Supplementary information

Case Studies

1) Detroit-Windsor urban-influenced air masses arriving at Harrow and Bear Creek

(a) Harrow, June 21, 2007, 16:00 UTC (11 EST)

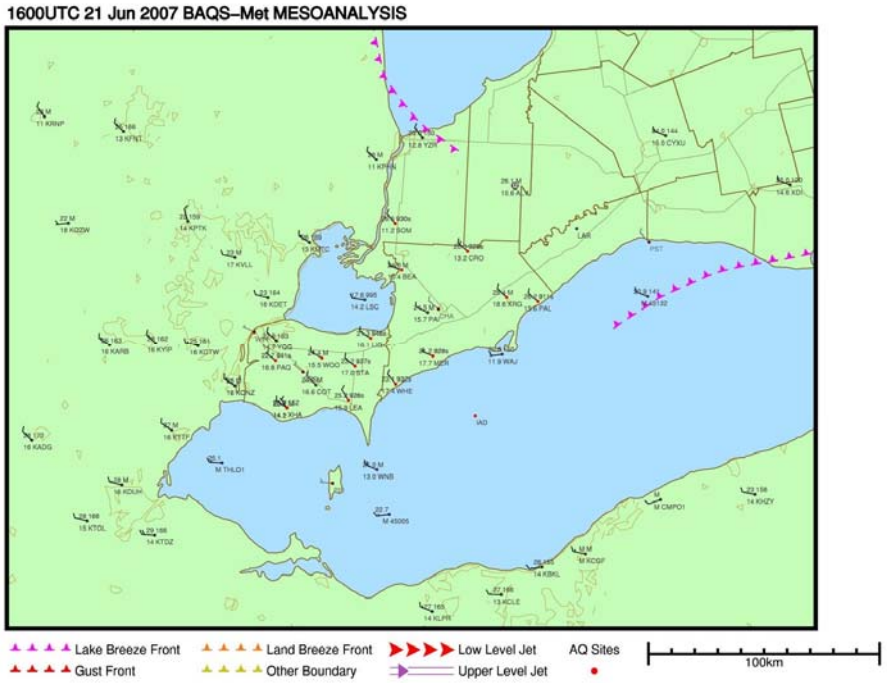
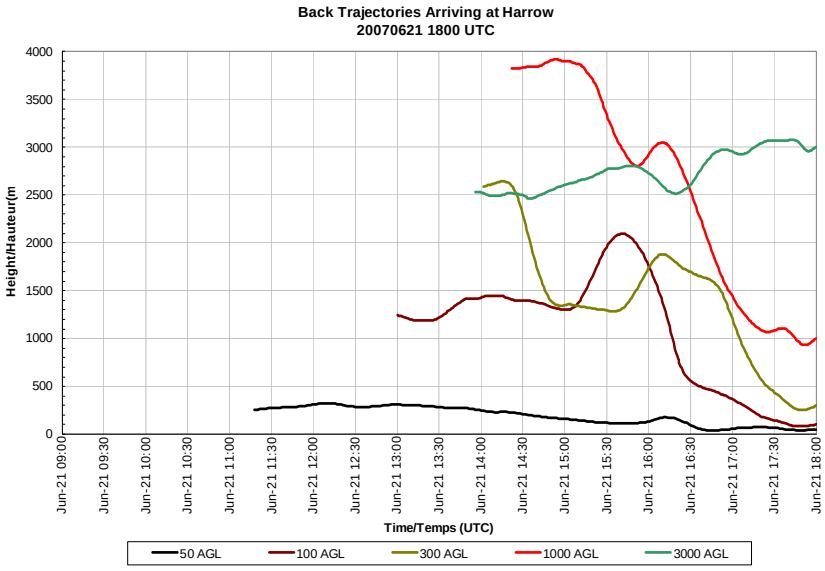
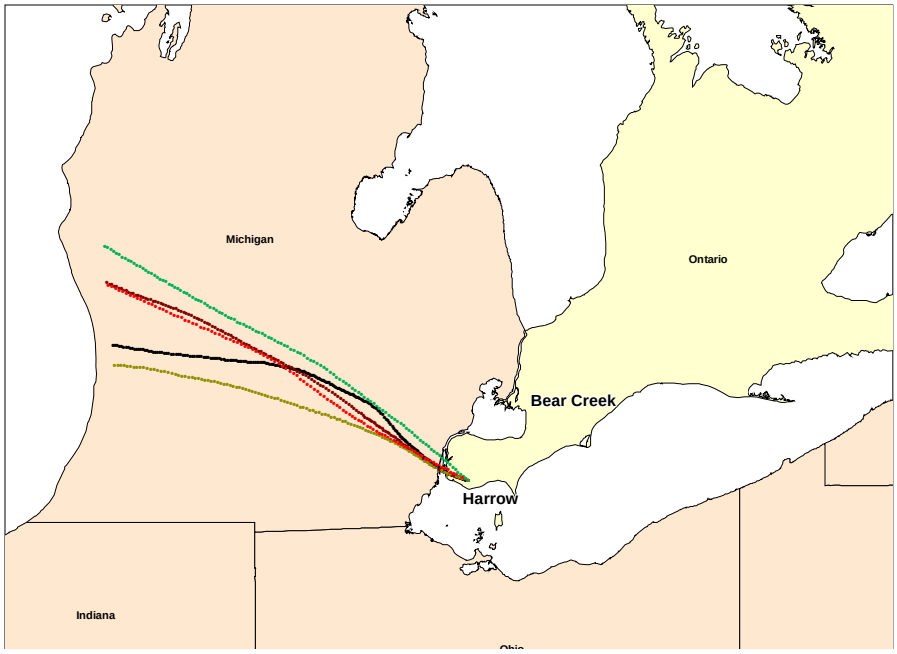


Image shows moderate winds from NW and no presence of lake breezes near Harrow. Cloud band passes through from north at 17 UTC. No change in wind direction on cloud passage.

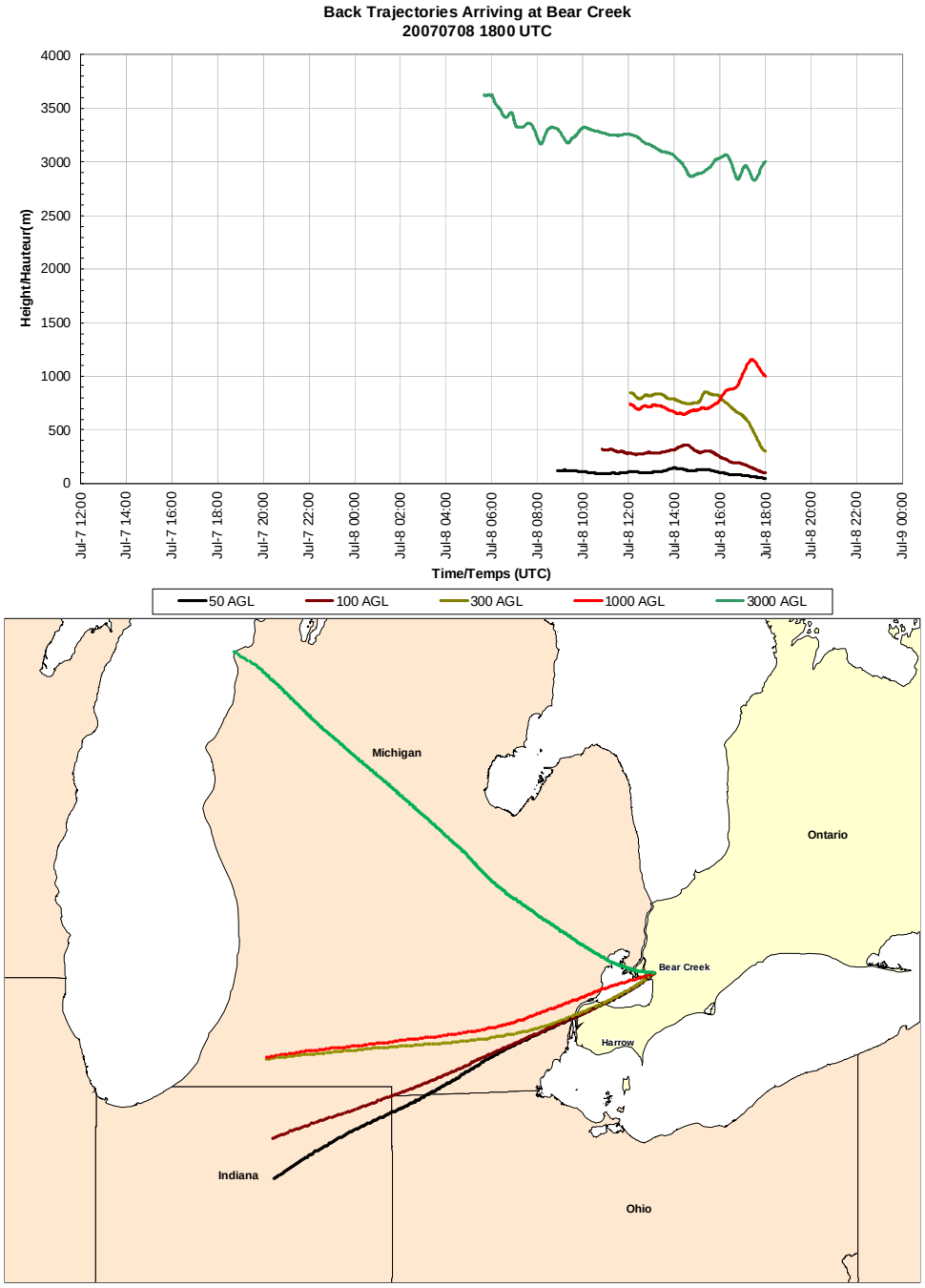




18 UTC back trajectories from Harrow, ON beginning at five heights: 50, 100, 300, 1000, and 3000 m a.g.l. The trajectories suggest that large-scale synoptic subsidence is present, but there is little directional wind shear for this period for generally WNW flow.

(b) Bear Creek, July 8, 2007, 18 UTC (13 EST)

Image shows moderate winds from the SW. The weather was hot with clear skies over Harrow. Some light cloud over Bear Creek at 17 UTC. No lake-breeze passages at supersites.

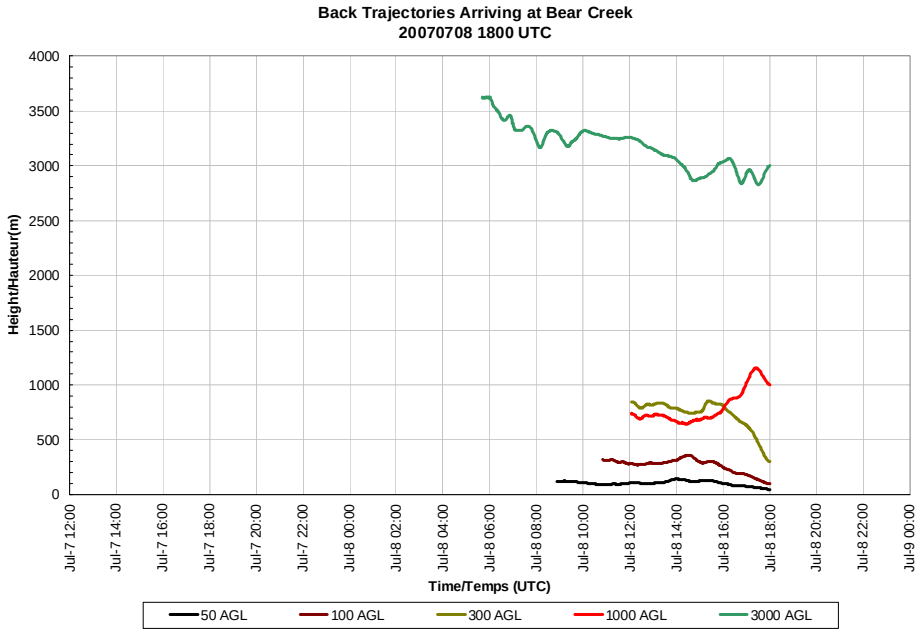


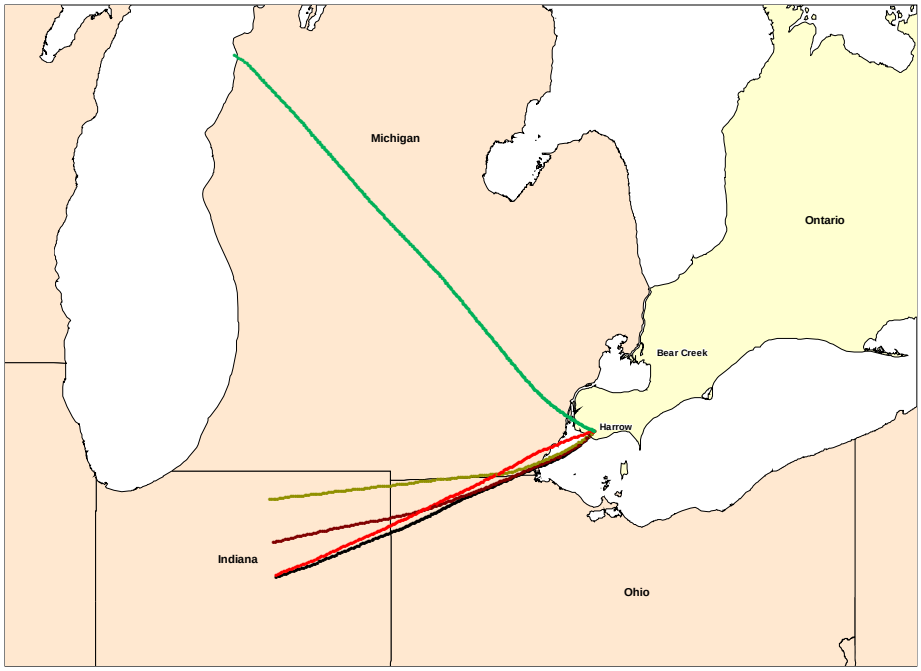
18 UTC back trajectories from Bear Creek, ON beginning at five heights: 50, 100, 300, 1000, and 3000 m a.g.l. The trajectories suggest that there is little directional wind shear or speed shear for this period near the surface (first 1000 m) associated with low-level southwesterly flow. There is directional shear between boundary layer and free troposphere.

2) Transport from the southwest

(a) Harrow, July 8, 2007, 18 UTC (13 EST)

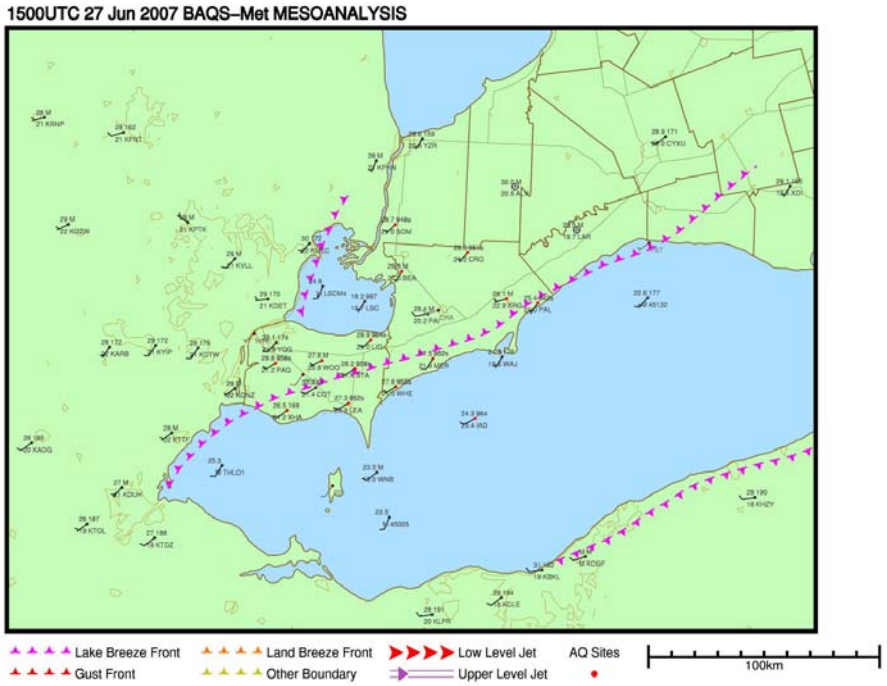
Image shows moderate winds from the SW. The weather was hot and clear skies over Harrow. Some light cloud over Bear Creek at 17 UTC. There were no lake-breeze passages at the supersites.



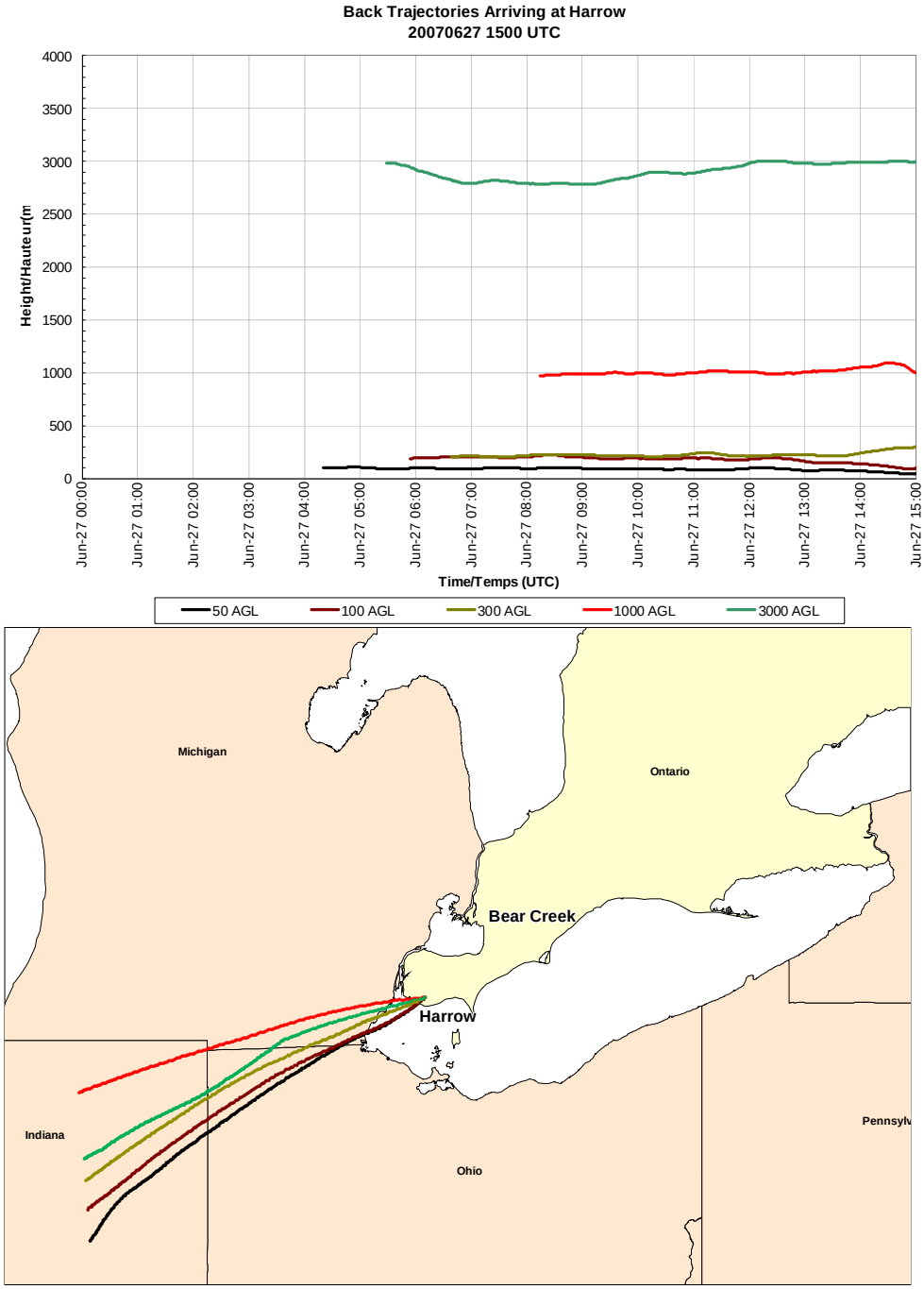


18 UTC back trajectories from Harrow, ON. The trajectories suggest that there was a little directional wind shear between 1000m level and the surface layers for this period, especially near Harrow. There was large directional shear between boundary layer and free troposphere.

(b) Harrow, June 27, 2007, 15 UTC (10 EST, start of case study)



The mesoscale analysis shows a recent lake-breeze passage at Harrow. The case study period was characterized by moderate winds from the southwest at the surface.

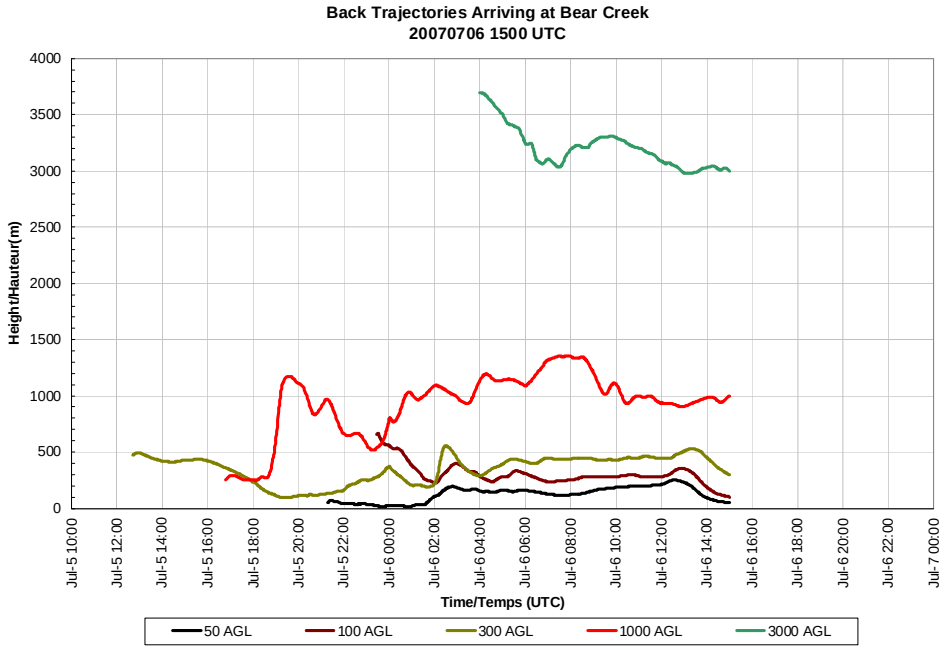


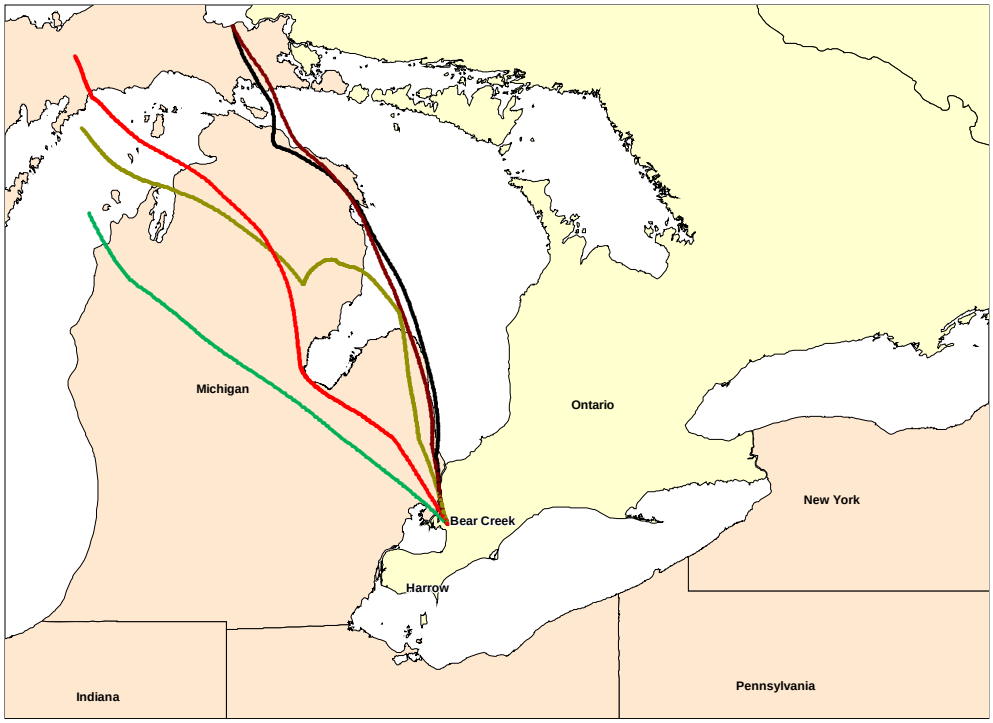
15 UTC back trajectories from Harrow, ON. The back trajectories suggest that there is a little directional wind shear for this period in the boundary layer in low-level southwesterly flow and virtually no subsidence. The 1000 m level had a more westerly component to the flow compared to 50 m and 100 m level.

3) Biomass Burning Cases

a) Harrow, July 6, 2007, 15-18 UTC (10-13 EST)

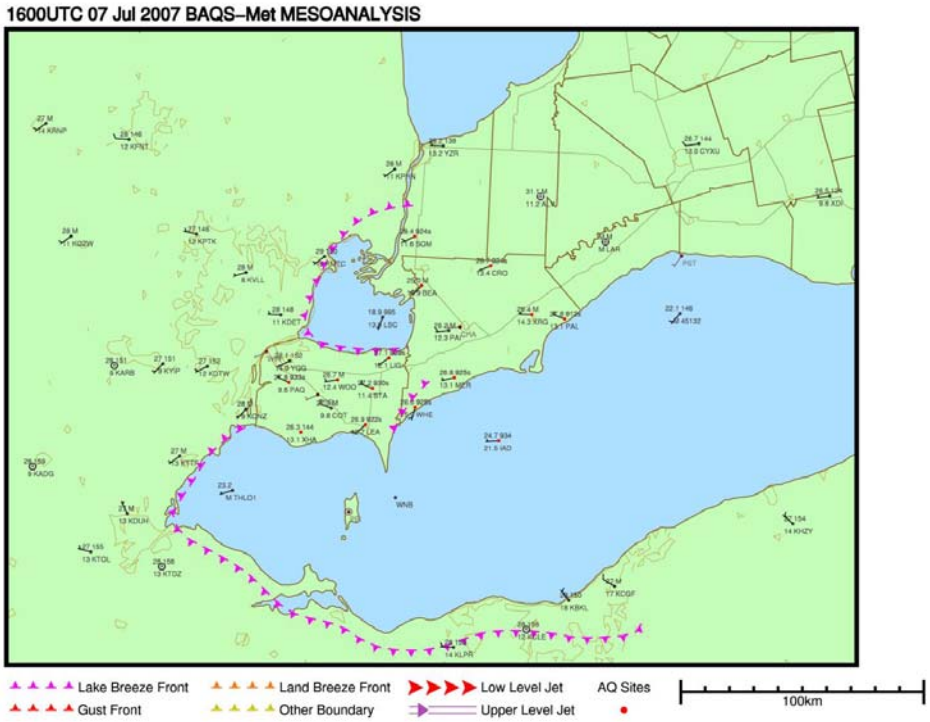
The weather was clear skies. Long-range transport from northern Michigan and Canadian Prairies dominated. There were no lake-breeze passages at the supersites.



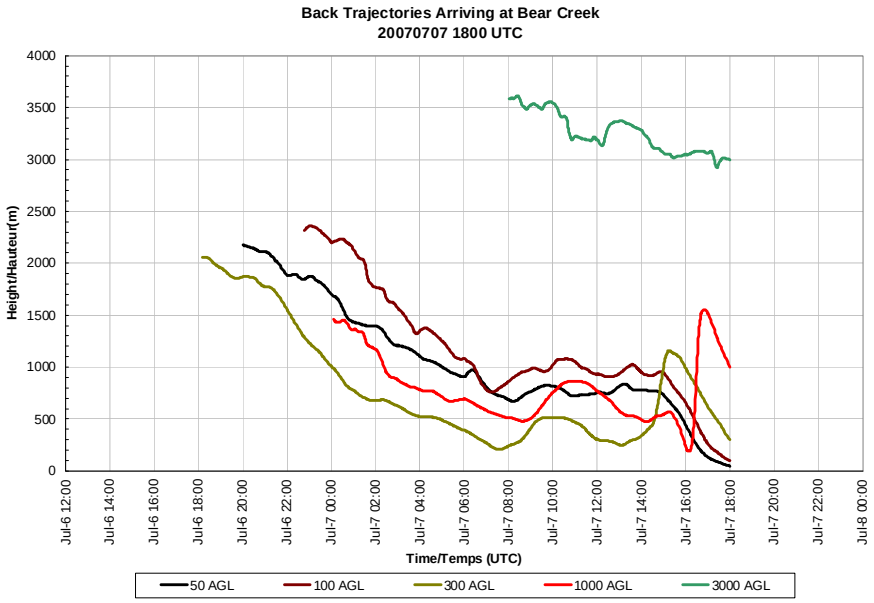


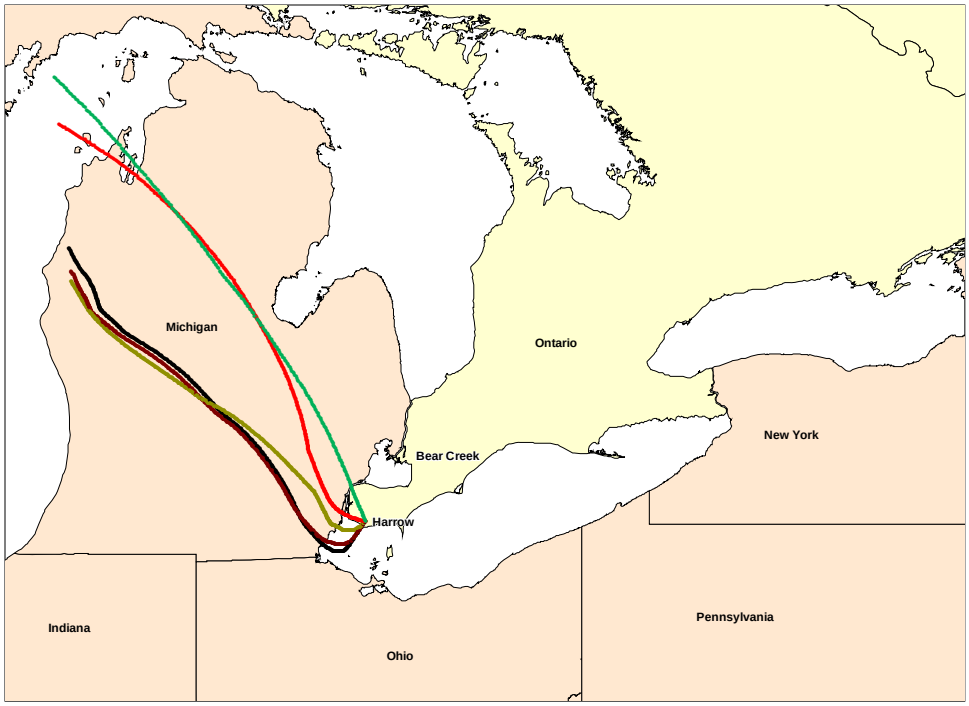
15 UTC back trajectories from Harrow, ON. The upper back trajectories display some directional shear (backing) but near-surface flow is northerly with little subsidence.

b) Harrow, July 7, 2007, 14-20 UTC (9:00-14:50 EST)



Some enhanced radar reflectivity was observed at 14 UTC, but by 16 UTC it had vertically mixed and dissipated. There was no lake breeze at Harrow.





18 UTC back trajectories from Harrow, ON. Although the low-level transport at Harrow is from the southwest, the air parcels originate in descending northwesterly flow.

4) Regional Transport from North

(a) Bear Creek, June 29, 2007, 17-20 UTC (12-15 EST)

The image shows the Lake St. Clair lake breeze has not reached Bear Creek. Low-level flow is northerly.

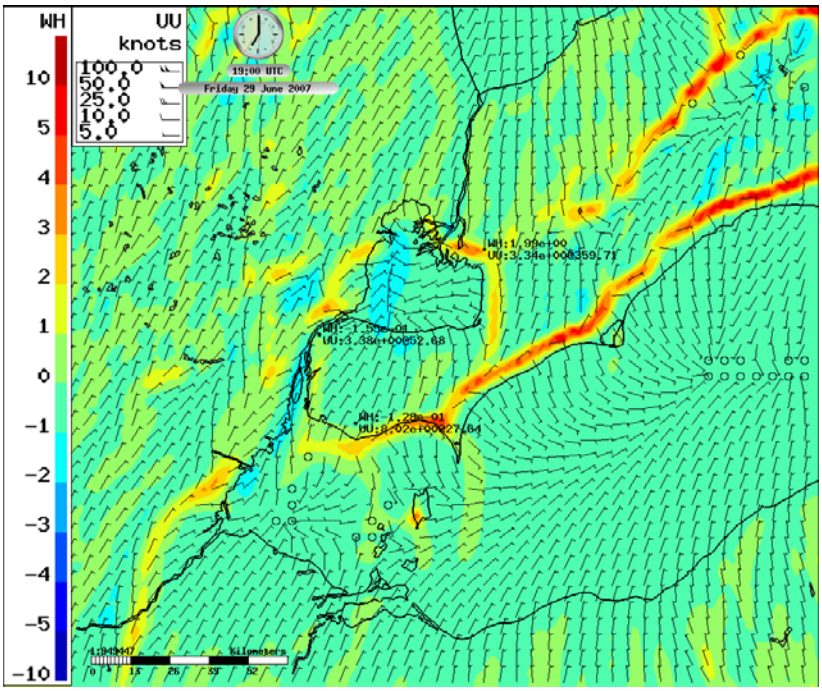
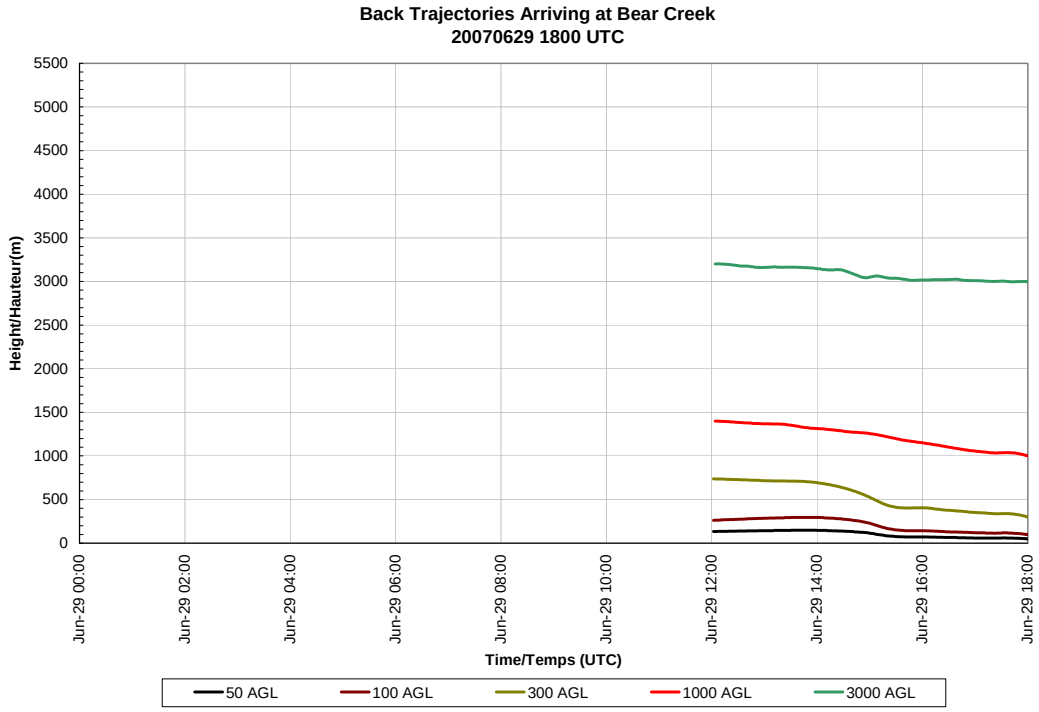
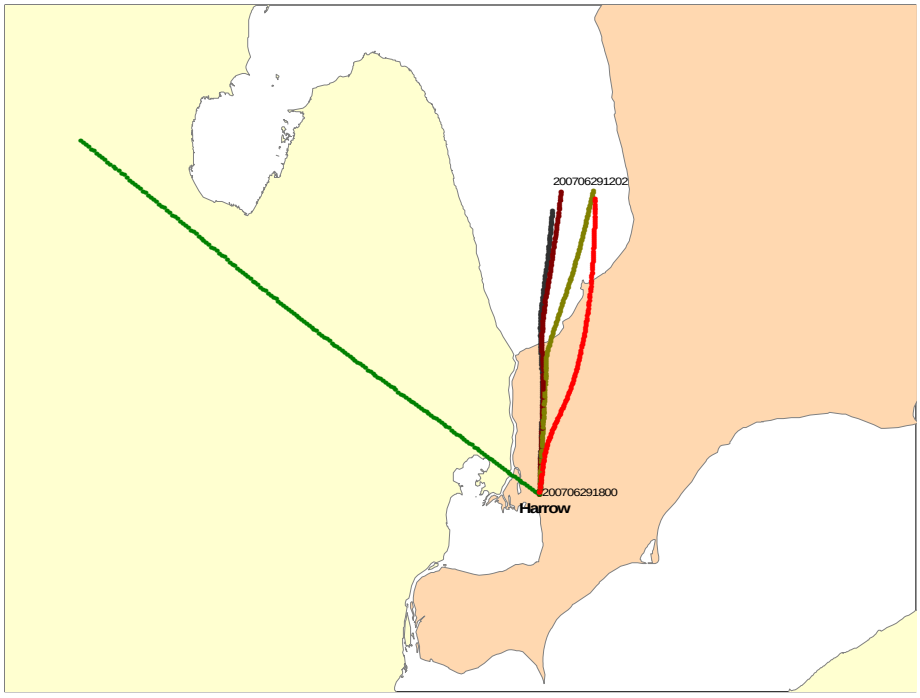


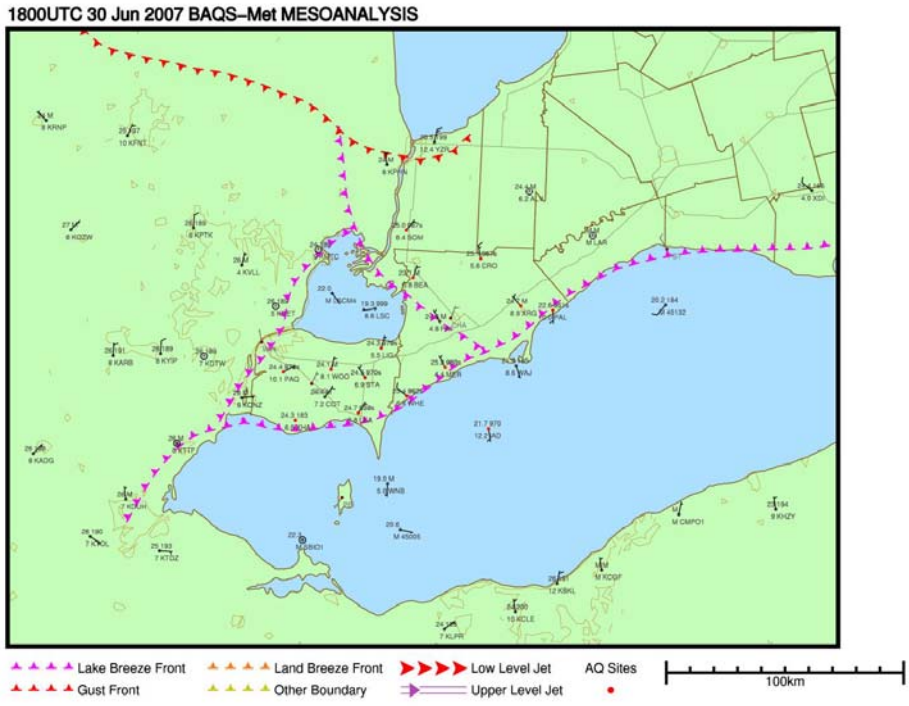
Image illustrates model predicted vertical velocity fields at 19 UTC at 395m. Areas of rising motion agree well with the prior image from the mesoscale analysis of lake-breeze-front positions.



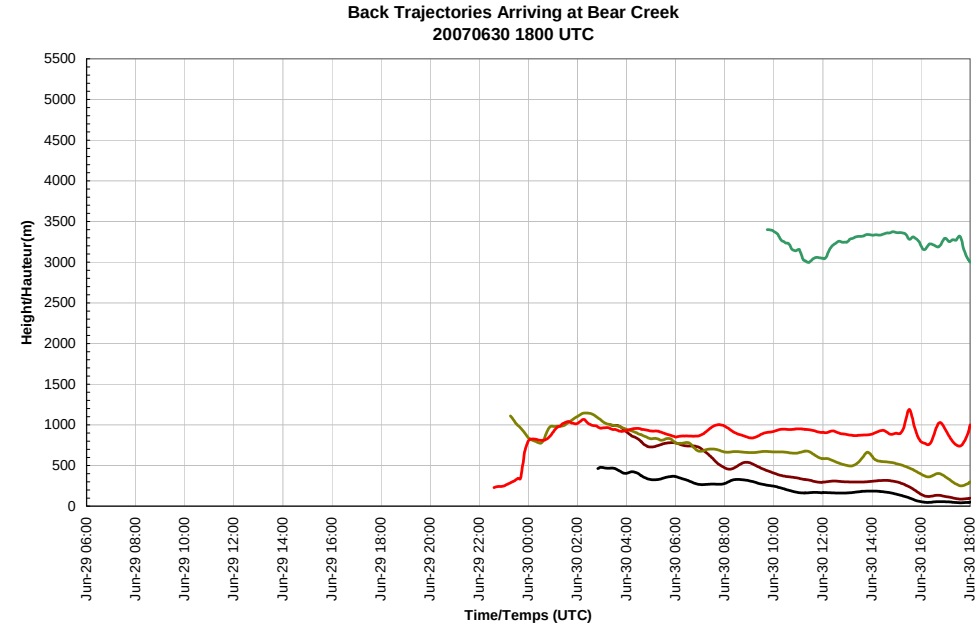


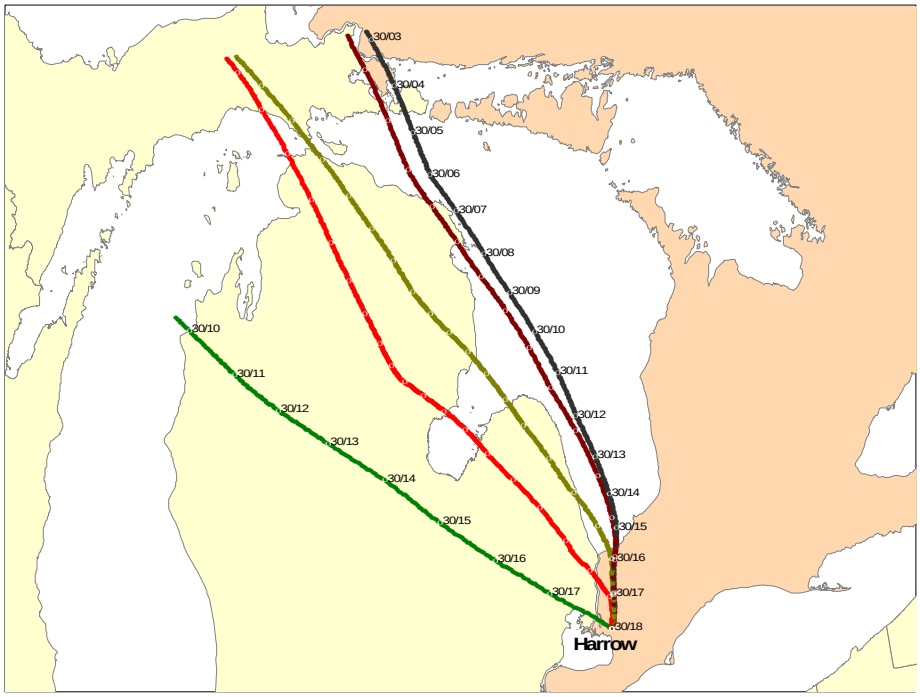
Back trajectory could only be calculated for 6 hr due to lack of meteorology data. The back trajectory and vertical cross section show northerly flow and descending air.

(b) Bear Creek, June 30, 2007, 17-20 UTC (12-15 EST)



18 UTC meso-analysis is quite similar to analysis for previous day (see Case 4a). The gust front passes through Bear Creek from the north just after the end of the defined case study period.





The back trajectory and vertical cross section show northerly flow and slowly descending air.