

Western to Central U.S. Winter Storm

24-29 November, 2015

By: Sean Ryan, WPC Meteorologist

Meteorological Overview:

On 24 November, a vigorous upper-level low moved south along the U.S. West Coast before moving inland over northern California (Fig. 1). Ahead of the upper-level low, a surface low moved inland, reaching the Great Basin by the afternoon and evening hours on 24 November. While rain initially fell ~~in~~ ahead of the surface low and the associated cold front as it crossed California and moved into the Great Basin, precipitation changed to snow as the cold front passed, and heights quickly dropped as the upper-level low moved inland. Snow continued to fall across the Sierras and the Great Basin into 25 November, before beginning to taper off by late afternoon as the low pressure system moved into the Four Corners region.

North of the low pressure system, an arctic cold front was moving south across the northern Intermountain States, northern Rockies, and extending east into the central and northern plains. This front, along with southerly low/mid-level flow ahead of the Pacific storm system provided sufficient lift for snow to develop across portions of Idaho, Wyoming, and Montana on 25 November. While this frontal boundary became stationary across the West, it progressed rapidly southward across the plains as the dense and shallow arctic air became banked up against terrain. This would set the stage for freezing rain over much of the central U.S. As the upper-level low became cut off and nearly stationary over the Great Basin, southwesterly mid/upper-level flow, traversed by numerous shortwaves, persisted across the southern and central plains. As this flow interacted with the broad slope of the arctic front, widespread overrunning precipitation developed north of the front, including snow, sleet, and freezing rain. This pattern persisted for several days, with multiple rounds of precipitation affecting the southern and central plains. Also during this time, as the upper-level low persisted over the Great Basin, snow continued to fall across much of the western U.S.

By late on 29 November into early on 30 November, the upper-level low began to move eastward into the central Rockies (Fig. 1). Mid-level flow was no longer ideal for transporting moisture northward into the southern and central plains. As a result, this multi-day winter precipitation event across the plains came to an end. Total ice accumulations from this event exceeded 0.25 in. across portions of several states, including Texas, Oklahoma, Kansas, Nebraska, and Iowa. Freezing rain also fell in New Mexico, but ice accumulations were slightly less than a 0.25 in. The heaviest ice accumulations were reported in northern Texas, where up to 0.75 in. of ice occurred. Total snowfall accumulations across the western U.S., ranged from 6 to 12 inches, with 1 to 2 feet at many higher elevation locations.

Impacts:

Given its broad areal coverage and long duration, this event significantly affected a large region of the western and central U.S. Strong winds, blowing snow, and flash freezing of roadways led to dangerous travel conditions with hundreds of automobile accidents and stranded vehicles in Montana. Ice accumulations resulted in substantial damage across the southern and central plains, and even across portions of the southern Rockies. Widespread trees and powerlines were downed under the weight of ice in Kansas, Oklahoma, and Texas, with scattered damage in Nebraska. In Texas, thousands of people were without power for up to three days as powerlines suffered major damage over long distances. The multi-day storm resulted in heavy economic losses for the city of Lubbock in the form of lost revenue (estimated at \$5 million), when thousands of holiday shoppers stayed home at the busiest shopping time of the year. Total property damage was estimated at \$19 million (not including economic losses). No fatalities or injuries were directly attributed to the event.

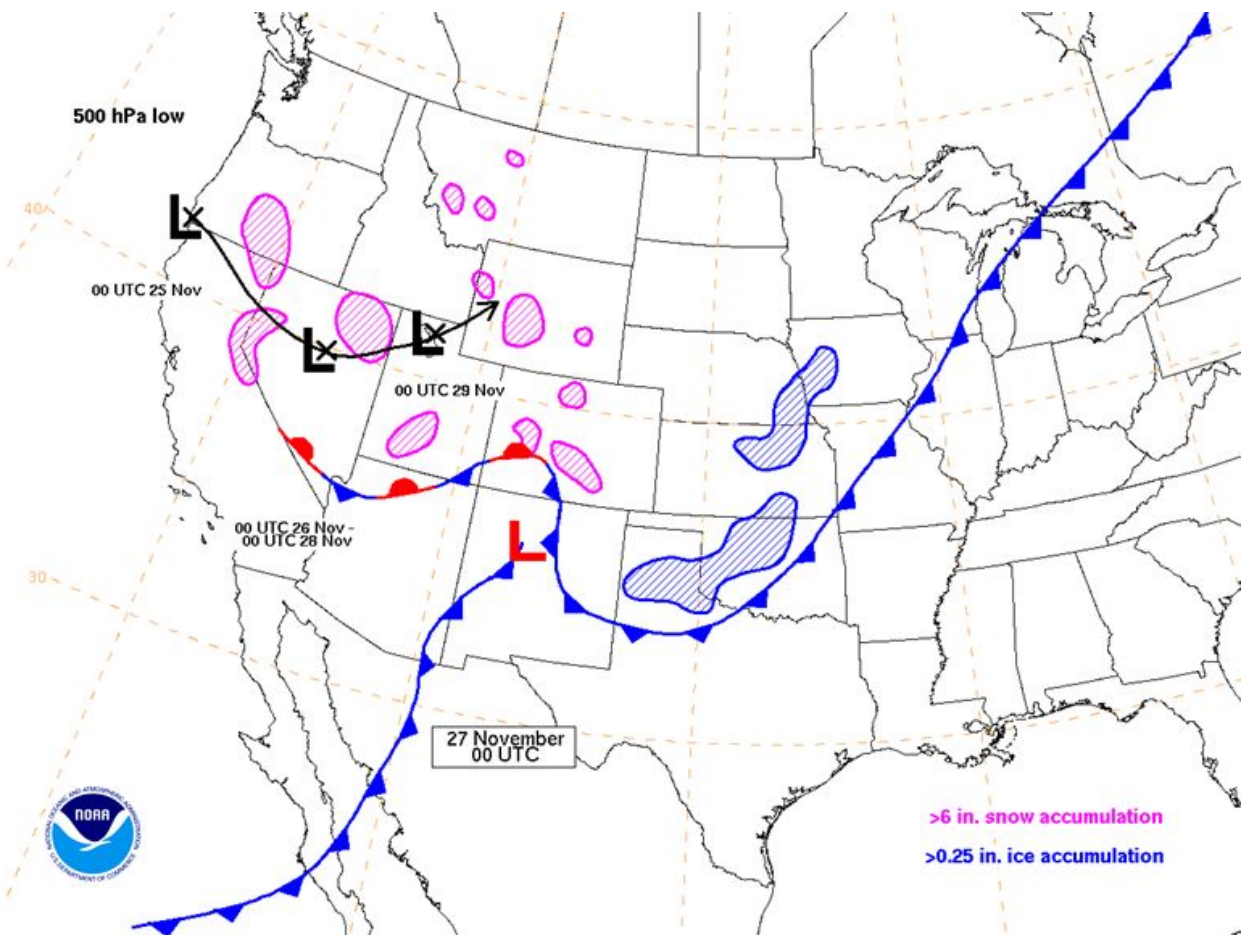


Figure 1: Areas receiving greater than 6 in. of snow (pink), and greater than 0.25 in. ice (blue), 500 hPa low track (black), and surface frontal analysis at 00 UTC on 27 November, 2015.

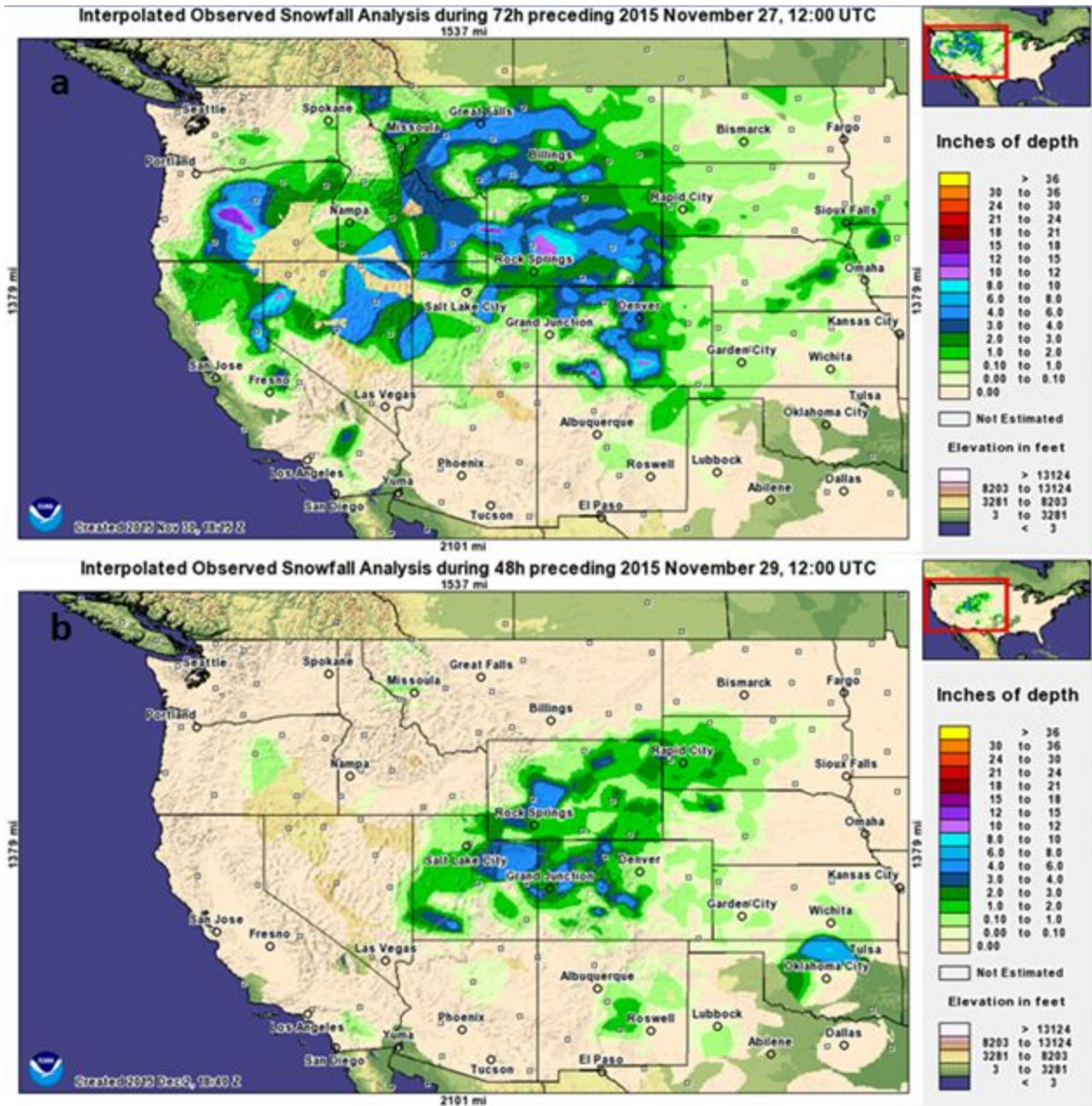


Figure 2: Total interpolated snowfall accumulation during the 72 hours preceding 12 UTC on 27 November (a), and the 48 hours preceding 12 UTC on 29 November, 2015 (b). (NOHRSC)