A WES CASE ANALYSIS OF A COLUMBIA BASIN DUST STORM

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Introduction

This WES case is a Dust Storm event that occurred during the afternoon and early evening on 16 March 2005. This event was chosen because it challenges forecasters to consider warnings and advisories for both high wind and for blowing dust. For the majority of locations in the Columbia Basin observed wind speeds were just slightly below high wind criteria. Accordingly, one challenge this case presents is choosing between the issuance of high wind warnings versus wind advisories. A second challenge is estimating visibilities due to blowing dust. Because fall (not spring) is the peak season for dust storms, some forecasters may tend to underestimate the threat of low visibilities due to blowing dust. In reality, blowing dust was a greater threat than damaging wind, e.g., in at least 4 zones roads were closed due to near zero visibility from blowing dust.

Synoptic Features

This event was preceded by a two-week period dominated by a high-pressure ridge resulting in almost zero precipitation east of the Cascades. This precipitation-free period created the dry soil conditions necessary for a dust storm. The “break down” of the ridge was accomplished by a strong short wave moving northwest to southeast across Washington. Water Vapor Imagery at 00z 17 March 2005 indicates fairly strong subsidence behind the shortwave (see figure 1), except the “darkening” behind the shortwave is not as dark as is typical for most high wind events.

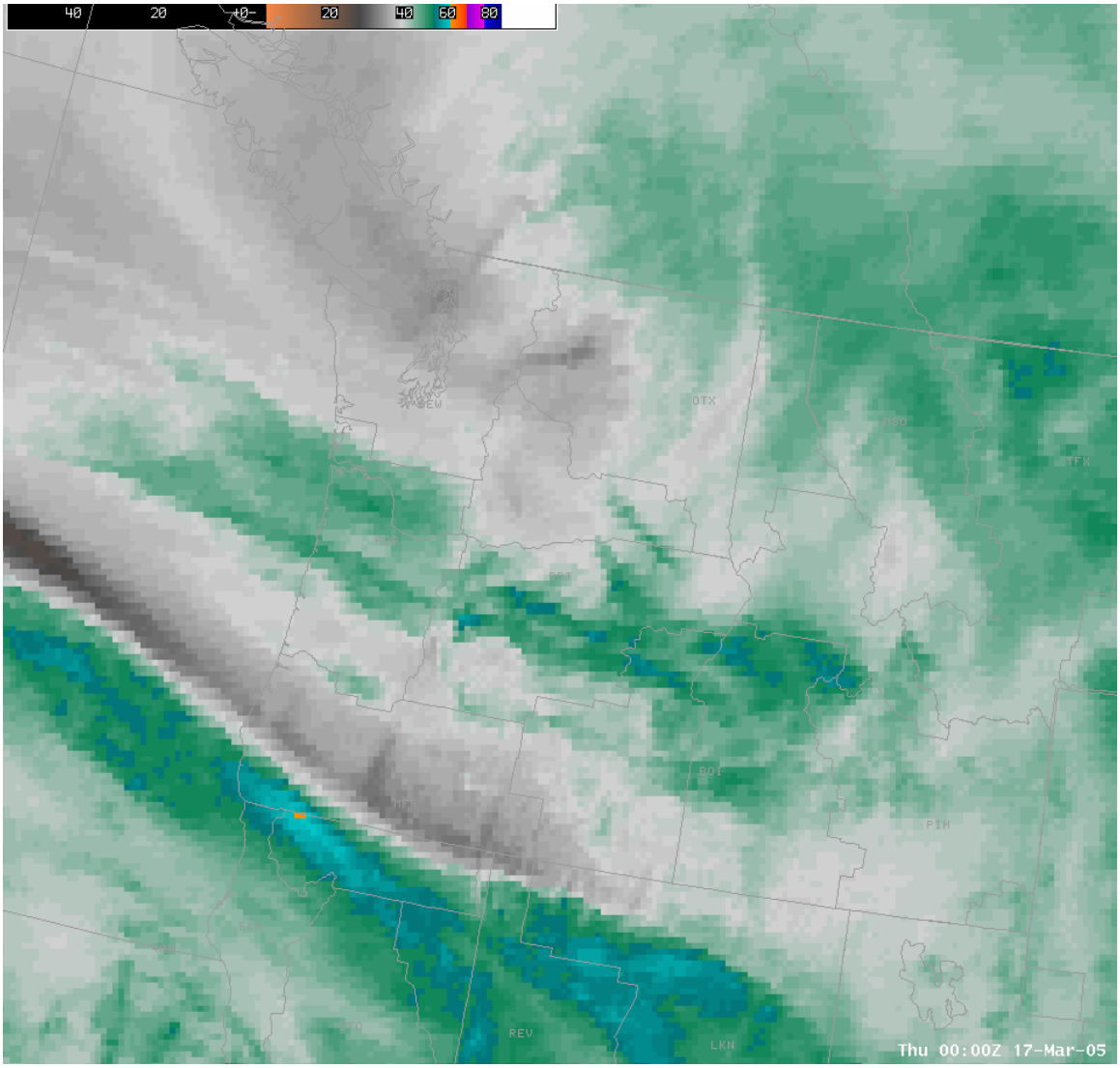

Figure 1.

A surface cold front did not stall along the Cascades, as often occurs, but rather remained ahead of the upper level front driven by a strong upper-level jet oriented perpendicular to the surface front. A well-defined surface low also tracked across eastern Washington. Model analyses at 12z 16 March 2005 showed prefrontal 850 mb southwesterly winds were in the 25 to 35 kt range and postfrontal 850 mb winds maximized at about 45 kt that afternoon. Figure 2 shows the 12-hour forecast of MSL pressure and 850 mb wind valid at 00z 17 March 2005 from the 12z 16 March 2005 run of the Eta (NAM) model.

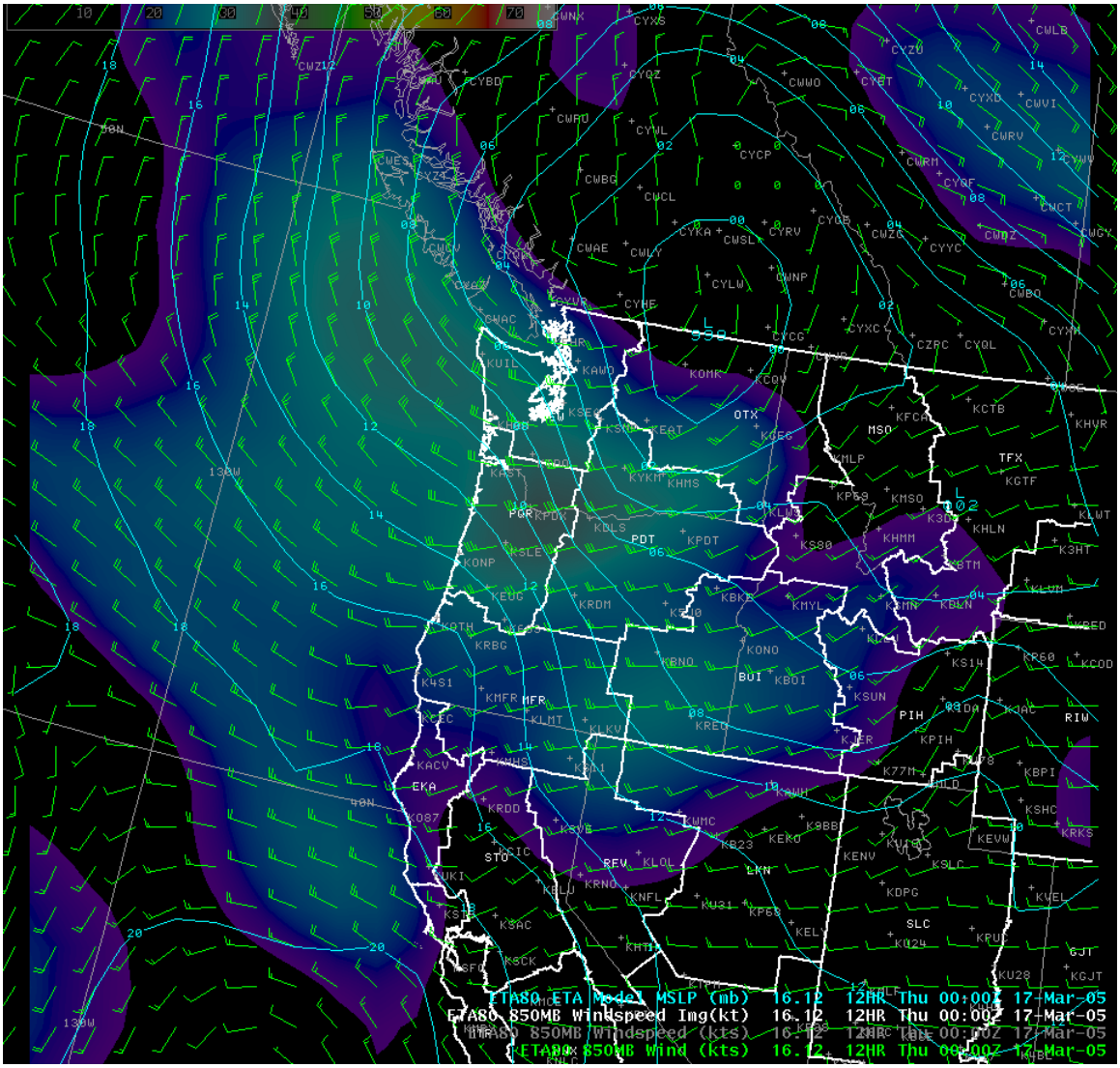

Figure 2.

Most locations in the Columbia Basin showed an obvious cold frontal passage with rapid pressure fall/rises accompanied by a distinct shift in wind direction from southwest to northwest. The strongest observed winds were southwesterly during the 2-hour period prior to the wind shifting to the northwest. Figure 3 is a 00z 17March 2005 surface plot and MSL pressure analysis showing the approximate location of the surface low.

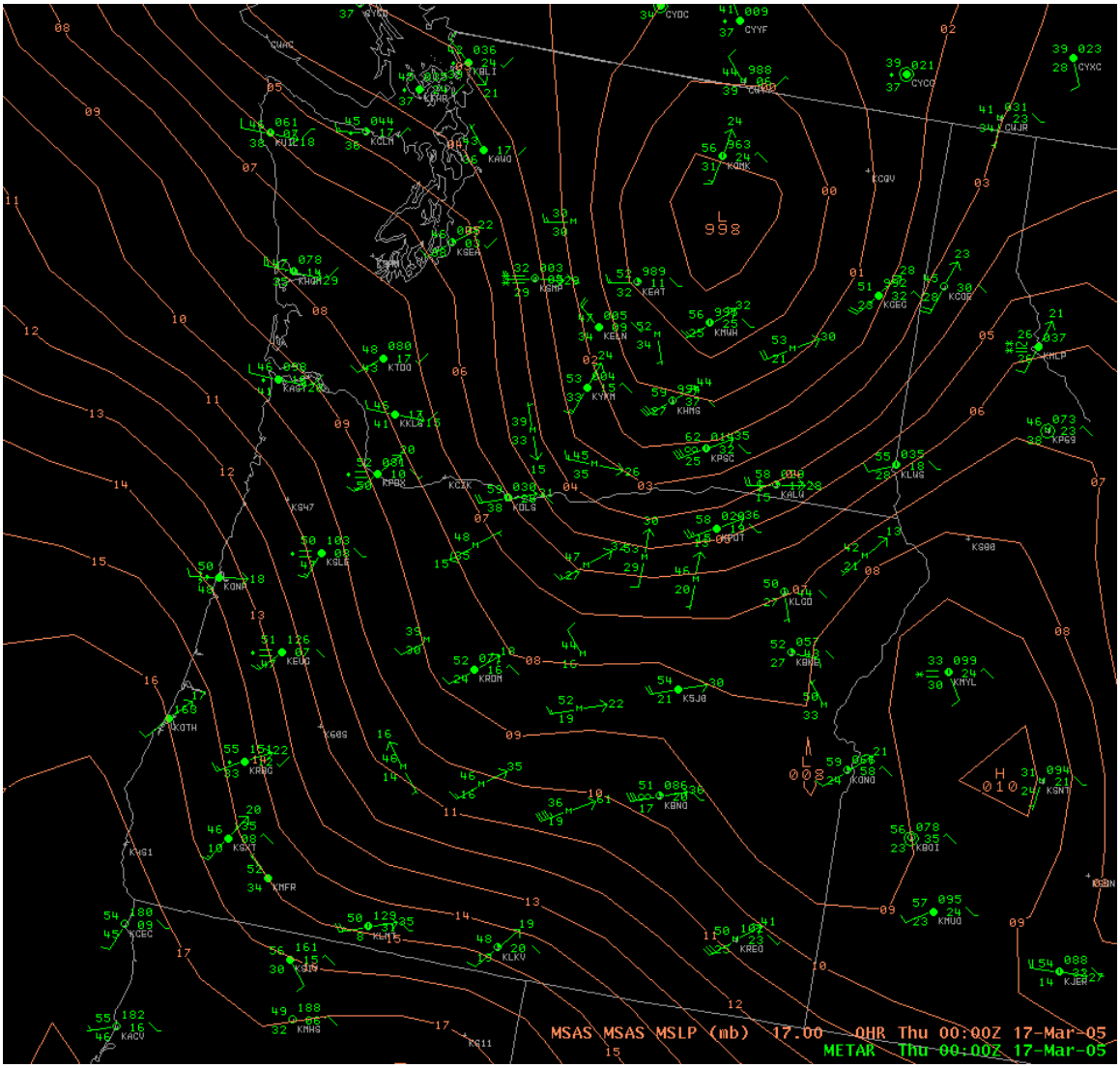

Figure 3.

Discussion

Based on several case studies, forecaster guidance for Columbia Basin southwesterly high wind events includes looking for (a) 850 mb wind speeds at least 40 to 50 knots, (b) 700 mb wind speeds greater than 60 knots, (c) a strong MSL pressure gradient across the Columbia Basin, e.g., a PDX-GEG gradient of at least 12-15 mb, (d) a mechanism to bring the strong winds to the surface, e.g., a cold front or isentropic descent, and (e) in the short term monitoring water vapor imagery for darkening, showing isentropic descent associated with a short wave. Another feature to watch for with cold frontal and/or surface low events is sharp surface pressure rises with model forecasts showing at least 6mb MSL pressure rises over a 6 hour period. This event marginally involved all of these ingredients with the exception of (c) -- the maximum MSL pressure gradient was about 10 mb. Therefore, this event validates the forecaster guidance in that it was at best a

marginal high wind event. On the other hand, significant problems and low visibilities due to blowing dust occurred several hours before the strongest wind. Outlook products leading up to this event (such as the Hazardous Weather Outlook) would have best served the public by focusing more on threats due to blowing dust rather than on damaging high wind.

This event points out that blowing dust and high wind warning episodes may occur at any time of the year as long as the ambient conditions, meteorological and non-meteorological, support them. In addition, not all guidance predictors need to be fully satisfied for a high wind or blowing dust event to occur. Each event needs to be examined on a case-by-case basis.