

Southwest U.S. to Southern Mid-Atlantic Winter Storm

22-25 February, 2015

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Meteorological Overview: In the last week of February 2015, a winter storm affected much of the southern tier of the United States. The storm first brought significant snowfall over the mountainous terrain of the Southwest and the central Rockies, before becoming a mainly sleet and freezing rain event across the Deep South and later over the Carolinas. This winter weather event was the result of mutual interaction among three synoptic systems—a polar jet, a subtropical jet, and an outbreak of arctic air (figure 1). Figure 2 shows the 500 hPa synoptic flow pattern over much of North America prior to the event. A longwave trough was already in place over the eastern part of North America with much of the U.S. under strong northwesterly flow. Meanwhile, an upper-low was forming just west of California with a polar jet wrapping around its southern flank. Farther south, a prominent stream of moisture can be seen coming from the subtropical eastern Pacific ahead of a positively-tilted trough. In the meantime, an arctic air mass had been building in central Canada. Figure 4 shows how these three elements evolved and interacted with each other over the next few days. The areas highlighted in blue represent snow in the left exit region of the polar jet (fig. 4b, d, f). Note that the snow formed deep into the cold air in the Colorado Front Range as the arctic air mass began surging southward. This batch of snow then sheared off to the east under strong upper-level westerlies on 22 February. Just as the snow was departing, an upper-level low quickly formed in its heels over the Great Basin and began to enhance the upper-level westerly winds across the Southwest (highlighted in green in fig. 4d). In response, a new area of snow formed over the Great Basin which lingered into the next day (fig. 4f, h). Much of the snow fell during these two days over the higher elevations in the Southwest, across the Four Corners, through the central Rockies and into the central plains with as much as 2 to 3 feet reported in southwestern Colorado.

Farther to the south, another key player—a subtropical jet, moved across the eastern Pacific and approached the southwestern U.S. on 22 February. As the jet overran the surface frontal boundary, an area of precipitation developed in the arctic air mass. This area of precipitation (highlighted in red in fig. 4b, d, and f) was mainly in the form of sleet mixed with freezing rain as it moved across northeastern Texas and into Arkansas. The precipitation moved rapidly off to the east just as another fast-moving upper-level shortwave associated with the subtropical jet approached the southwestern U.S. in the evening of 22 February (highlighted in purple in fig. 4d, and f). The shortwave again overran the arctic front and brought another round of sleet and freezing rain across northeastern Texas and Arkansas. The area of mixed precipitation continued moving rapidly eastward into the southeastern U.S. on 24 February, where parts of the Carolinas saw a period of sleet and freezing rain. The disturbance then moved off the coast as a surface trough and a couple of low pressure centers developed. A few inches of snow fell in parts of the New England coast before the storm moved out into the Atlantic Ocean.

Impacts: This winter storm was part of a series of storms in late February of 2015 which resulted in wintry precipitation across the South. The highest amounts of snow fell in southwestern Colorado with as much as 39 inches reported at Wolf Creek Pass (fig. 3). Farther to the southeast in the southern plains, milder air aloft associated with the subtropical jet resulted in two rounds of sleet and freezing rain over an extended area across northeastern Texas and into Arkansas. As much as two inches of sleet was reported in Dennis, Texas. Many schools and businesses were closed due to the wintry weather. A coating of ice resulted in a hazardous morning commute farther to the east in the Jackson, MS metro area and other locations across northern Louisiana, Arkansas, and Mississippi. Over the East Coast, light snow associated with a wave of low pressure overspread the foothills and Piedmont of the Carolinas and continued through the night on 23 February before tapering off during the morning of the 24 February. Accumulations ranged from a dusting to 2 inches, with the highest amounts generally occurring closer to the mountains (fig. 3). Temperatures right around freezing and warm roads resulted in minimal travel issues.

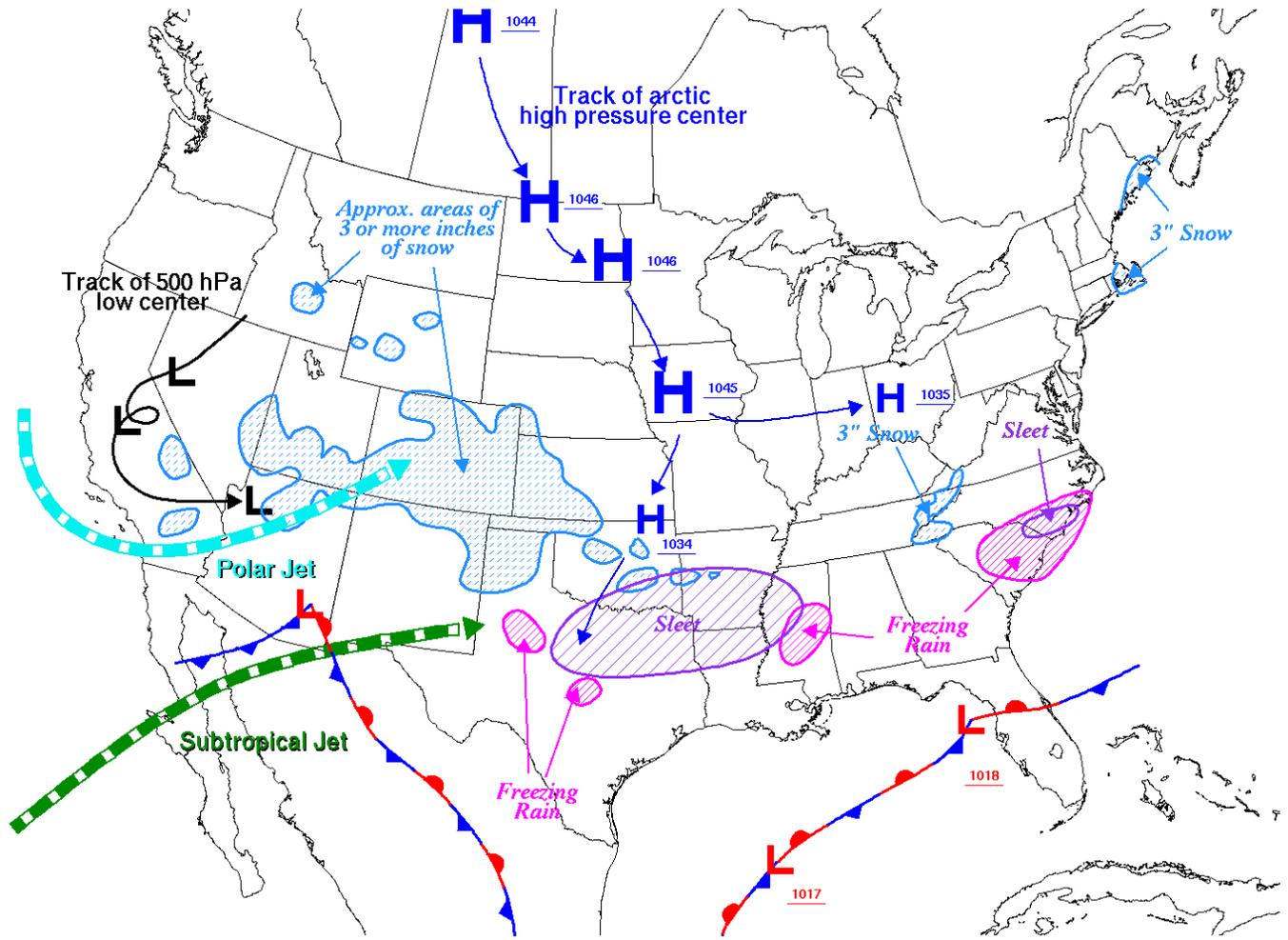


Fig. 1 A summary chart of the winter storm showing main areas of snow, sleet, and freezing rain, the track 500 hPa low center, the track of arctic high pressure centers, the surface frontal analysis at 12 UTC February 24, 2015, and the schematic positions of the polar jet and the subtropical jet.

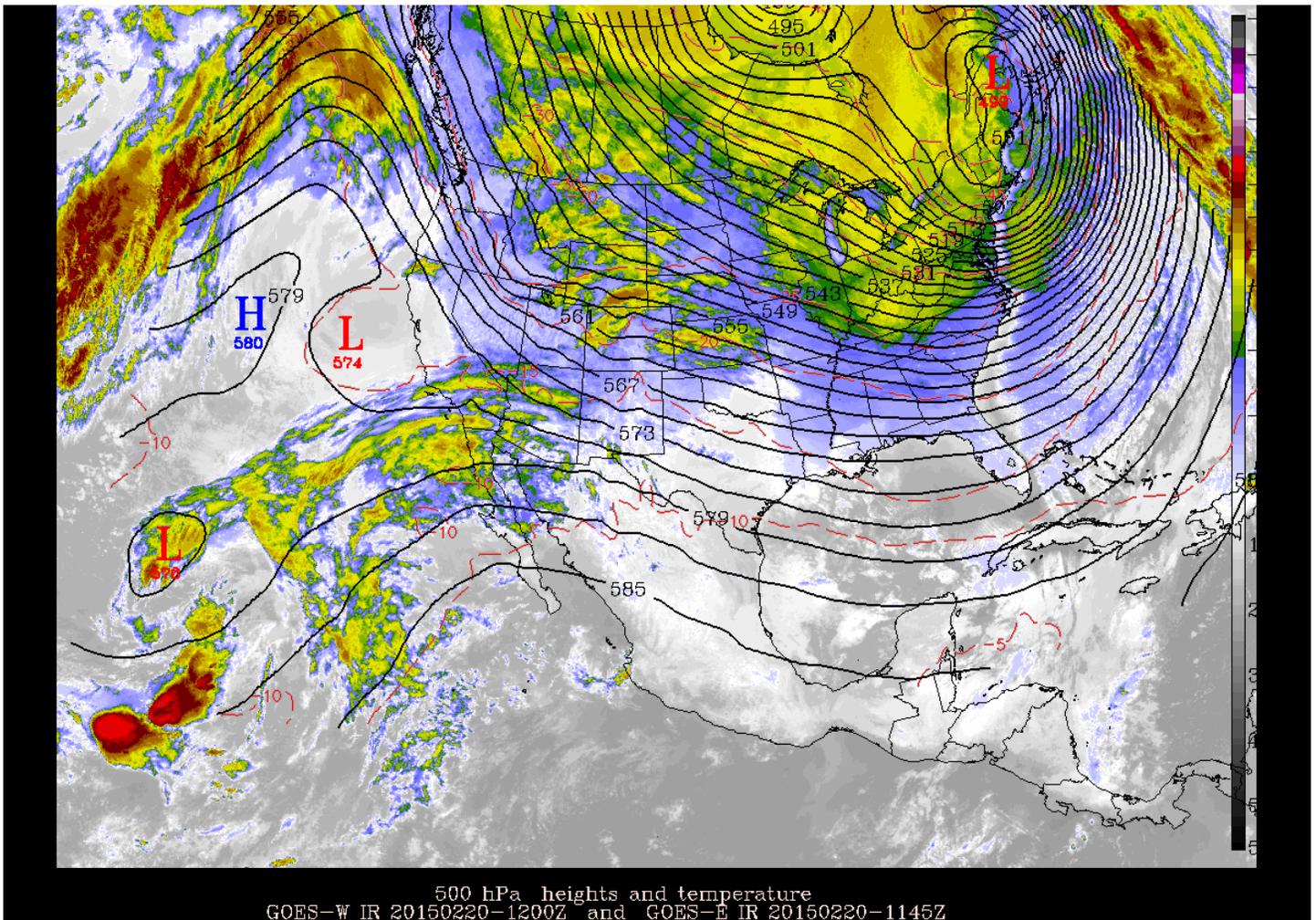


Fig. 2. 500 hPa analysis overlaid on enhanced GOES-West and GOES-East infrared image composite at around 12 UTC February 20, 2015.

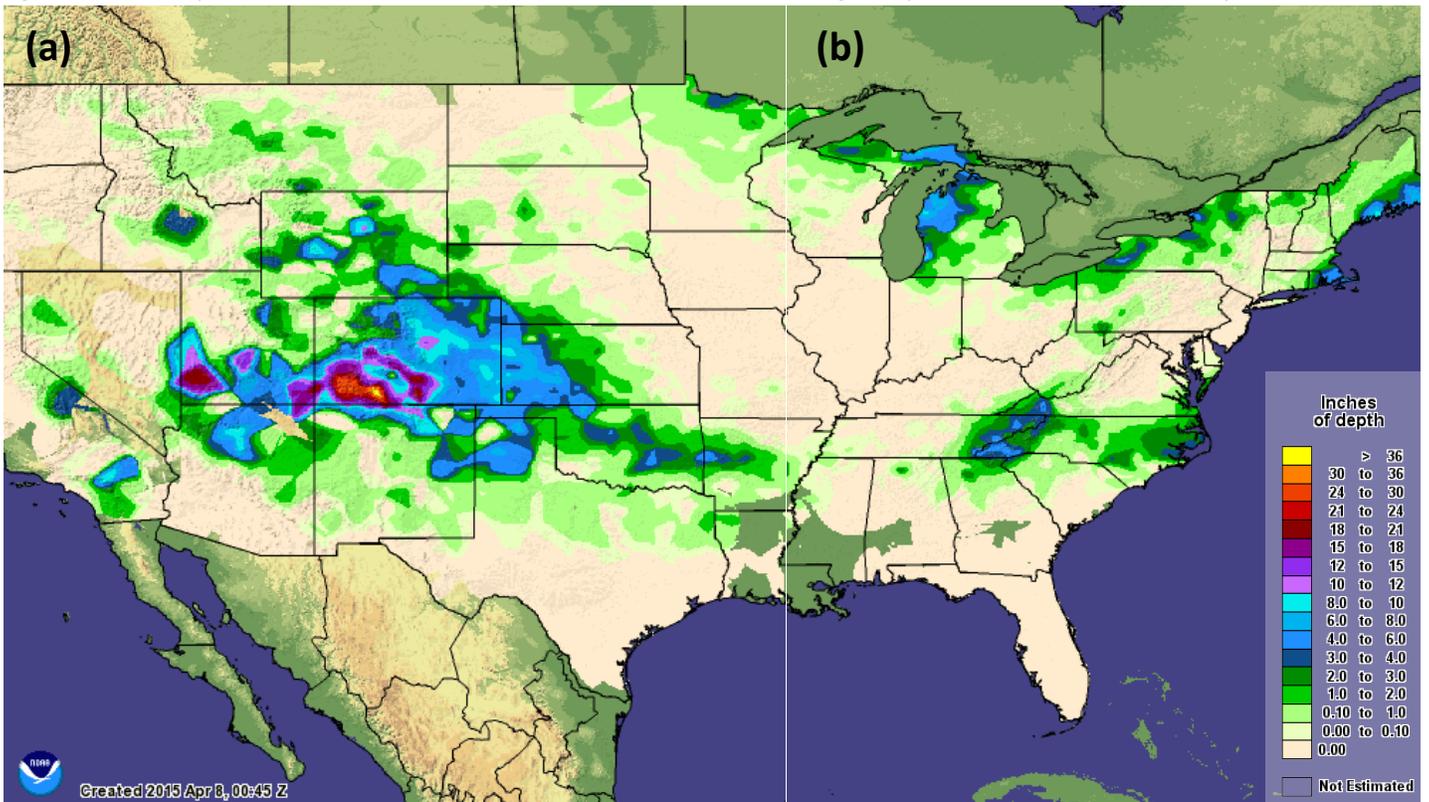


Fig. 3. 72-hour snowfall analysis for the (a) western U.S. ending at 12 UTC February 24, 2015, (b) eastern U.S. ending at 12 UTC February 25, 2015.

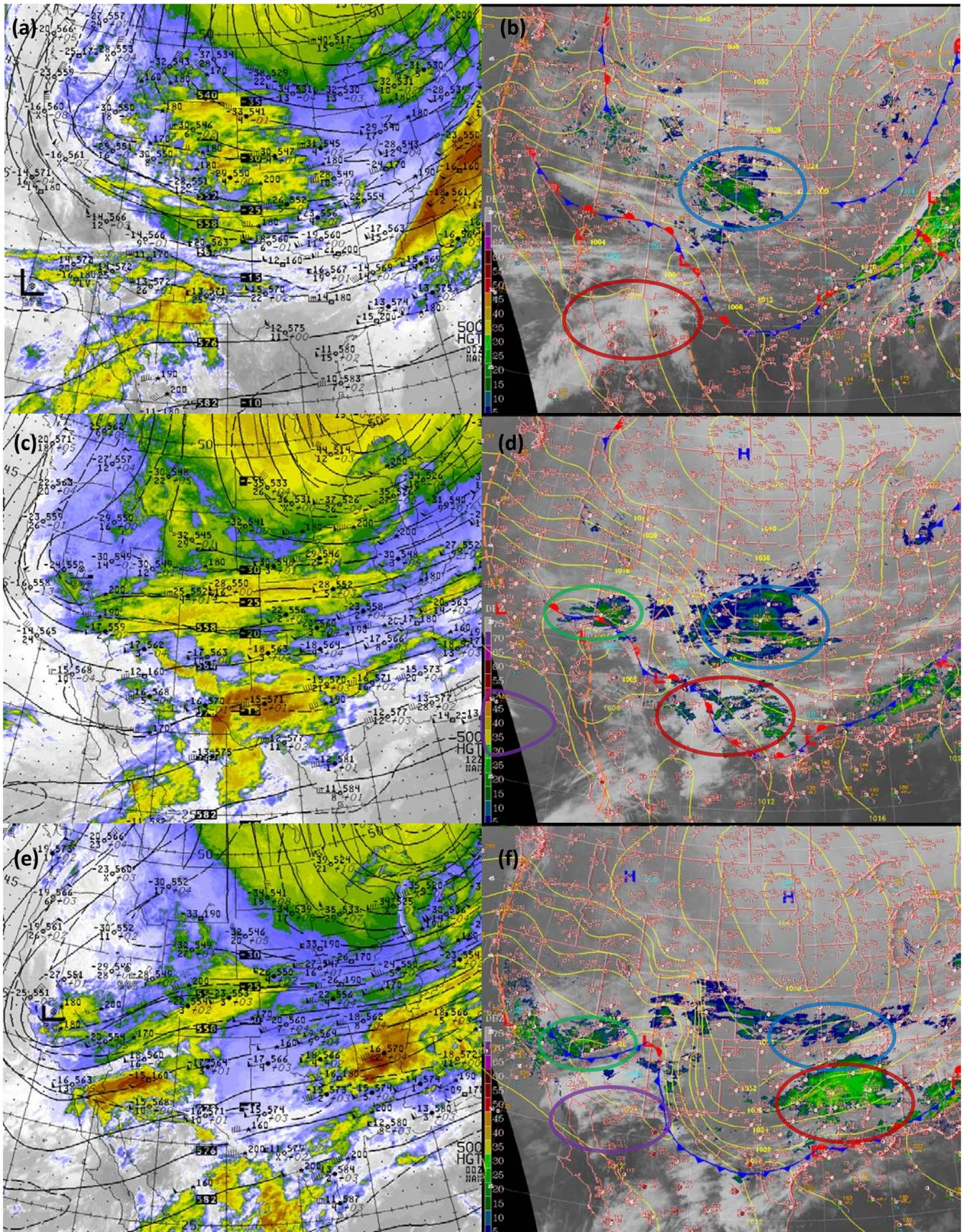


Fig. 4. 500hPa analysis overlaid on GOES-East/West infrared image composite (left column) and WPC surface analysis overlaid on GOES-East infrared and radar composite (right column) (a, b) 00 UTC February 22, 2015; (c, d) 12 UTC February 22, 2015; and (e, f) 00 UTC February 23, 2015.

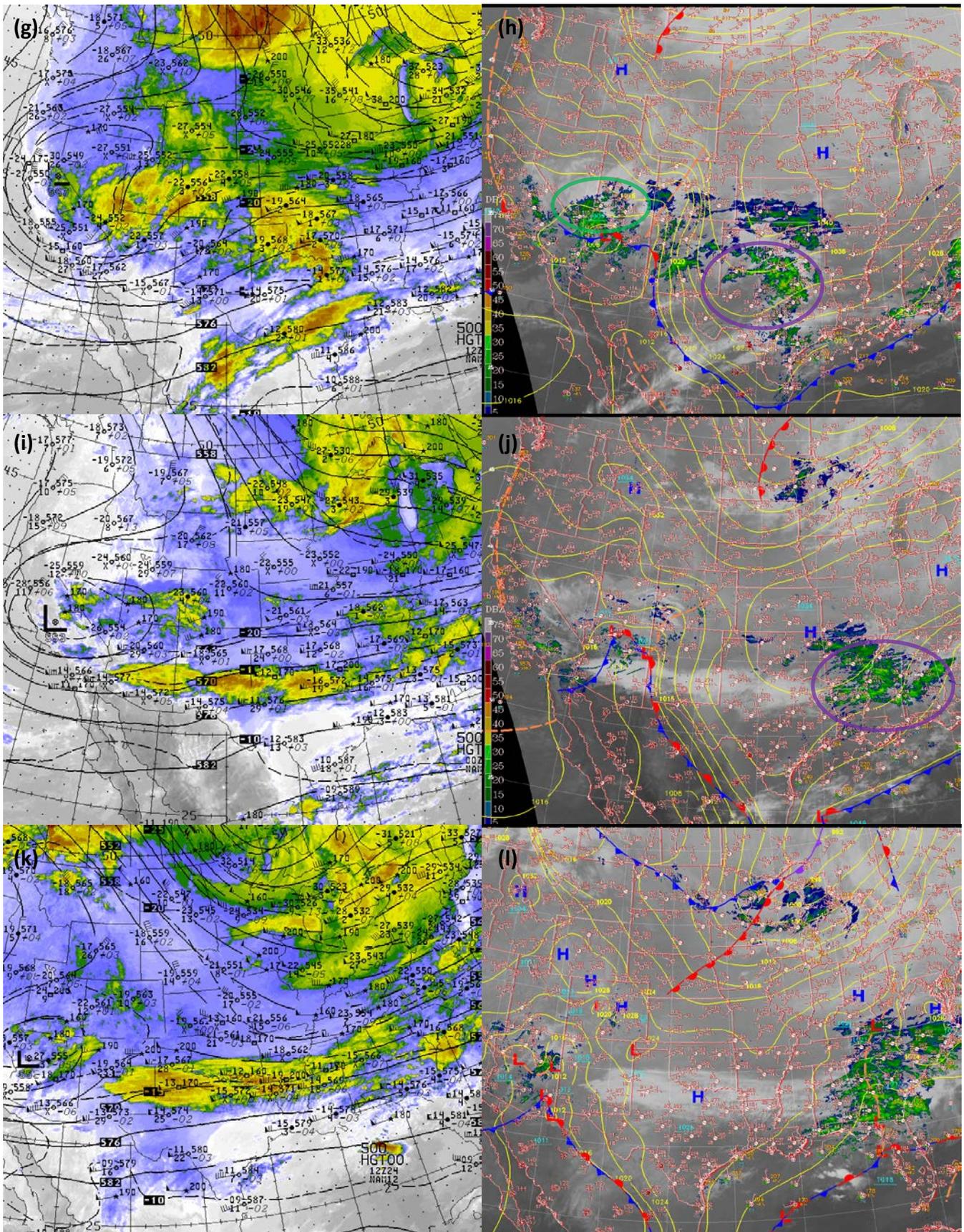


Fig. 4. 500hPa analysis overlaid on GOES-East/West infrared image composite (left column) and WPC surface analysis overlaid on GOES-East infrared and radar composite (right column) (g, h) 12 UTC February 23, 2015; (i, j) 00 UTC February 24, 2015; and (k, l) 12 UTC February 24, 2015.