Figure 1

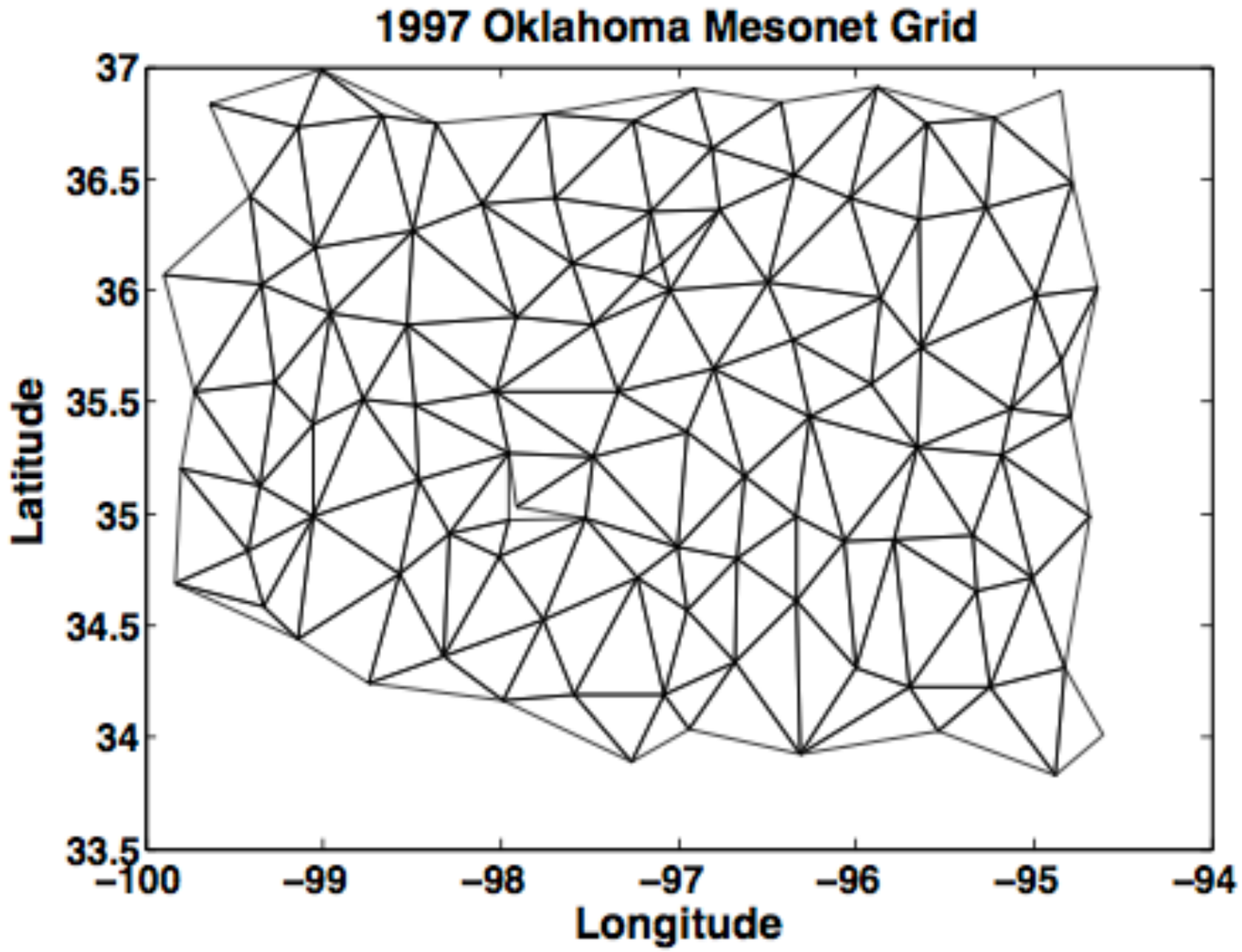

Fig. 1. Map of the Oklahoma Mesonet grid used for 1997. Delaunay triangulation was used to connect the stations to form the grid. Low aspect ratio triangles were removed, primarily on the outer border with the exception of two near 35°N 98°W.

Figure 2

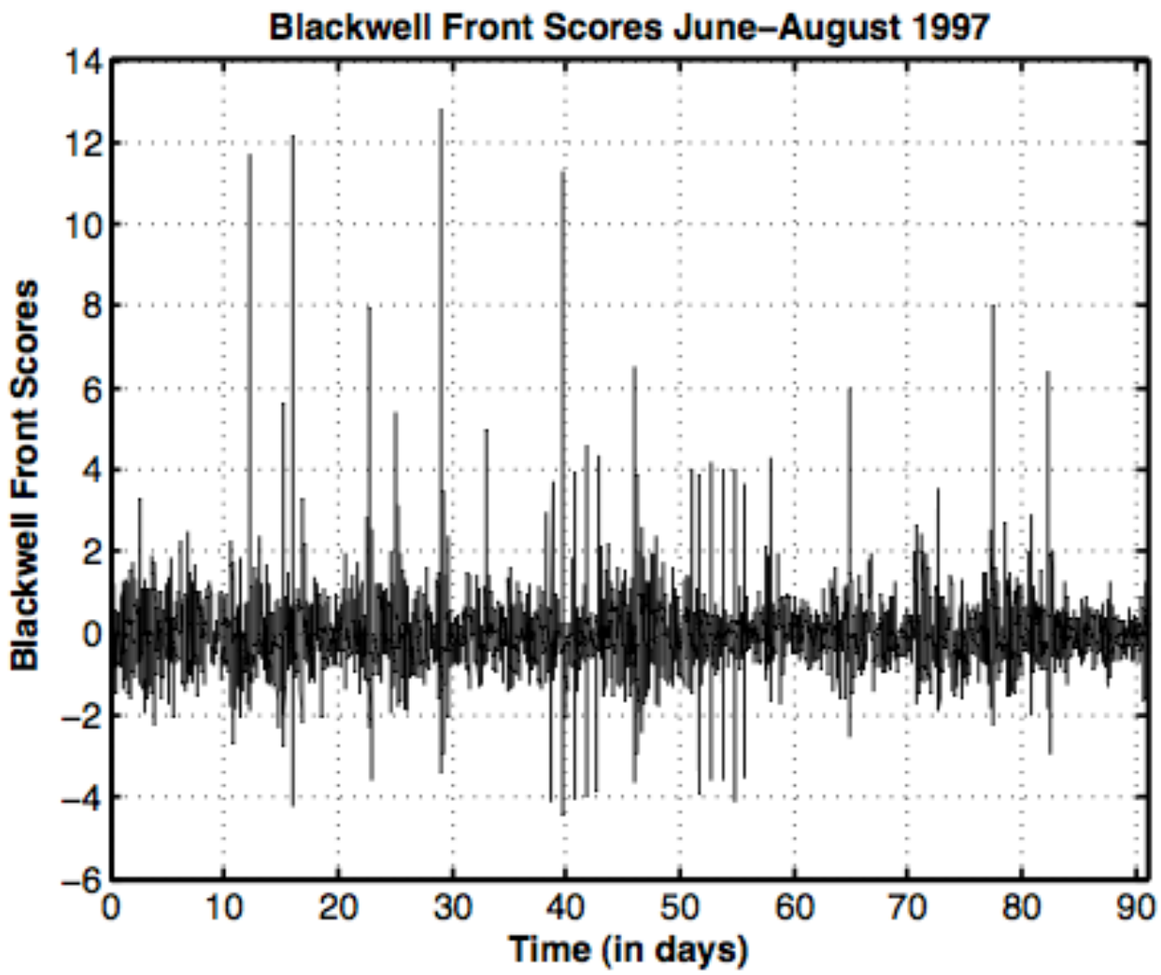

Fig. 2. Front scores for the JJA 1997 period at the Blackwell Mesonet station (36.75°N 97.25°W). Large positive front scores indicate frontal passages.

Figure 3

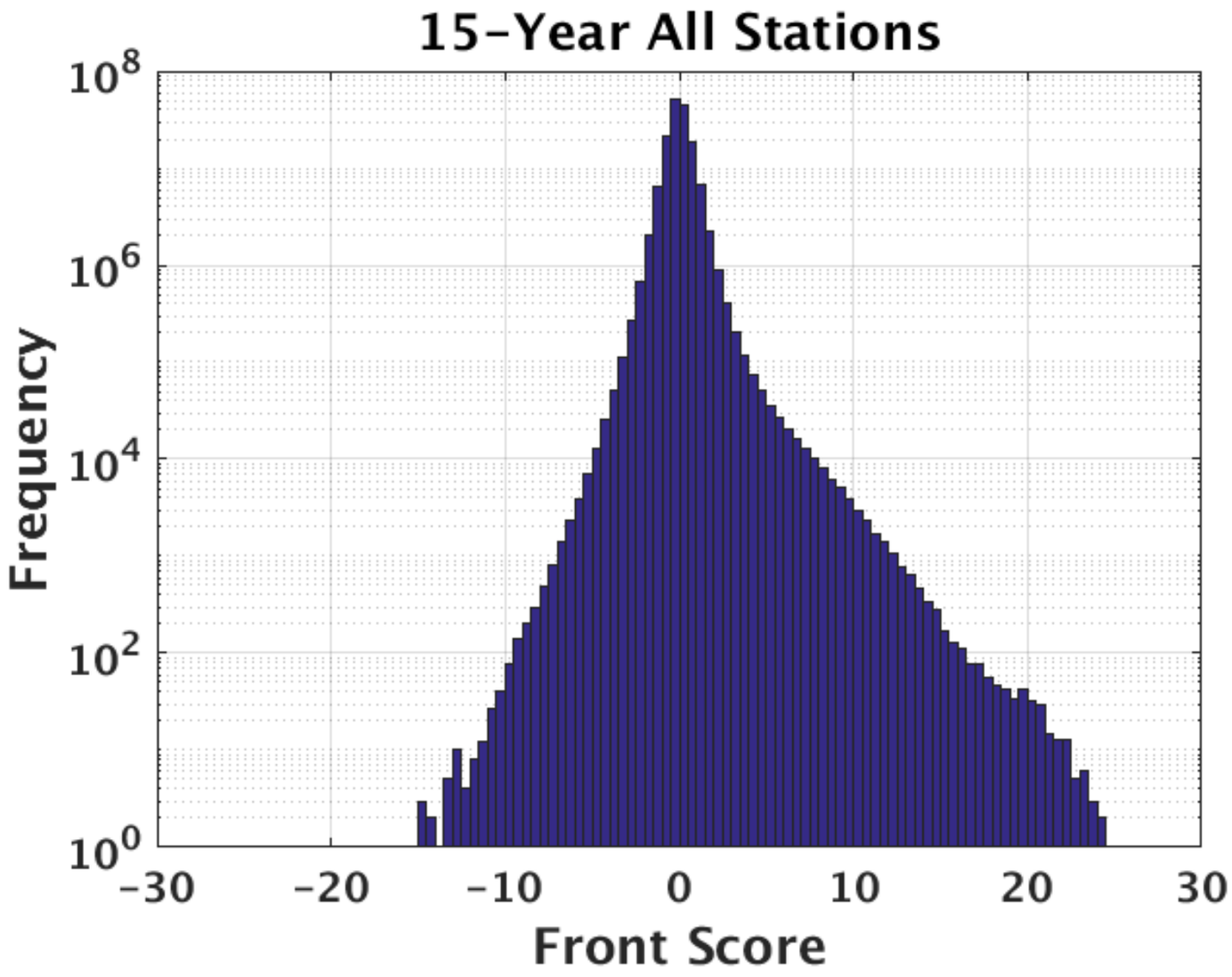

Fig. 3. Front score frequency for all stations at each 5-minute observation over the 1997-2011 period.

Figure 4

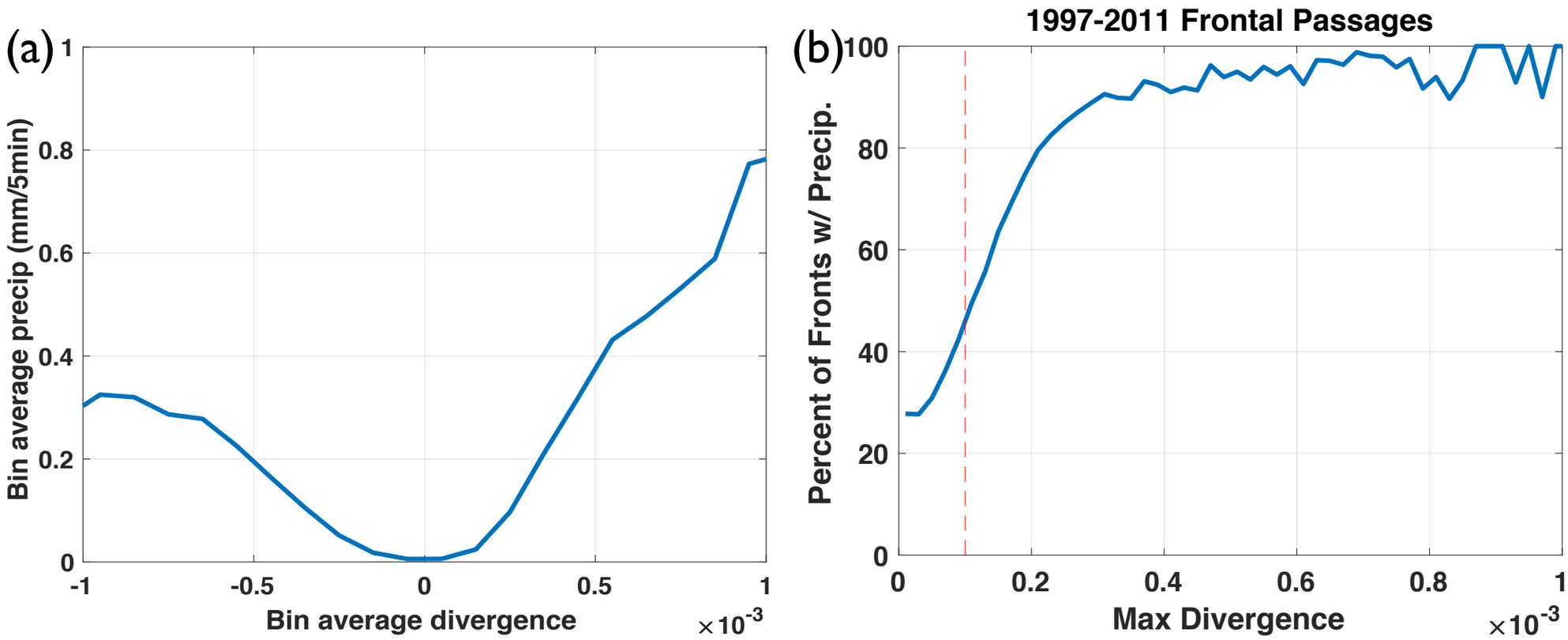

Fig. 4. The (a) average surface precipitation (in mm/5min) for each divergence bin and (b) percentage of frontal passages which record surface precipitation, as a function of maximum divergence associated with the front.

Figure 5

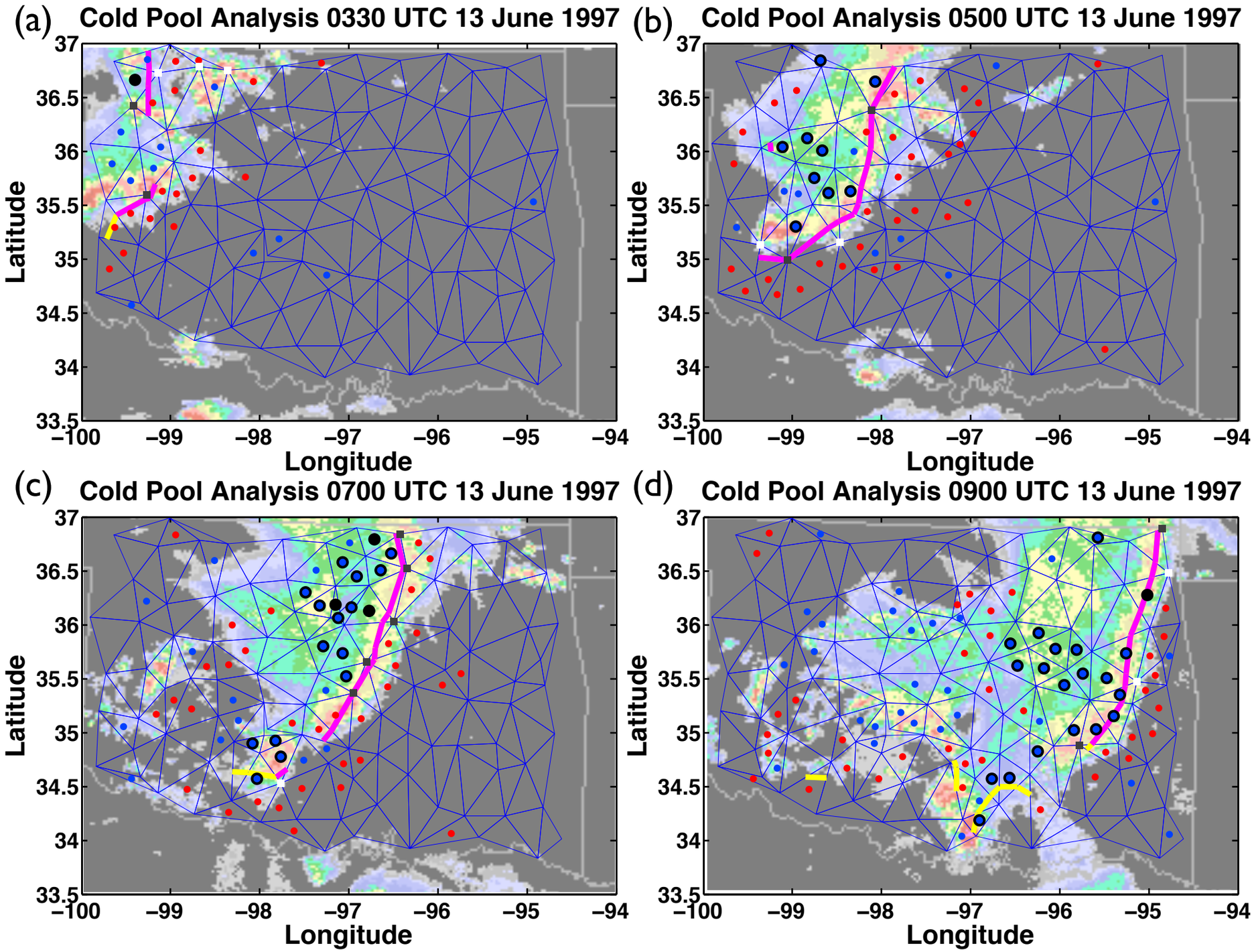

Fig. 5. Front and cold pool analysis for 13 June 1997 (a) 0330 UTC, (b) 0500 UTC, (c) 0700 UTC, and (d) 0900 UTC. Red dots are $D_i < -10^{-4}s^{-1}$ while blue dots are $D_i > 10^{-4}s^{-1}$. Yellow lines are frontal passages with FSs of 3 <= FS < 5 while magenta lines are frontal passages with FSs of 5+. White squares are stations where at the current timestep the FS is 3 <= FS < 5; gray squares designate stations currently with FSs at 5+. Black dots indicate triangles currently designated as cold pools. Radar images are from the UCAR image archive, NEXLAB - College of DuPage.

Figure 6

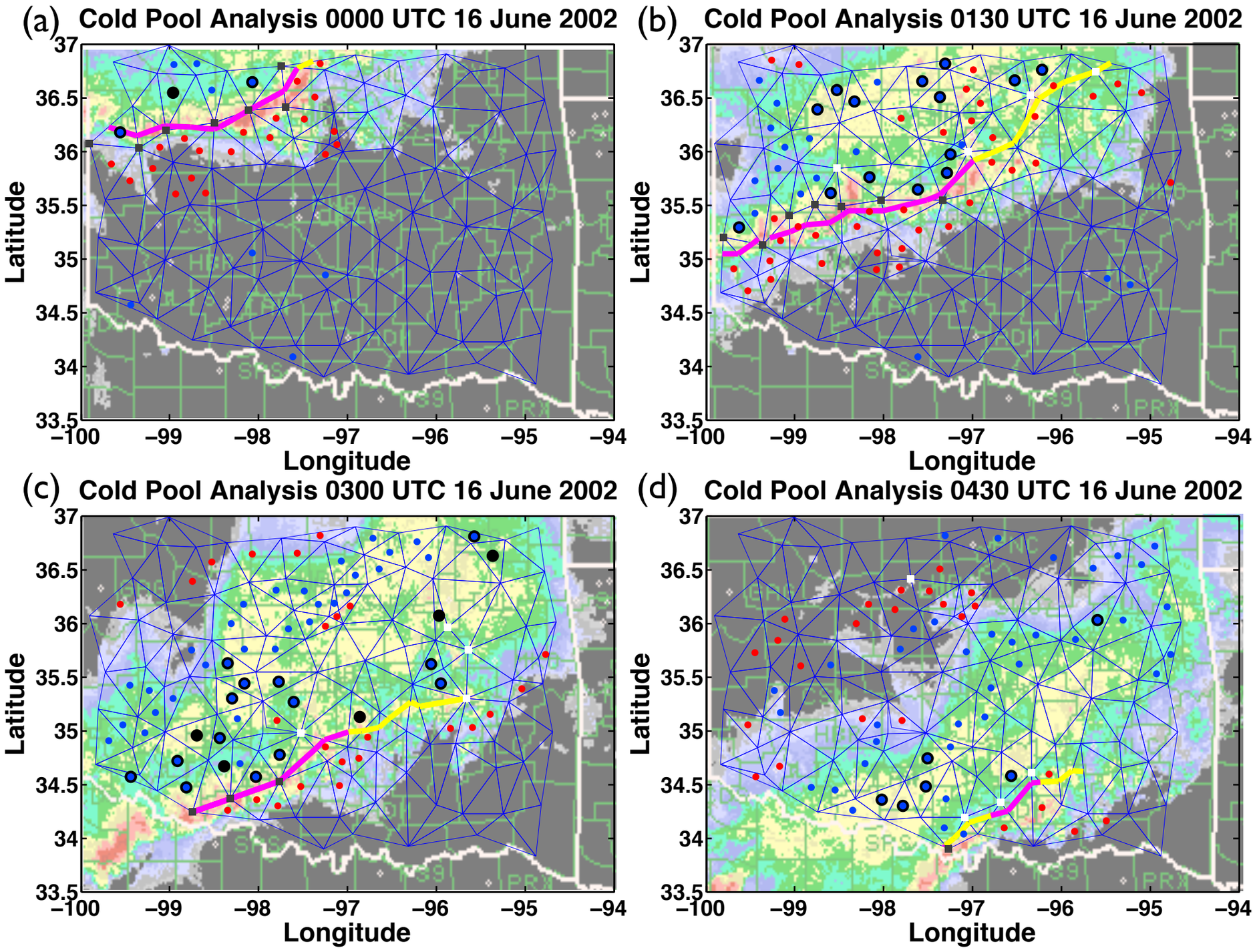

Fig. 6. Same as Figure 5 except for 16 June 2002 (a) 0000 UTC, (b) 0130 UTC, (c) 0300 UTC, and (d) 0430 UTC.

Figure 8

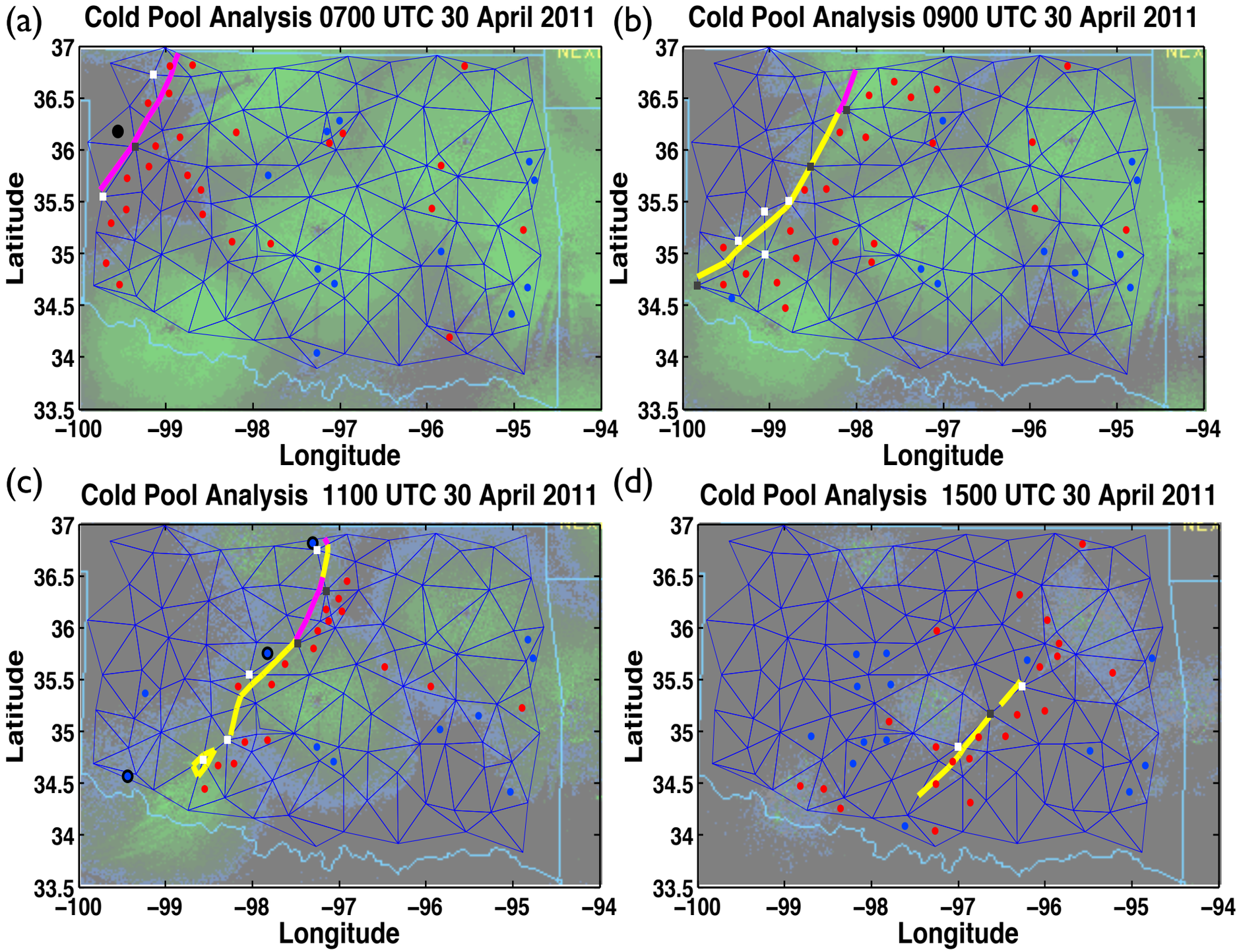

Fig. 7. Same as Figure 5 except for 30 April 2011 (a) 0700 UTC, (b) 0900 UTC, (c) 1100 UTC, and (d) 1500 UTC.

Figure 7

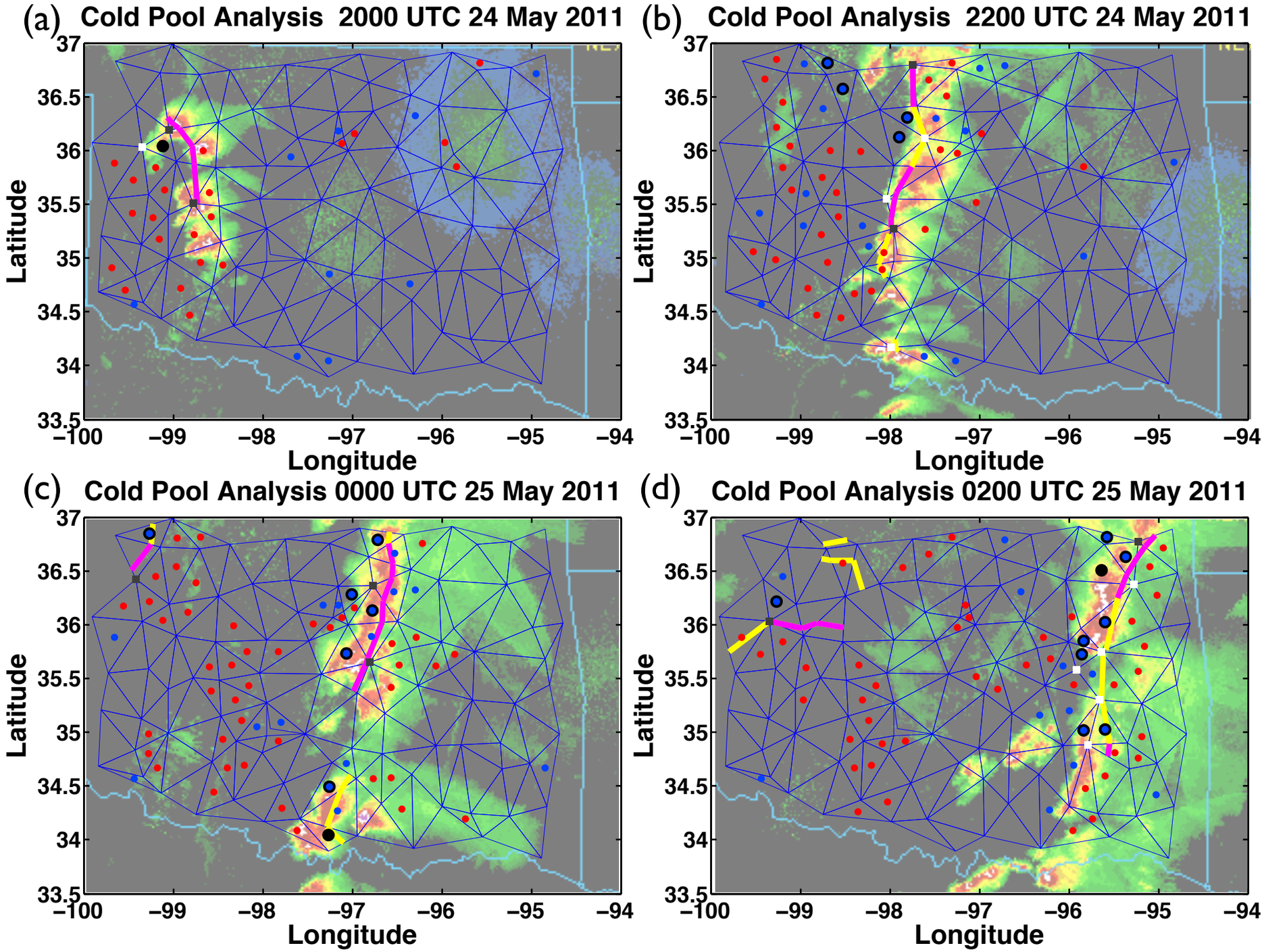

Fig. 8. Same as Figure 5 except for 24 May 2011 (a) 2000 UTC, (b) 2200 UTC, 25 May 2011 (c) 0000 UTC, and (d) 0200 UTC.

Figure 9

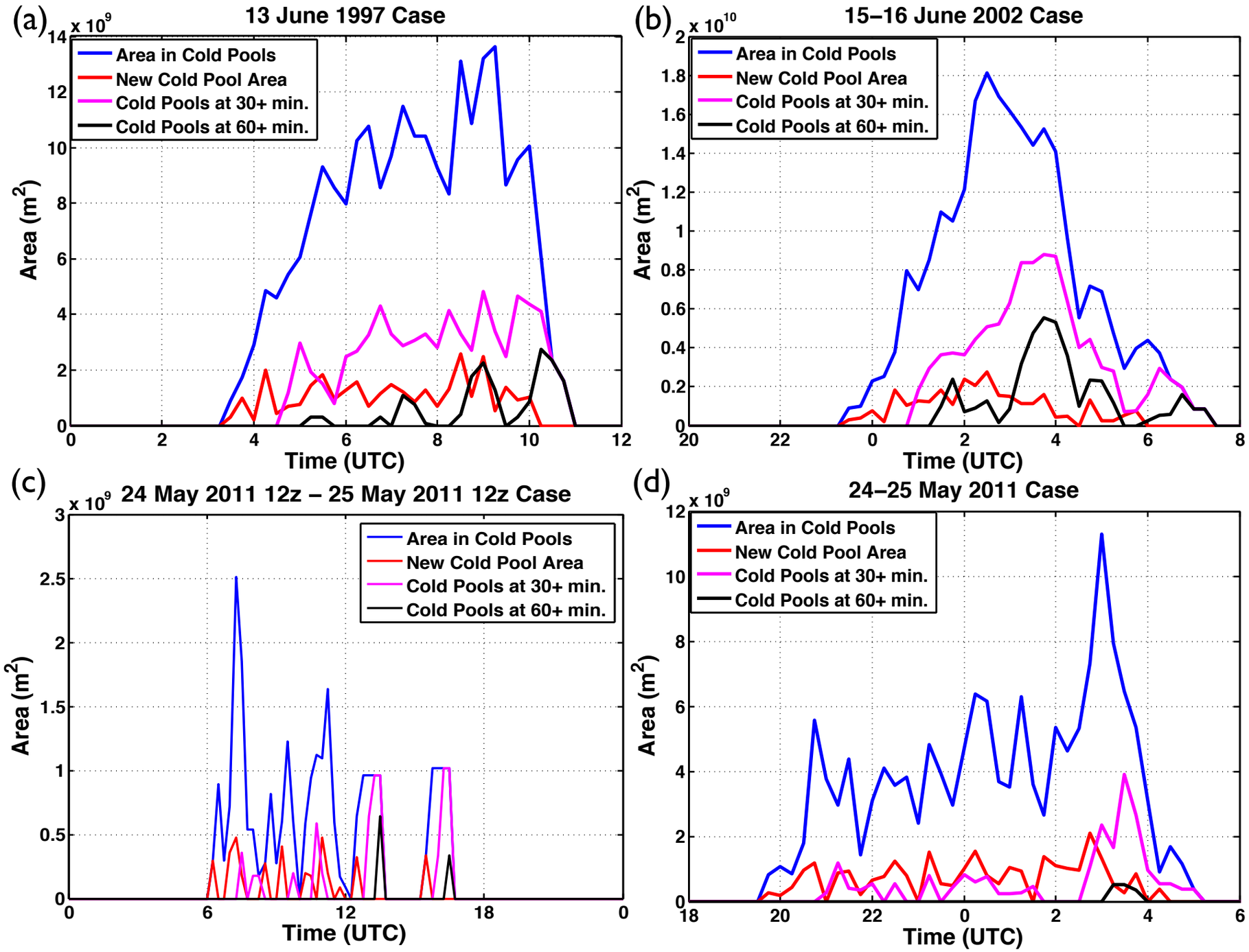

Fig. 9. Cold pool areas for the case studies: a) 13 June 1997 0-12 UTC, b) 15-16 June 2002 20-8 UTC, c) 30 April - 1 May 2011 0-0 UTC, d) 24-25 May 2011 18-6 UTC. Cold pool areas are shown as 15 minute averages for total area in cold pools (blue), new cold pool area (red), area residing in a cold pool at least 30 mins (magenta), and area residing in a cold pool at least 60mins (black).

Figure 10

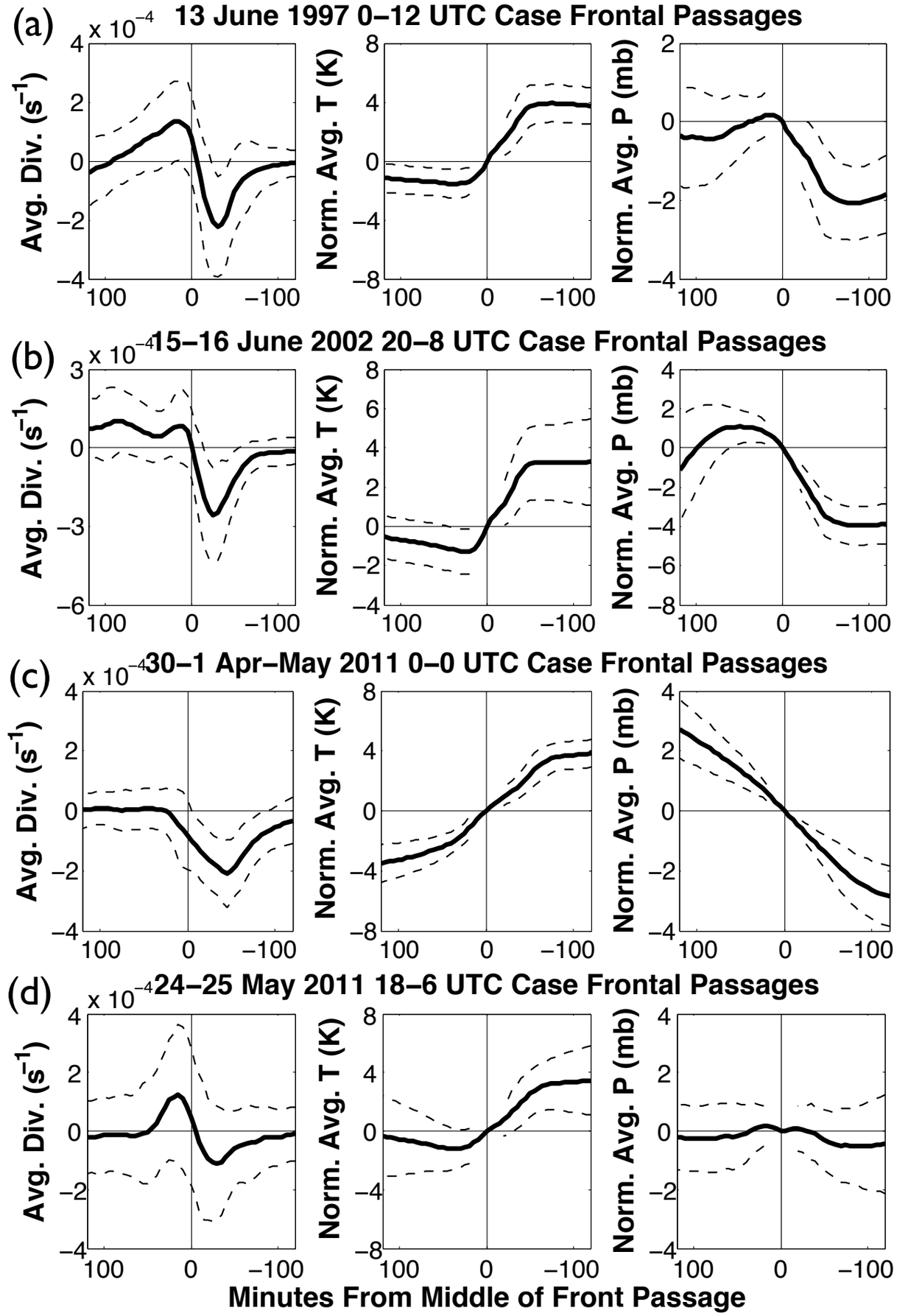

Fig. 10. Average (solid) and +- 1 standard deviation (dashed) divergence, normalized temperature, and normalized pressure values for frontal passages at Mesonet triangles. The x-axis is reversed to show a west to east pattern. Case studies are: a) 13 June 1997 0-12 UTC, b) 15-16 June 2002 20-8 UTC, c) 30 April - 1 May 2011 0-0 UTC, d) 24-25 May 2011 18-6 UTC.

Figure 11

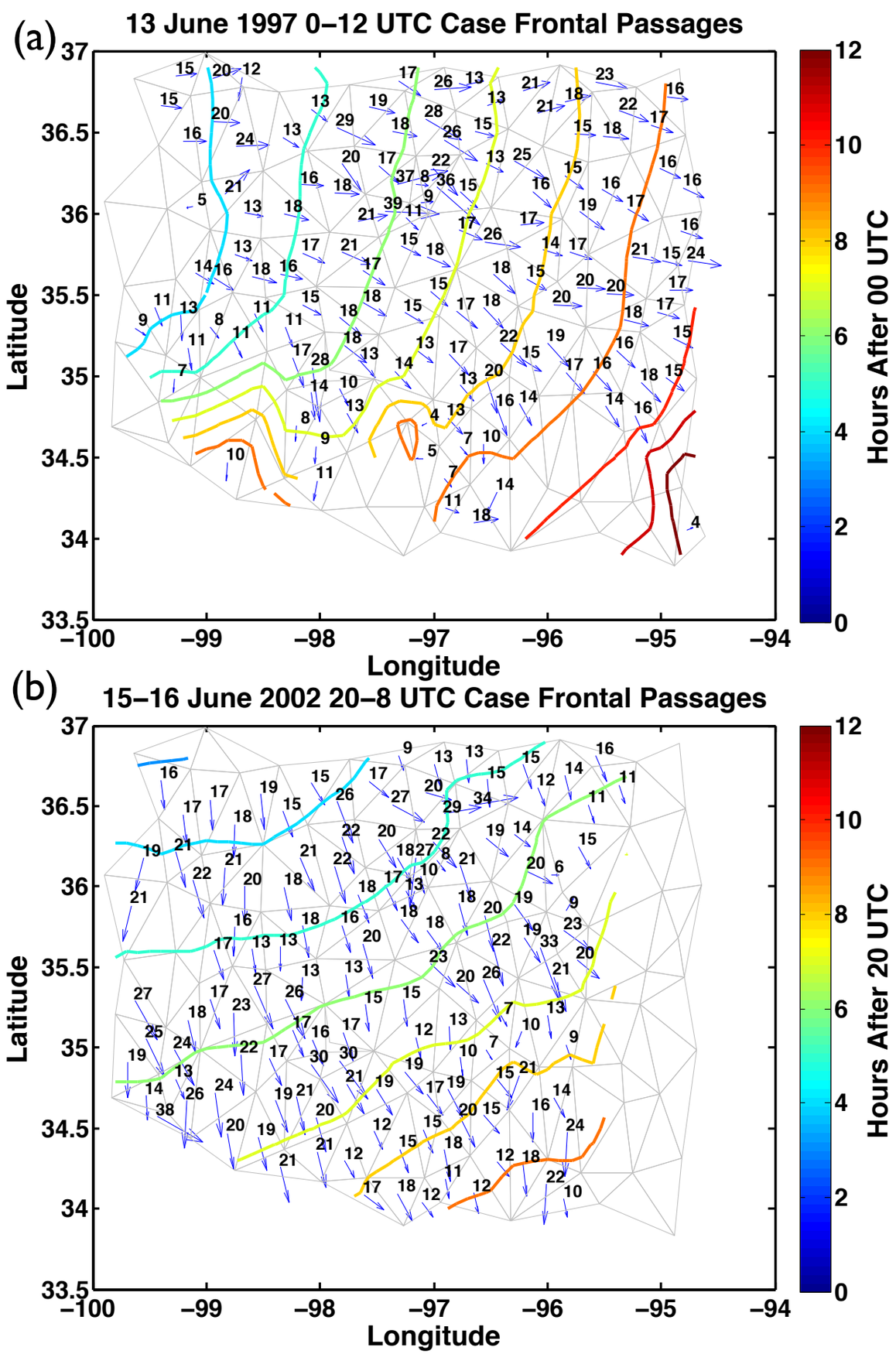

Fig. 11. Frontal passage location and timing (contours) with front speeds (in m s^{-1}) represented by quivers. Case studies are: a) 13 June 1997 0-12 UTC and b) 15-16 June 2002 20-8 UTC.

Figure 12

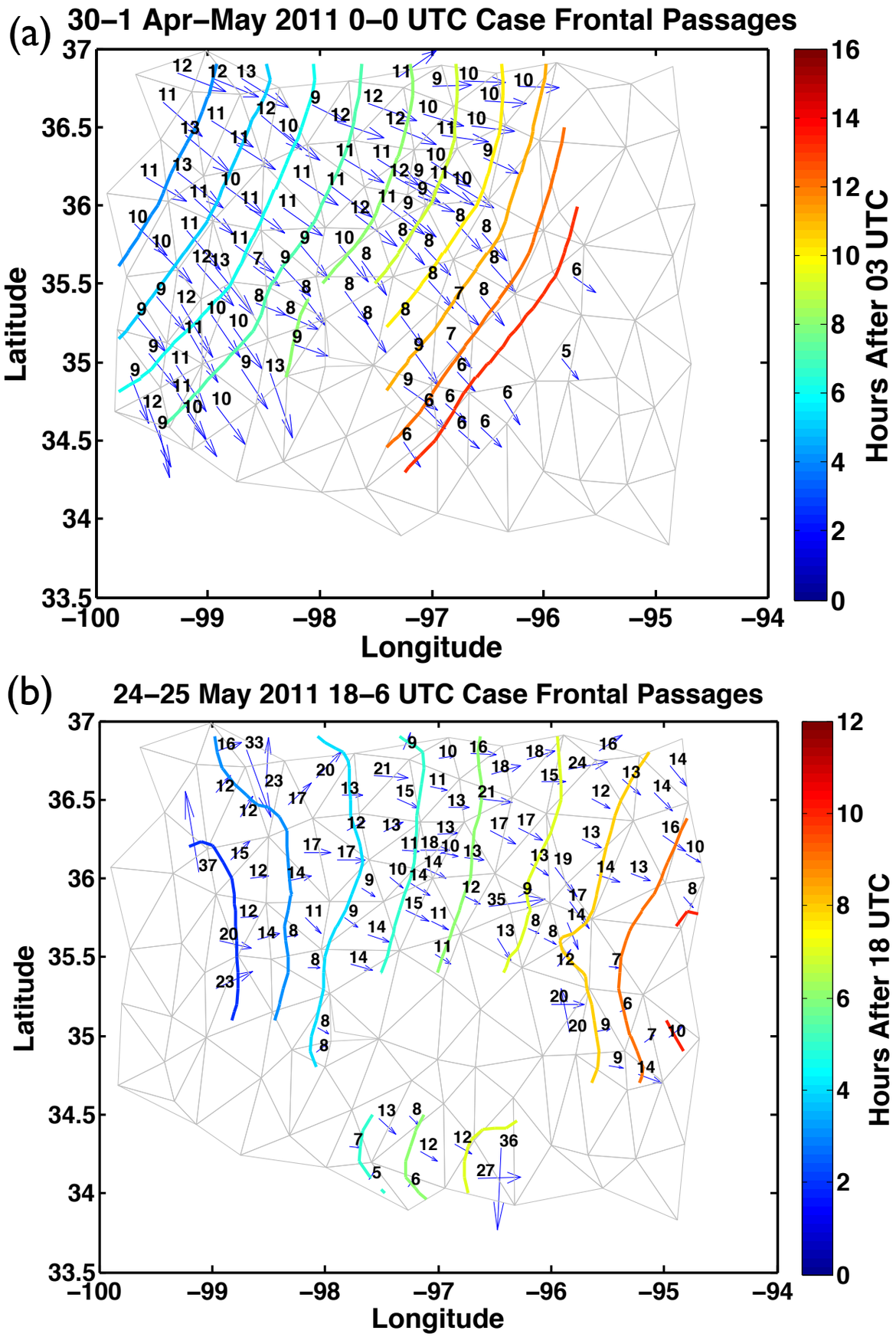

Fig. 12. Frontal passage location and timing (contours) with front speeds (in m s^{-1}) represented by quivers. Case studies are: a) 30 April - 1 May 2011 0-0 UTC and b) 24-25 May 2011 18-6 UTC.

Figure 13

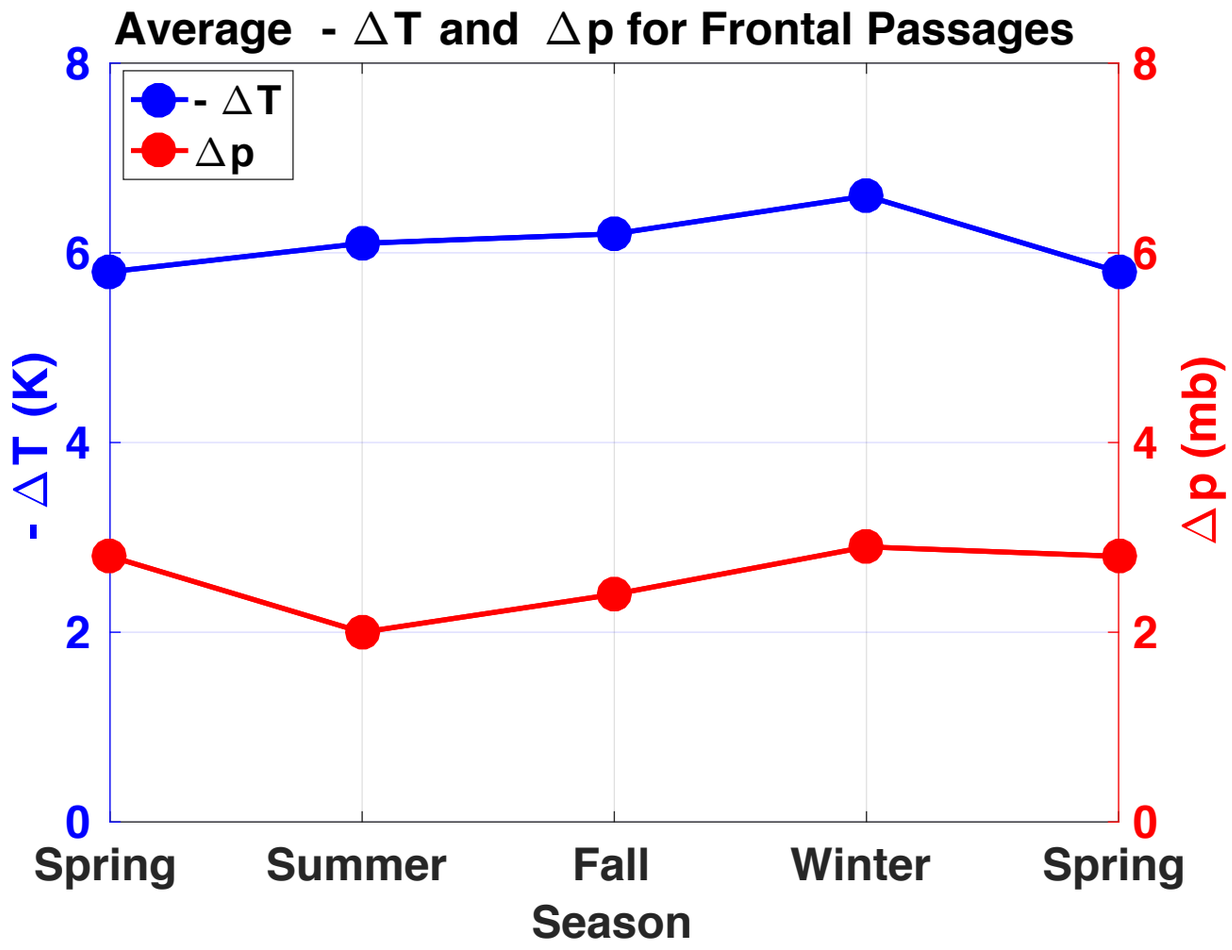

Fig. 13. Seasonal average -ΔT and Δp for 1997-2011 frontal passages.

Figure 14

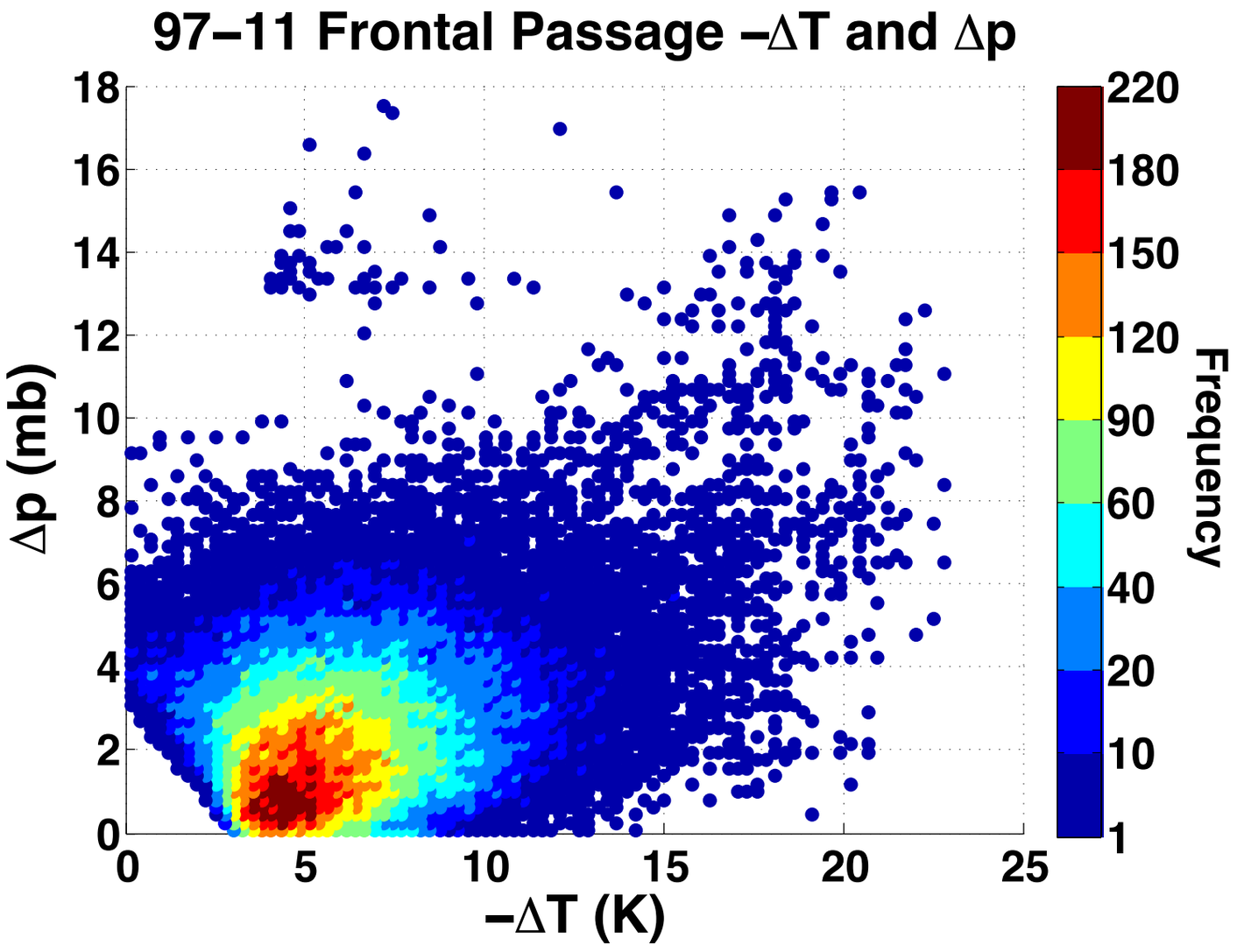

Fig. 14. Δp versus -ΔT at stations that are part of frontal passages across triangles in the Oklahoma Mesonet from the 1997-2011 period. The color bar represents the frequency of occurrence. The correlation is 0.28.

Figure 15

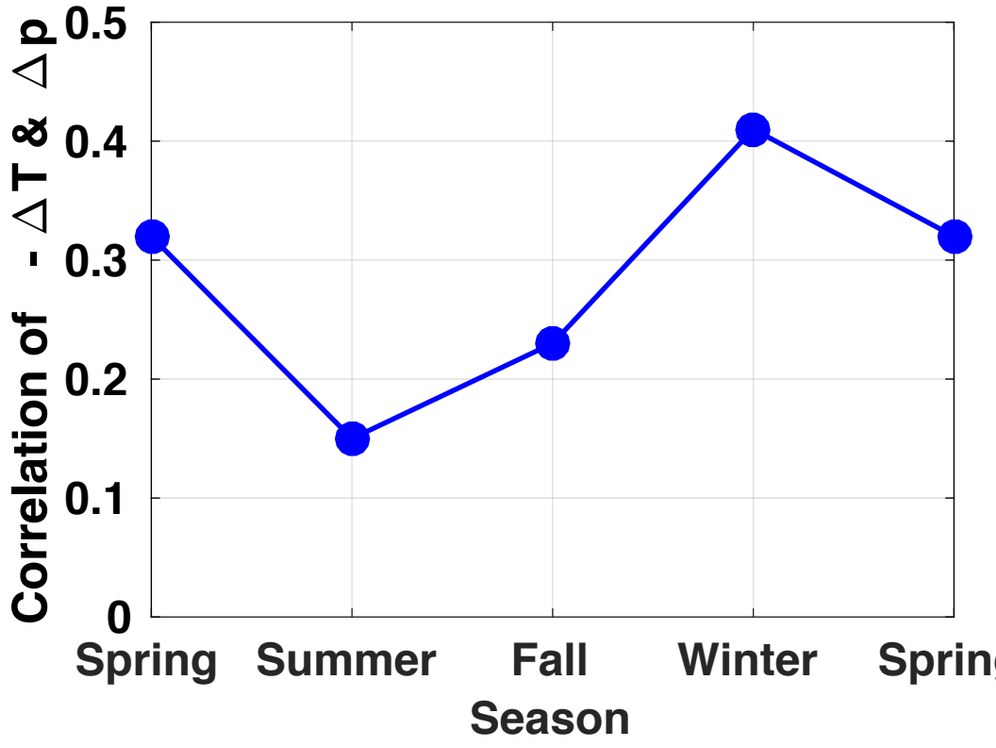

Fig. 15. Seasonal correlations between -ΔT and Δp at stations during frontal passages across triangles.

Figure 16

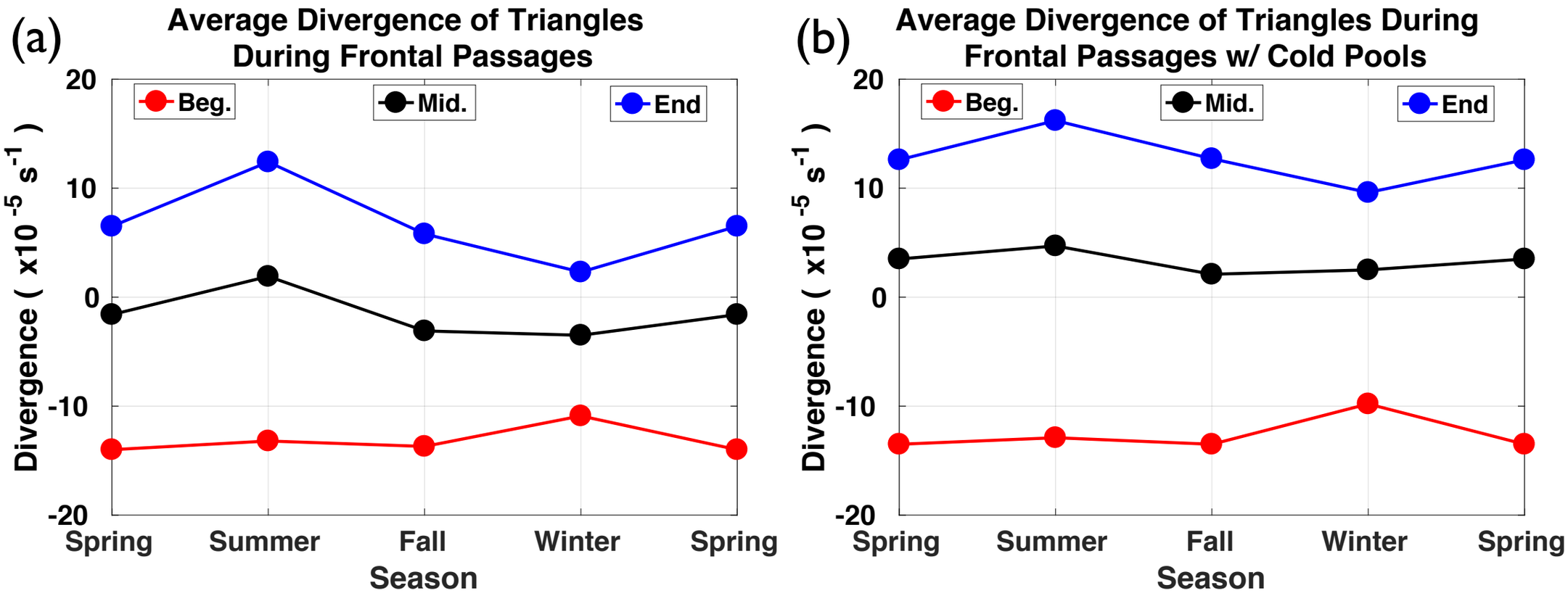

Fig. 16. Average divergence values (in $10^{-5}s^{-1}$) at the beginning, middle, and end of (a) all frontal passages and (b) frontal passages resulting in cold pools experienced by Mesonet triangles from 1997-2011 by season.

Figure 17

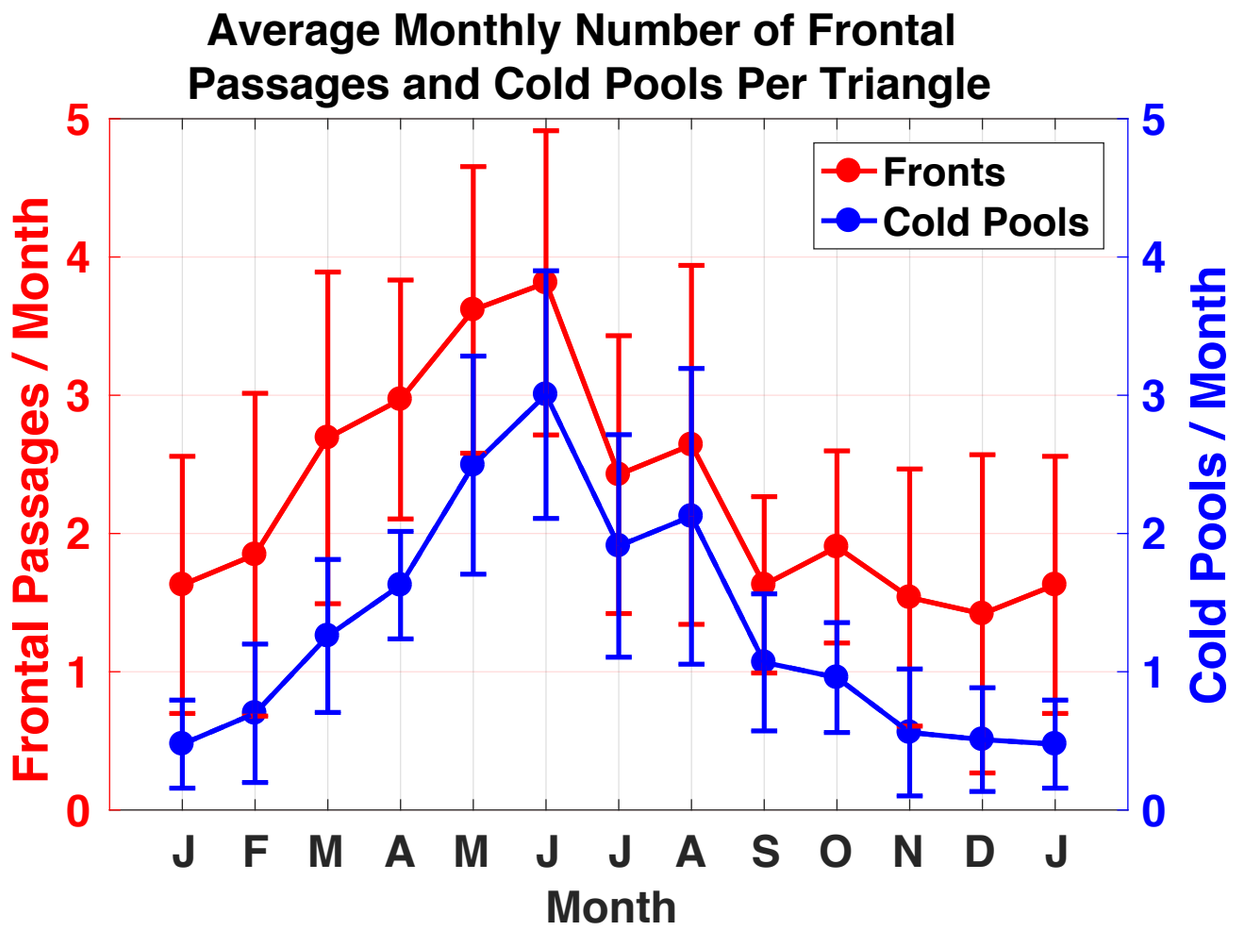

Fig. 17. Average and standard deviation of the number of fronts and cold pools experienced by Mesonet triangles per month from 1997 to 2011.

Figure 18

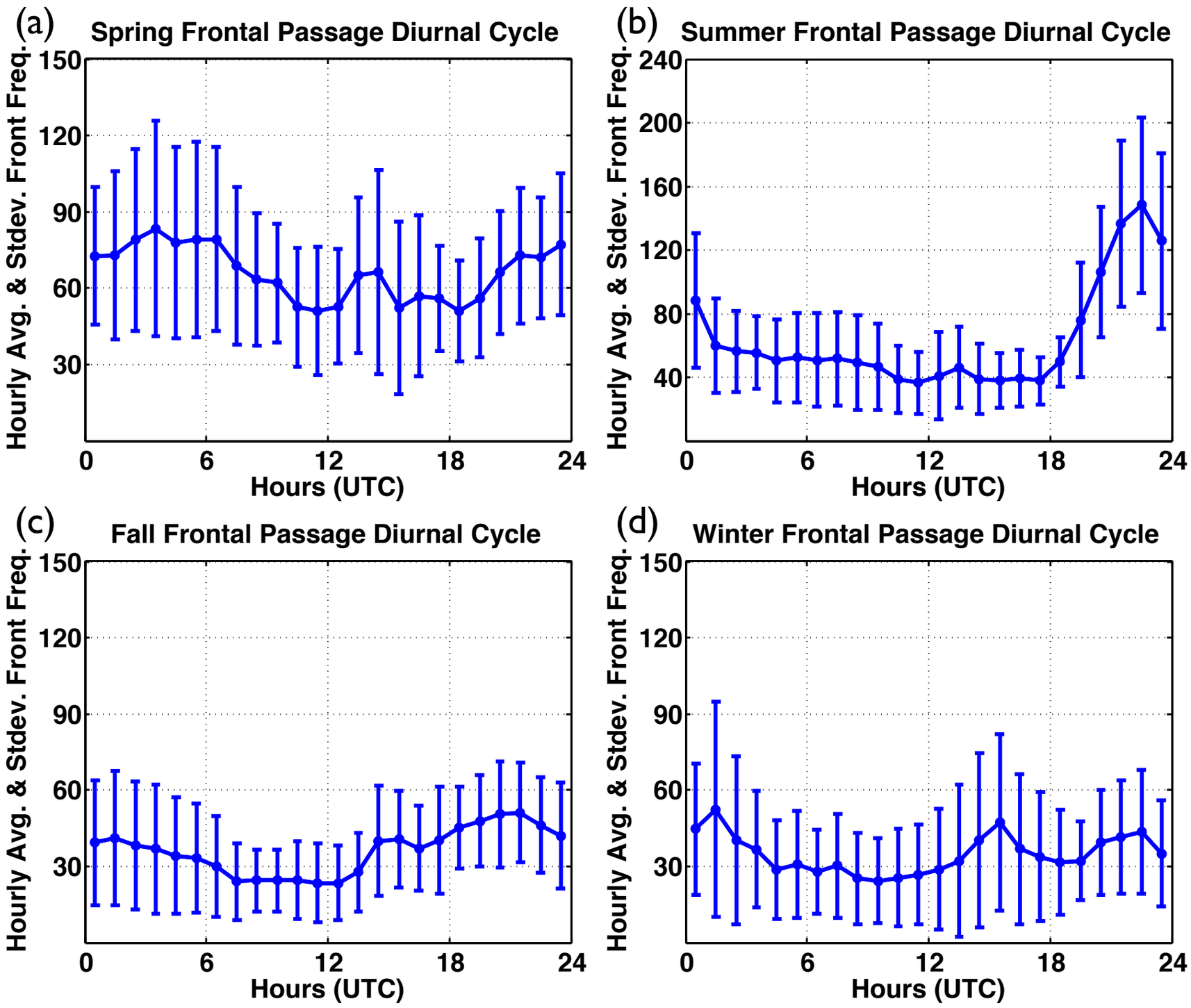

Fig. 18. Seasonally averaged diurnal cycle (in UTC time) of frontal passages at triangles in the Oklahoma Mesonet for the 1997-2011 period along with standard deviations.

Figure 19

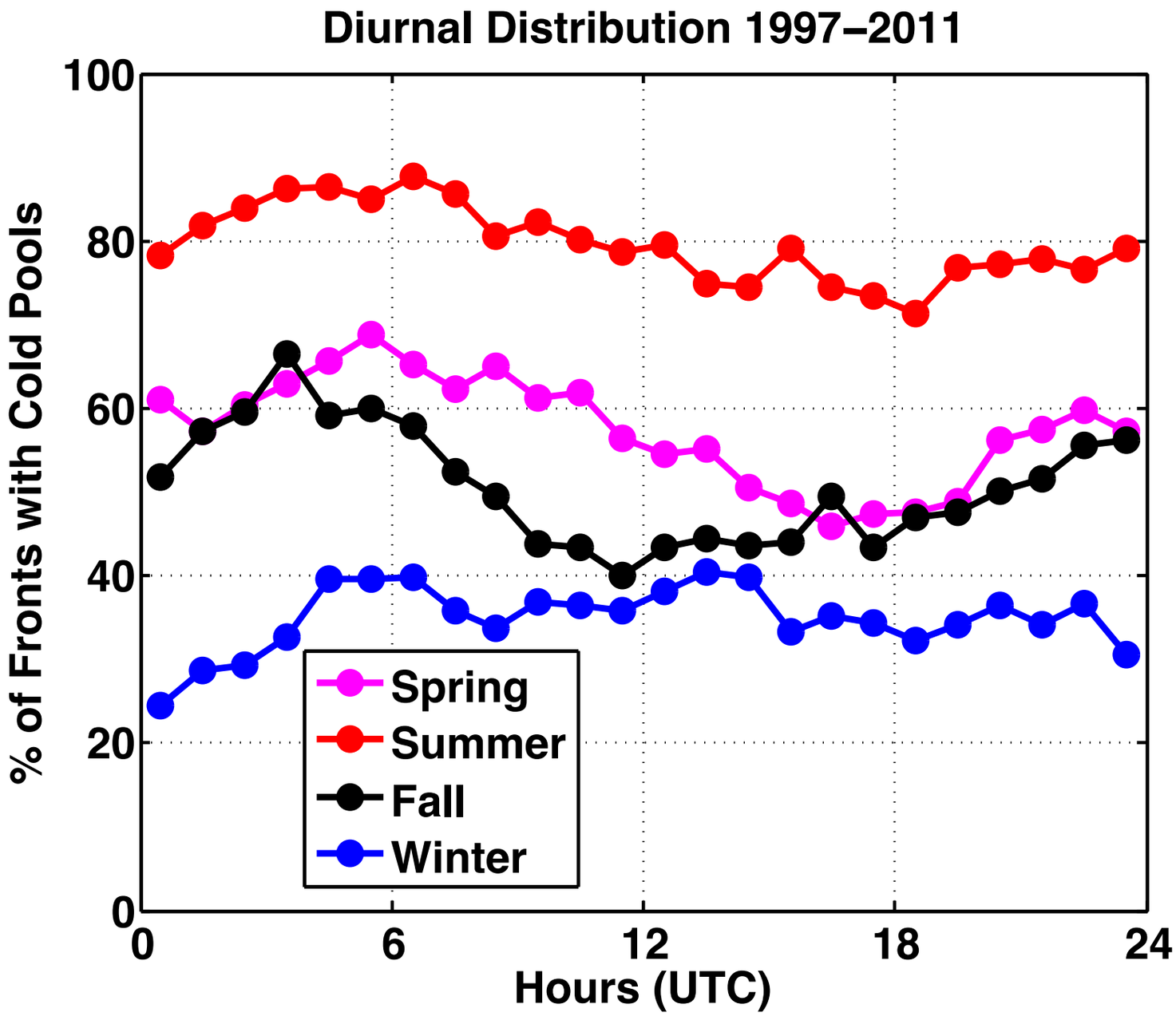

Fig. 19. Seasonally averaged diurnal cycle (in UTC time) of the percentage of frontal passages resulting in cold pools.