2004 Christmas Snow – A Look Back

It was a considered a minor miracle at the time of occurrence. As a matter of fact, snow falling across southeast Texas is rare under most circumstances, but getting measureable snow on Christmas seems implausible if not impossible. Yet, it happened – it really happened! Here is a brief synopsis of the Christmas 2004 snow event and the parameters that came together at the right time to produce a snow event that most people who experienced it will never forget.

A cold front crossed the region on December 22nd. Low temperatures that night behind the front plunged into the 30s across most of southeast Texas. High temperatures on the 23rd struggled to warm into the lower 40s. A reinforcing surge of colder air then filtered into the region on the 24th with high temperatures generally remaining in the upper 30s. With the cold air mass in place, an upper level disturbance approached south Texas from northern Mexico on the evening of the 24th.

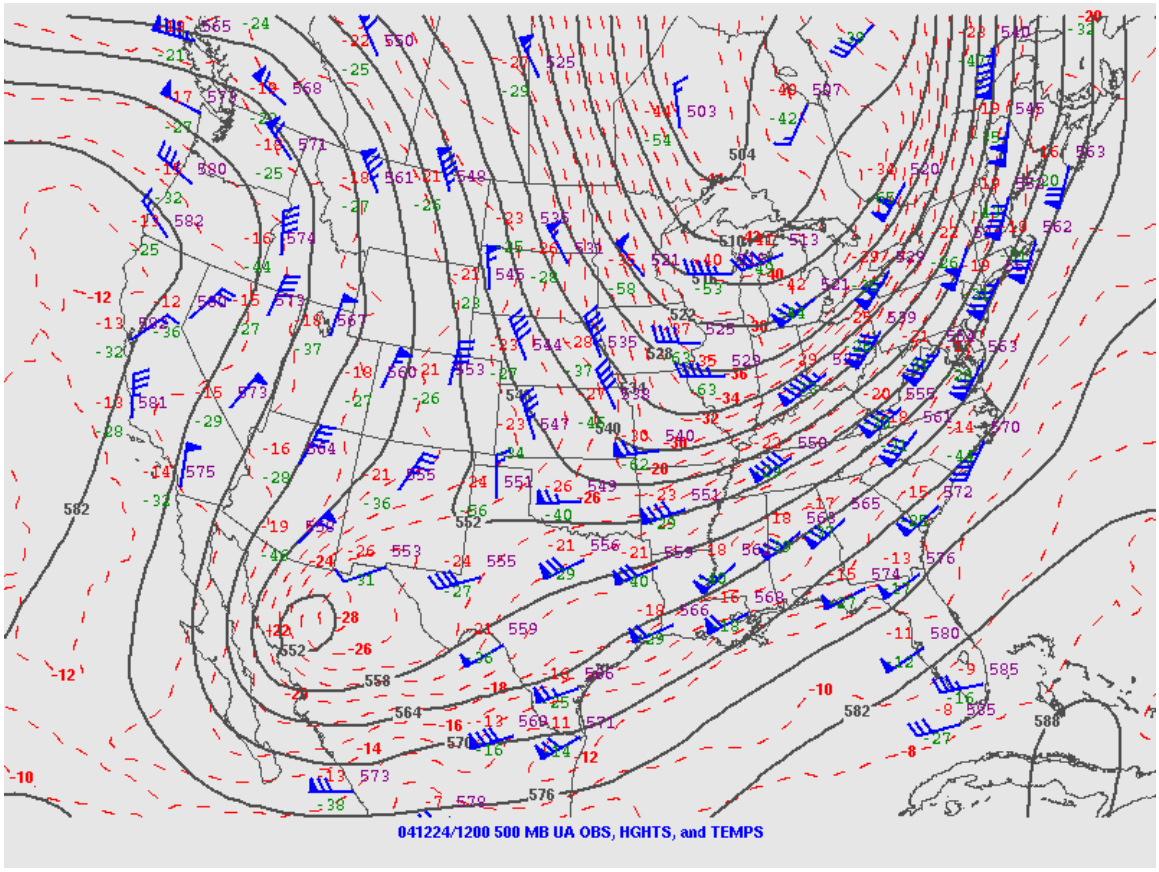

Figure 1 - 500 MB Upper Air Chart for 6:00 AM CST 24 December 2004
(Image courtesy Storm Prediction Center)

At 6:00 AM on the 24th, a deep upper level trough moved into northern Mexico (see Figure 1). Winds aloft were out of the southwest while the surface winds were generally out of the north. This type of situation is commonly referred to as isentropic up-glide or

overrunning event and generally results in some form of precipitation. Note in Figure 2 that the surface temperatures were near the freezing mark across southeast Texas in the wake of the recent cold front.

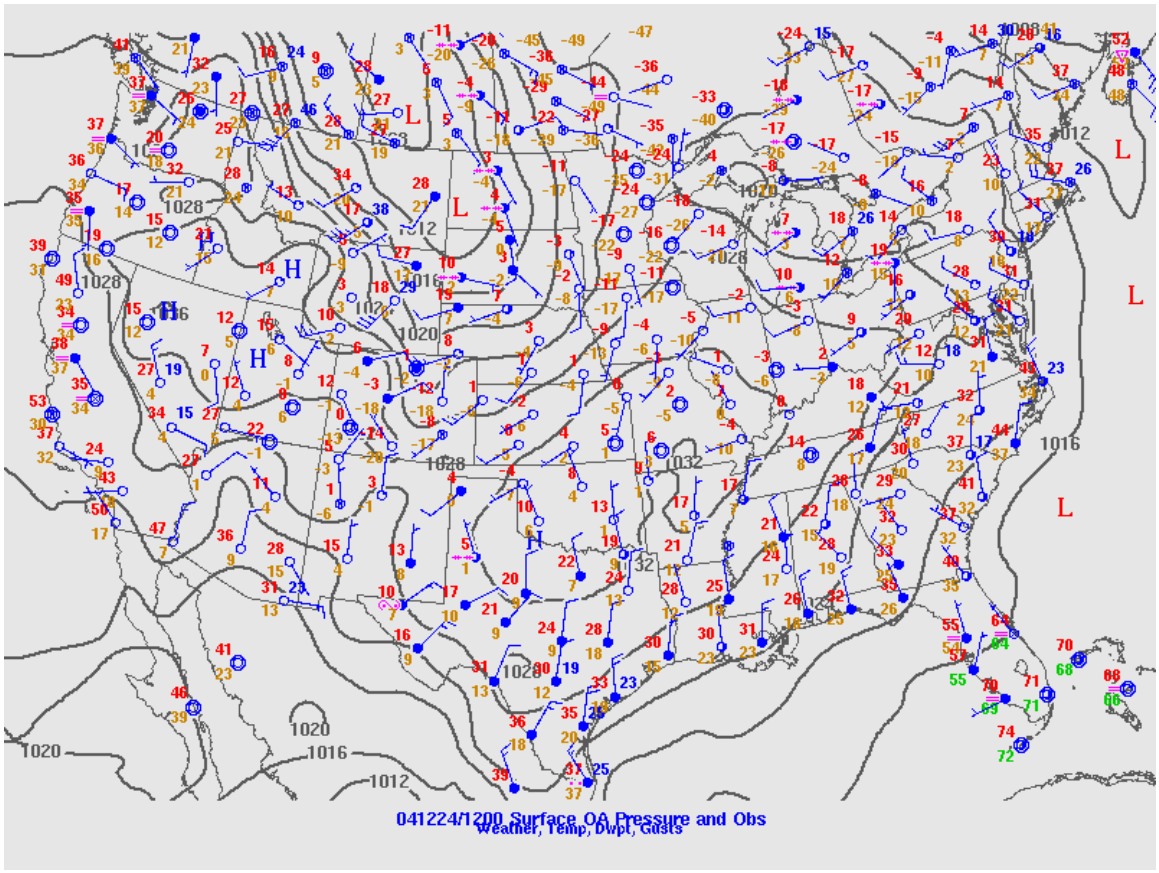

Figure 2 – Surface Map for 6:00 AM CST 24 December 2004
(Image courtesy Storm Prediction Center)

Note also how cold the temperatures were over northern Texas and southern Oklahoma. The cold air would continue to filter into southeast Texas for the next 36 hours.

The 12Z (6:00 AM CST) morning sounding from the Corpus Christi upper air site showed that the cold air over south Texas was fairly deep with a sub-freezing layer extending from just above the surface to the top of the tropopause (See Figure 3 to check out the thermal and moisture profile from the Corpus Christi morning sounding). There was a significant dry layer in the lowest 3000 feet of the atmosphere. Also note the winds in the lowest 5000 feet of the column were from the north and northeast while above this level, winds were out of the southwest. This is another indication that isentropic up-glide was occurring. The 12Z sounding also revealed that extensive cloud cover was in place and little to no warming would occur on the 24th. The sounding supported some very light precipitation – and indeed, some very light sleet, mixed at times with snow, fell across parts of south Texas into southeast Texas. Snow flurries were also reported in the afternoon at Pearland, Columbus and Wharton.

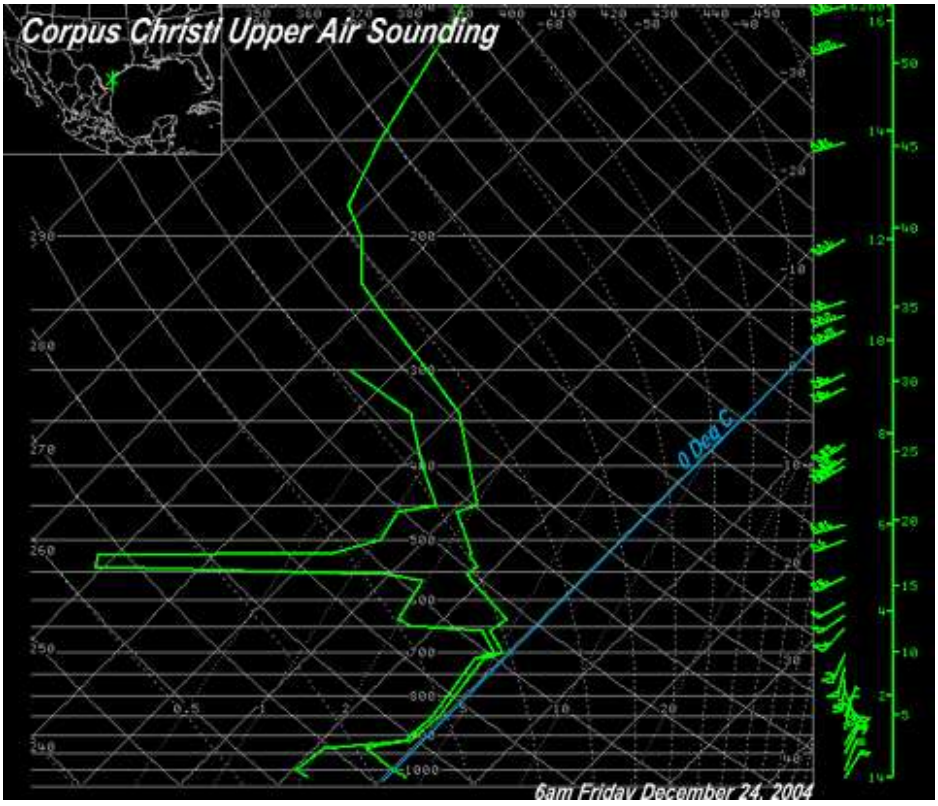

Figure 3 – Corpus Christi sounding for 6 AM CST 24 December 2004
(Image from the NWS Advanced Weather Interactive Processing System)

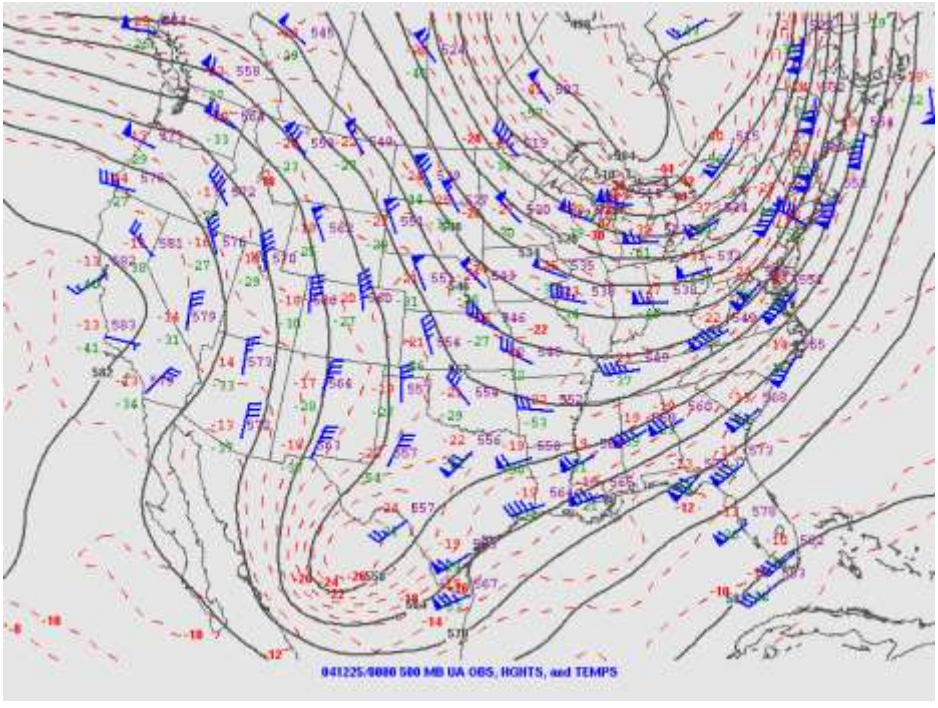

Figure 4 - 500 MB Upper Air Chart for 6:00 PM 24 December 2004
(Image courtesy Storm Prediction Center)

By 6:00 PM, conditions were coming together for a robust winter weather event. In Figure 4, note how the upper level trough over northern Mexico had moved further eastward. Upper level lift increased rather rapidly during the evening and precipitation would begin to develop.

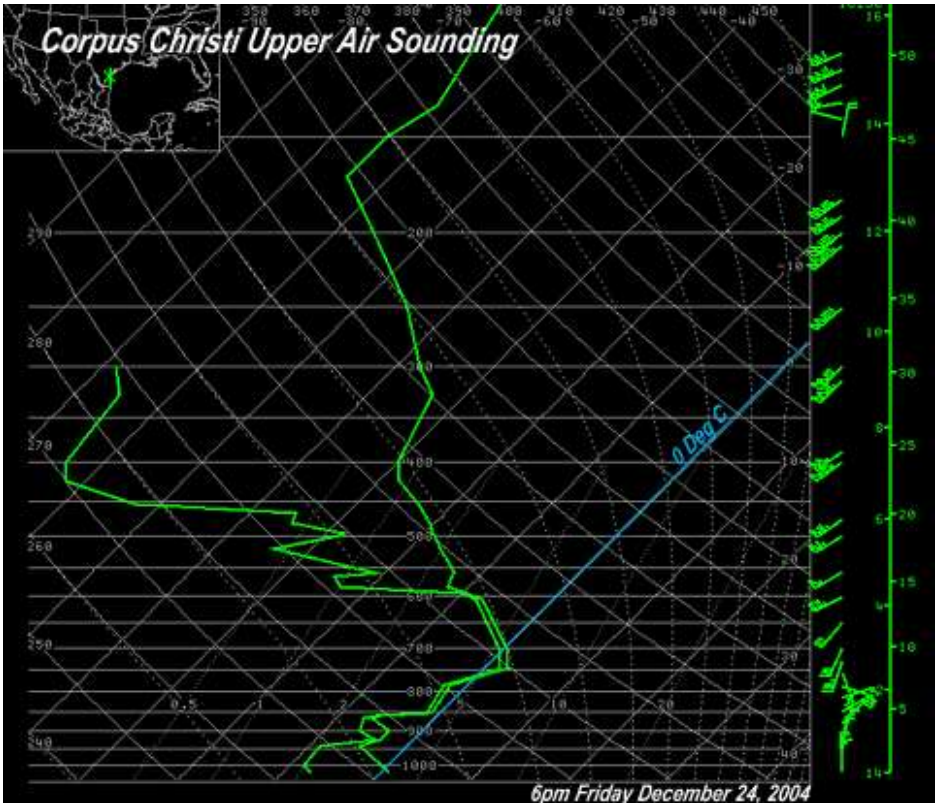

Figure 5 – Corpus Christi Sounding for 6:00 PM CST 24 December 2004
(Image from the NWS Advanced Weather Interactive Processing System)

Figure 5 is the evening sounding from the Corpus Christi upper air site. The thermal profile warmed a bit near 10,000 feet but most of the thermal profile remained below freezing. The warm layer was sufficiently narrow so that frozen precipitation falling through this layer did not melt. The dry air in the lowest 3000 feet of the atmosphere had also narrowed since the morning sounding and surface temperatures would remain near freezing throughout the upcoming precipitation event. The vertical wind profile continued to show that strong isentropic up-glide would persist.

A quick review of the winds aloft at 300 millibars (Figure 6) showed much of southeast Texas in a very favorable jet stream pattern with a pocket of higher wind speeds approaching the region from the southwest. This feature helped to enhance lift over the area. Some argument could be made that a part of southeast Texas was in a jet couplet for several hours during the evening of the 24th. A jet couplet enhances the large scale lift and precipitation can then become quite heavy. To support this argument, a couple of

radar images have been included to show the band of heavy snow affecting areas from Victoria to Danevang to Angleton (see Figures 7a and 7b). Snowfall rates were between 1 and 3 inches per hour from between 7:00 PM and midnight across parts of southeast Texas.

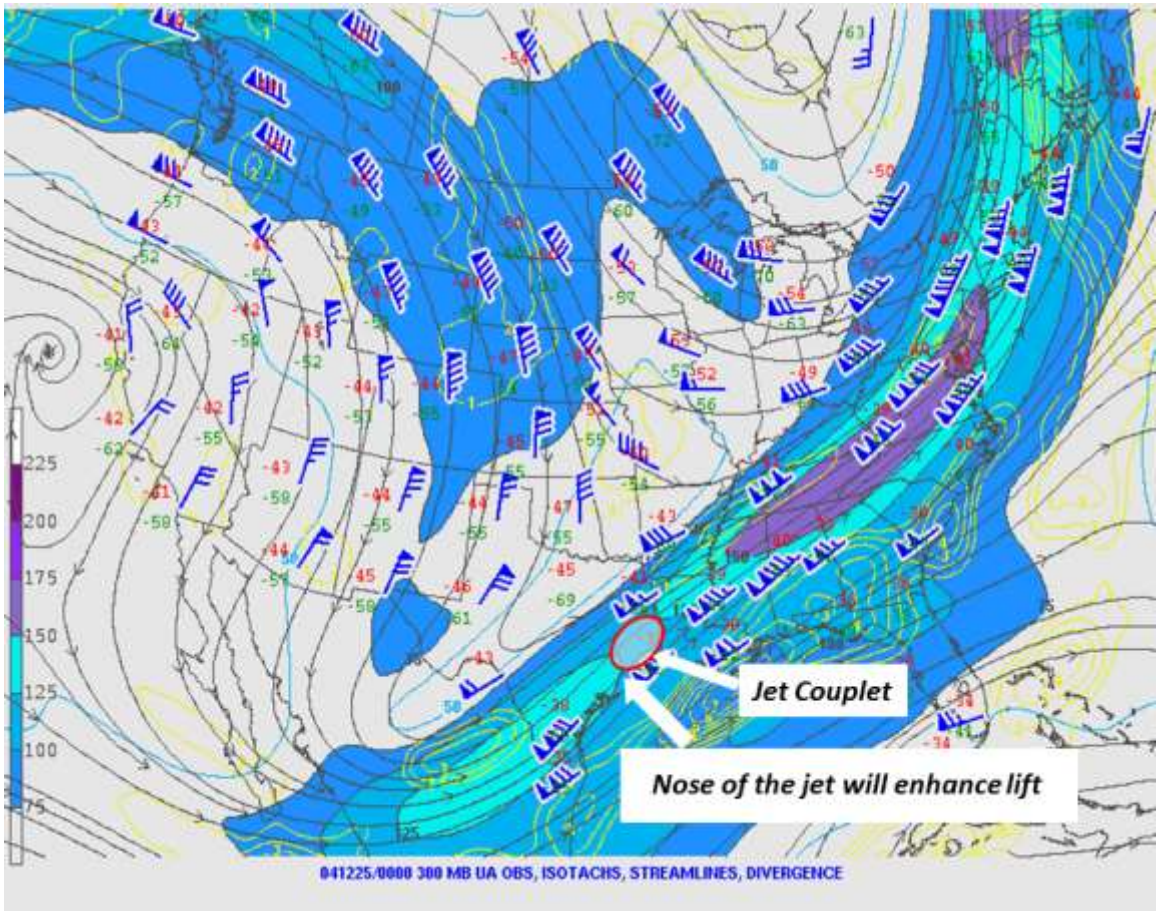

Figure 6 – Jetstream winds at 6:00 PM 24 December 2004
(Image courtesy Storm Prediction Center)

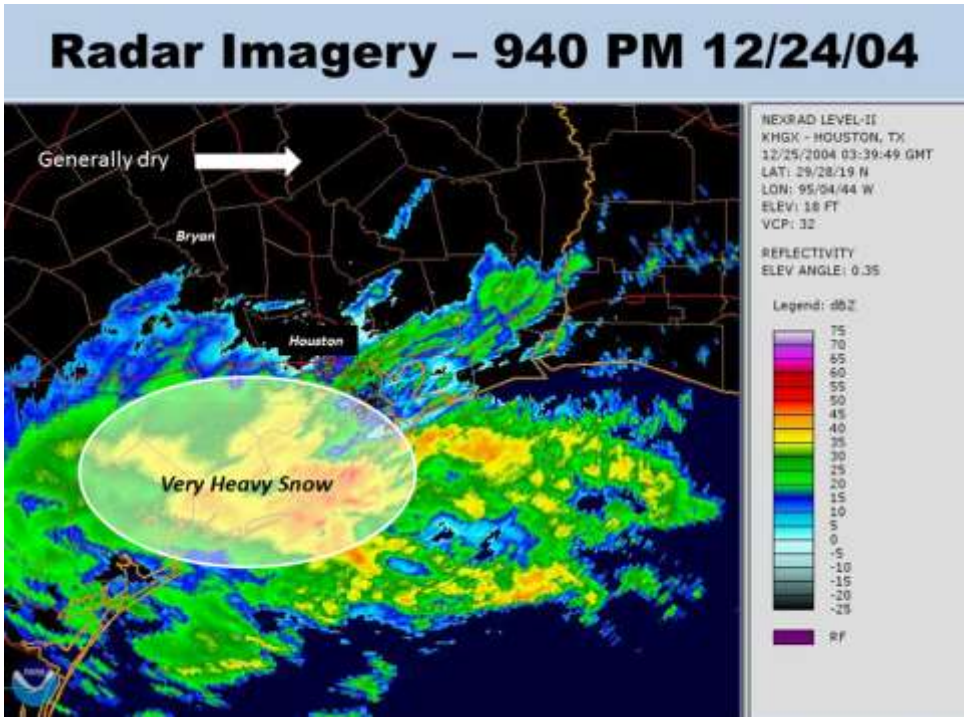

Figure 7a – WFO HGX 0.5 degree Reflectivity at 9:40 PM CST 24 December 2004 (Image courtesy the National Climatic Data Center)

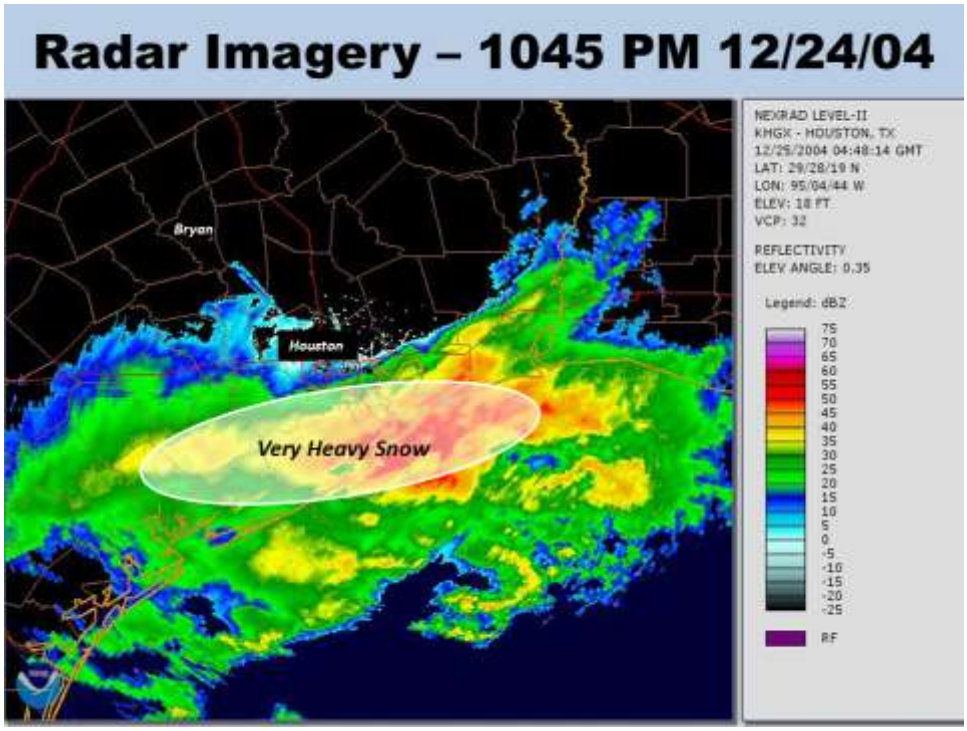

Figure 7b – WFO HGX 0.5 degree Reflectivity at 10:45 PM CST 24 December 2004 (Image courtesy the National Climatic Data Center)

So what eventually happened? A Winter Weather Advisory was issued at 4:00 PM for minor snow accumulations on grassy and elevated surfaces. At 7:00 PM, the Winter Weather Advisory was extended further north to include areas from Brenham to Lake Livingston and to increase the snowfall accumulations to the south. At 10:00 PM, the Winter Weather Advisory was changed to a Winter Storm Warning for expected significant snow accumulations.

A visible satellite view from the afternoon of the 25th showed the extent of the snowfall across the coastal plains of the state (see Figure 8). Snow can be seen on the ground south and southwest of the Houston area (Houston is in the center of the image). Snow can also be seen on Galveston Island. High clouds are evident on the image over portions of Galveston Bay and over locations to the east and northeast of Galveston.

The following table lists some of the higher snowfall totals across southeast Texas.

Location	Snowfall Totals (inches)	Location	Snowfall Totals (inches)
Ganado	12.0 *	El Campo	7.0
Louise	12.0 *	Alvin	6.0
Edna	10.0 – 12.0 *	Angleton	6.0
Van Vleck	10.0 – 12.0 *	Galveston	4.0
Danevang	10.5 *	Jamaica Beach	4.0
Bay City	8.0 – 10.0	Santa Fe	4.0
Matagorda	8.0	Friendswood	3.0
West Columbia	8.0	Pearland	2.0
Pierce	7.0	Dickinson	2.0

* Note: Greatest 24 hour snowfall in recorded history for the site.

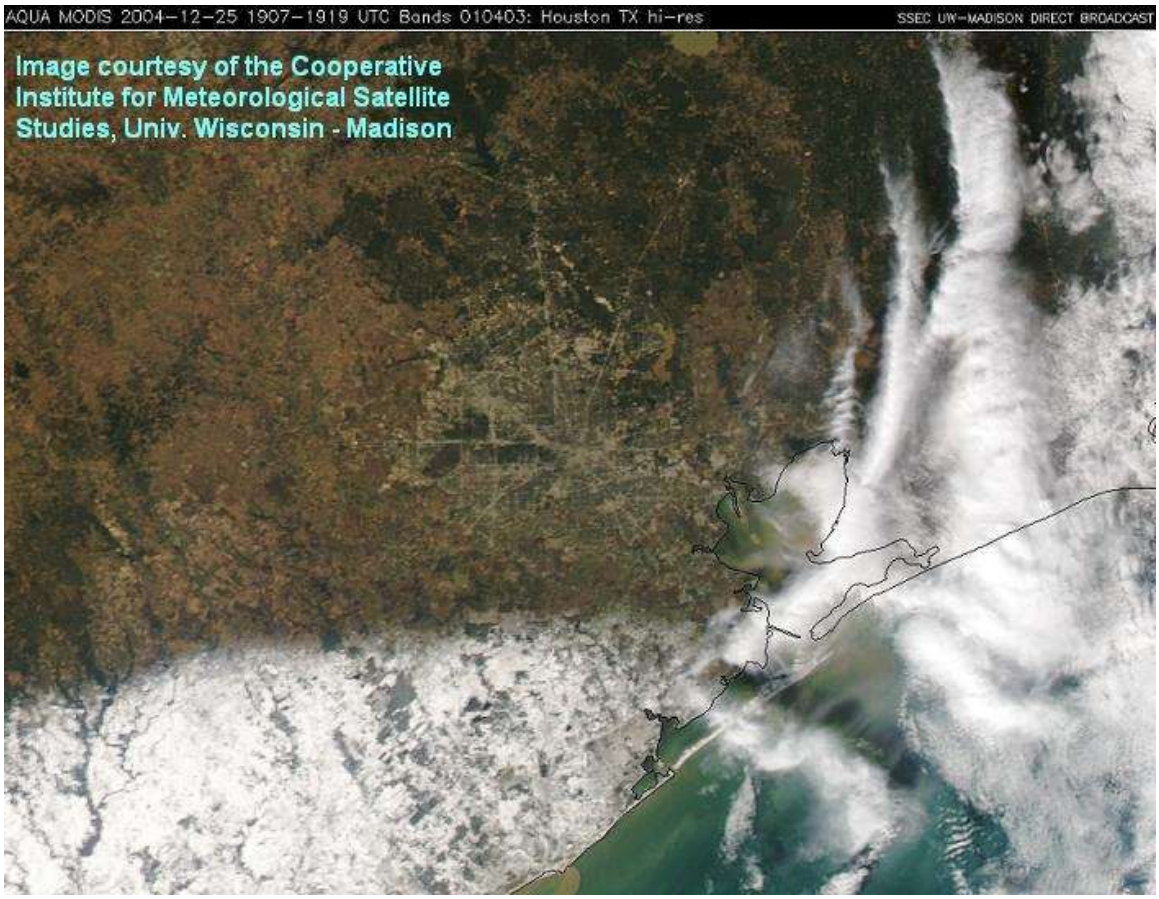

Figure 8 – Snow Cover shown on Visible Satellite
Valid 1:07–1:19 PM CST 25 December 2004

Here are some snowfall pictures that were taken across southeast Texas (Figures 9 through 20).

Figure 9 – Angleton, TX 24 December 2004

Figure 10 – Angleton, TX 25 December 2004

Figure 11 – Angleton, TX 25 December 2004

Figure 12 – Clute, TX (before)

Figure 13 – Clute, TX (after)

Figure 14 – Edna, TX 25 December 2004

Figure 15 – Edna, TX 25 December 2004

Figure 16 – Galveston, TX 25 December 2004

Figure 17 – Galveston, TX 25 December 2004

Figure 18 – El Campo, TX 25 December 2004

Figure 19 – El Campo, TX 25 December 2004

Figure 20 – Home Sweet Home at the NWS Houston/Galveston 25 December 2004
Photo courtesy of NWS HGX