A COLUMBIA BASIN HIGH WIND EVENT FOR THE WEATHER EVENT SIMULATOR (WES)

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Introduction

This WES case is a Columbia Basin high wind event that occurred 07 February 2002. The event centered around the passage of a surface low pressure center and resultant pressure gradients in conjunction with winds aloft mixing down. It demonstrates the importance of considering synoptic forcing, terrain forcing and mixing processes and not just surface pressure gradients when forecasting high winds. Because the model initialization of a Pacific low pressure system was quite poor for this event, it is also a good training exercise in recognizing poor initialization and responding quickly to observations and satellite imagery as an event unfolds.

Synoptic and Mesoscale Features

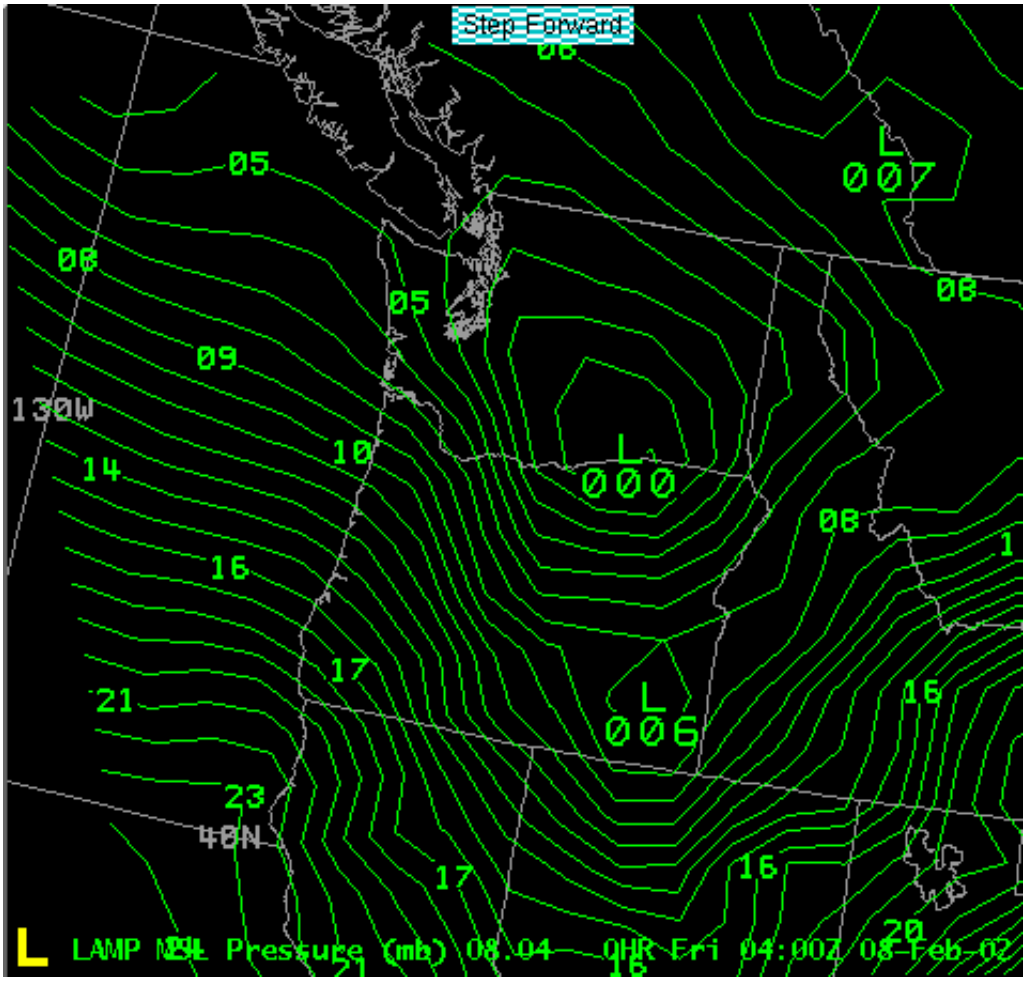
A deepening short wave rounded the base of an offshore Pacific trough and moved across the Oregon Cascades and then northward across the Columbia Basin. High winds with widespread damage occurred on both sides of the Cascade Mountains. The short wave did not weaken, e.g., the lowest surface pressure did not increase, as the system crossed the Cascades. The surface low pressure center crossed the Cascades near the Dalles, OR and then moved northward across the Columbia Basin (Fig. 1). Water vapor imagery shows a dark area trailing immediately behind the surface low indicating isentropic descent (Fig. 2). The high winds east of the Cascades were coincident with isentropic descent, the passage of the surface low, and impressive rapid rises in pressure. The Pendleton airport ASOS reported a SLP rise of 14 mb in one hour.

Discussion

The 12z Eta and AVN models both showed incorrectly that the surface low pressure center would cross Oregon farther south across the northeast Oregon mountains and then into Idaho. The 12z models under forecast the depth of the low by more than 10 mb. Observations, satellite imagery, and (later) the 18z models provided evidence that there were serious errors in the 12z model output.

It is common for low pressure systems crossing the Cascades to develop split fronts, especially for those moving from west to east. This event was somewhat unusual in that the surface features were coupled with those aloft, due in part to the southwest to northeast track of the system across the Cascades. In any event, pressure gradients alone are less likely to produce sustained high wind unless coupled with winds aloft. The mixing down of winds can occur through mountain waves, isentropic descent, evaporative cooling and microbursts, good thermal mixing near the surface, and cold air advection and pressure gradients along ridge lines.

Figure 1


Step Forward
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14
16
17
21
23
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16
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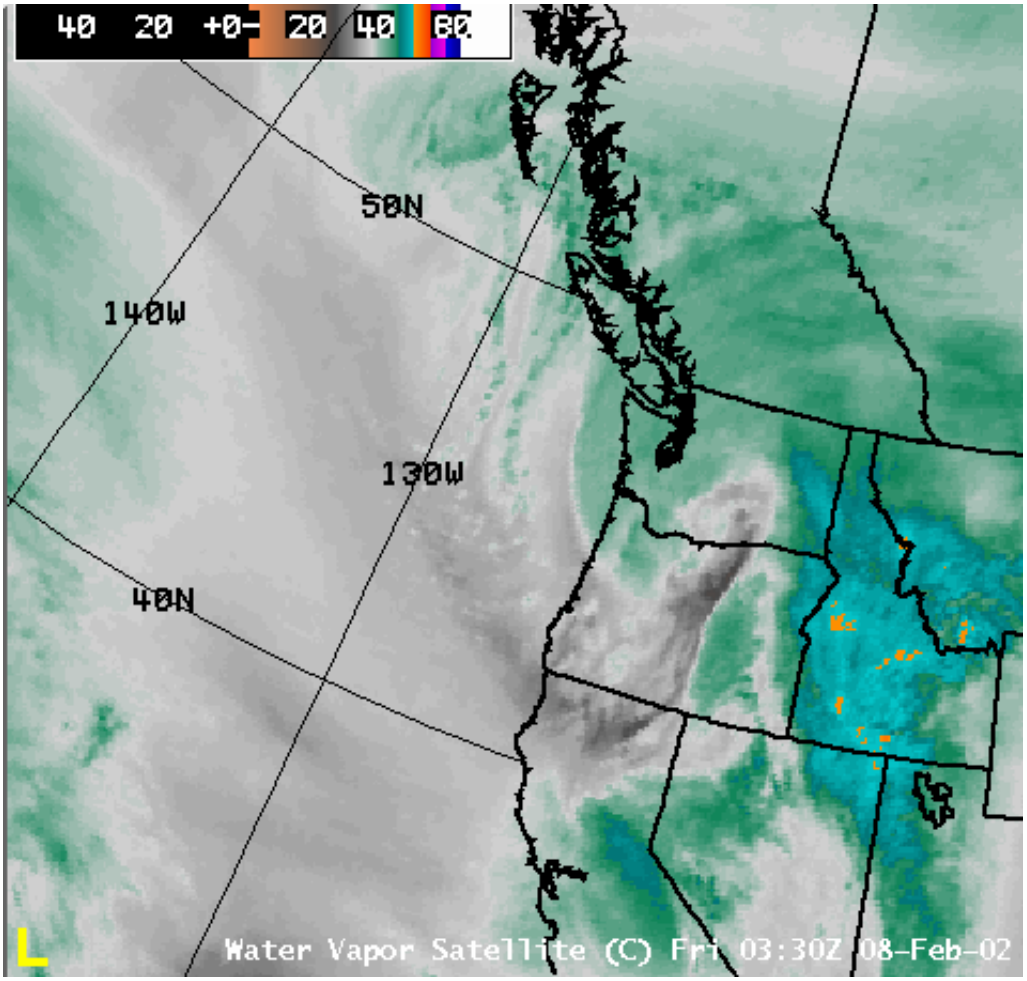
130W
48N
L LAMP MSL Pressure (mb) 08.04 — 0HR Fri 04:00Z 08-Feb-02

Figure 2


40 20 +0- 20 40 80
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140W
130W
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Water Vapor Satellite (C) Fri 03:30Z 08-Feb-02