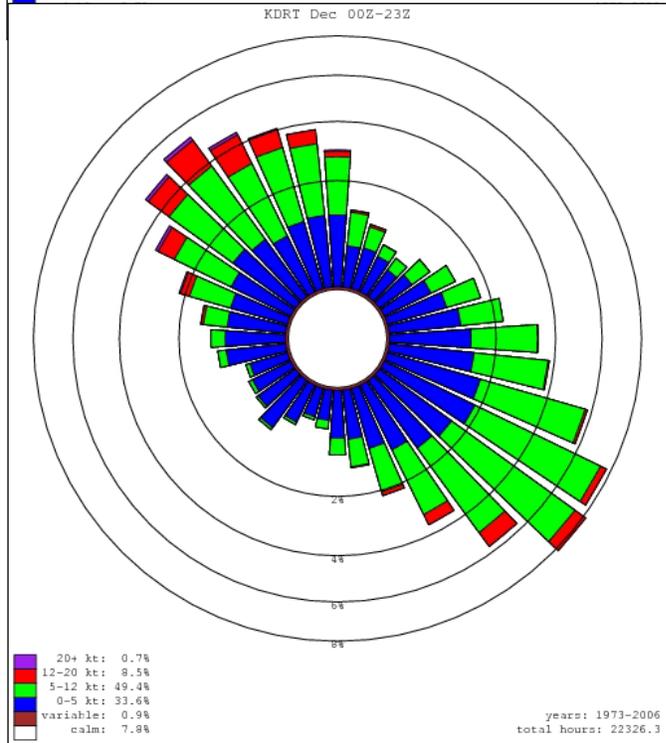
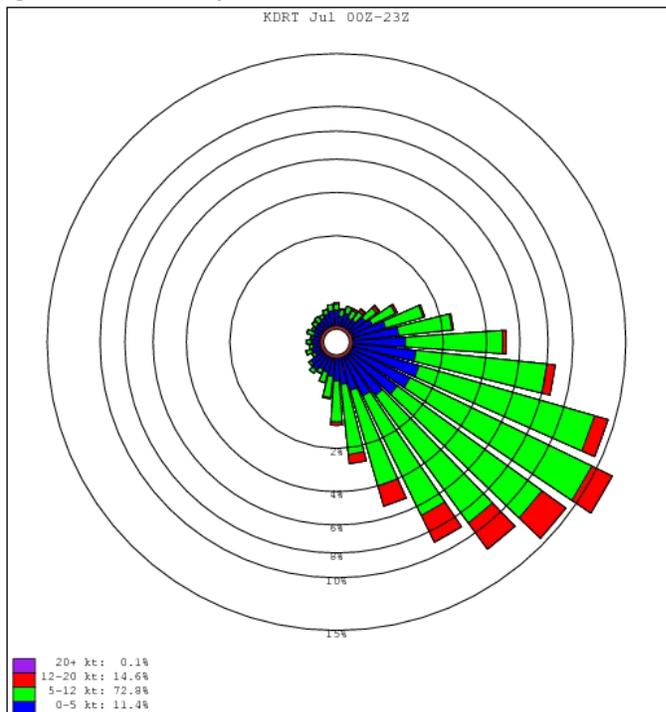


Figure D December 00z-23z