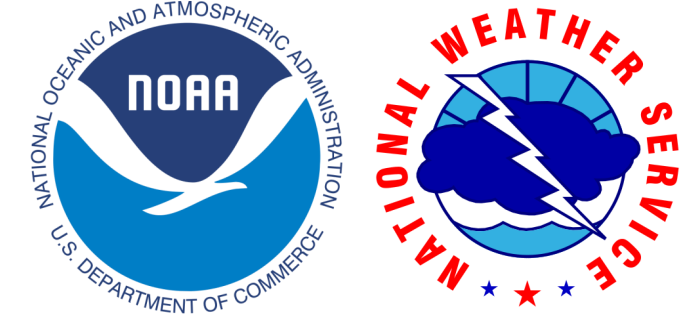


A METEOROLOGICAL ASSESSEMENT OF THE INITIAL DEVELOPMENT OF THE 19 JULY 2019 WISCONSIN DERECHO

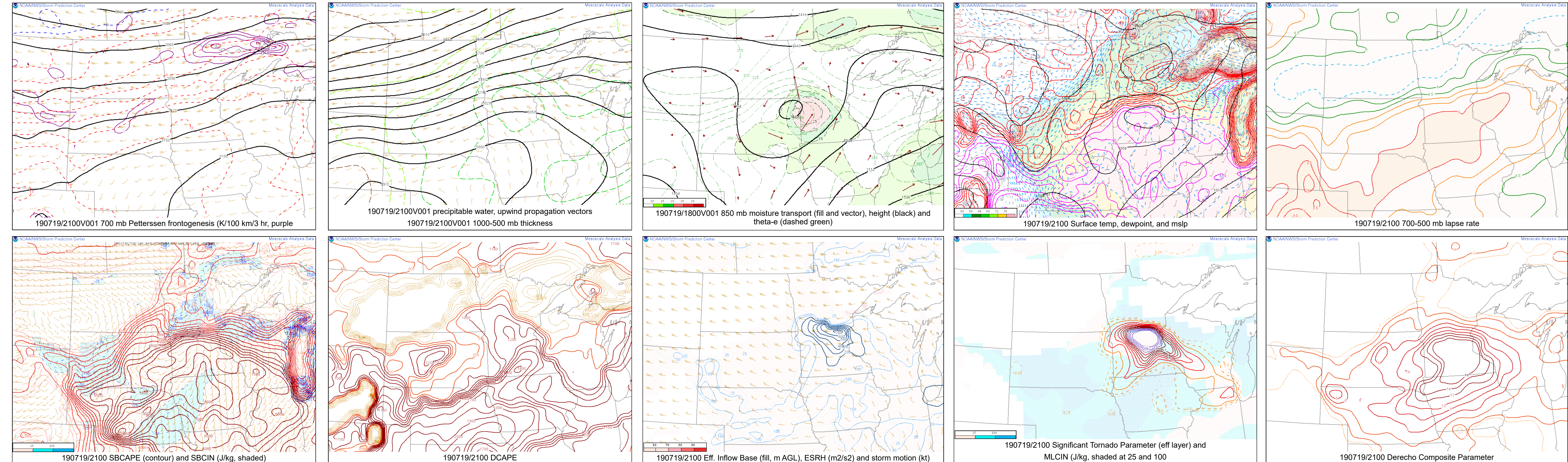
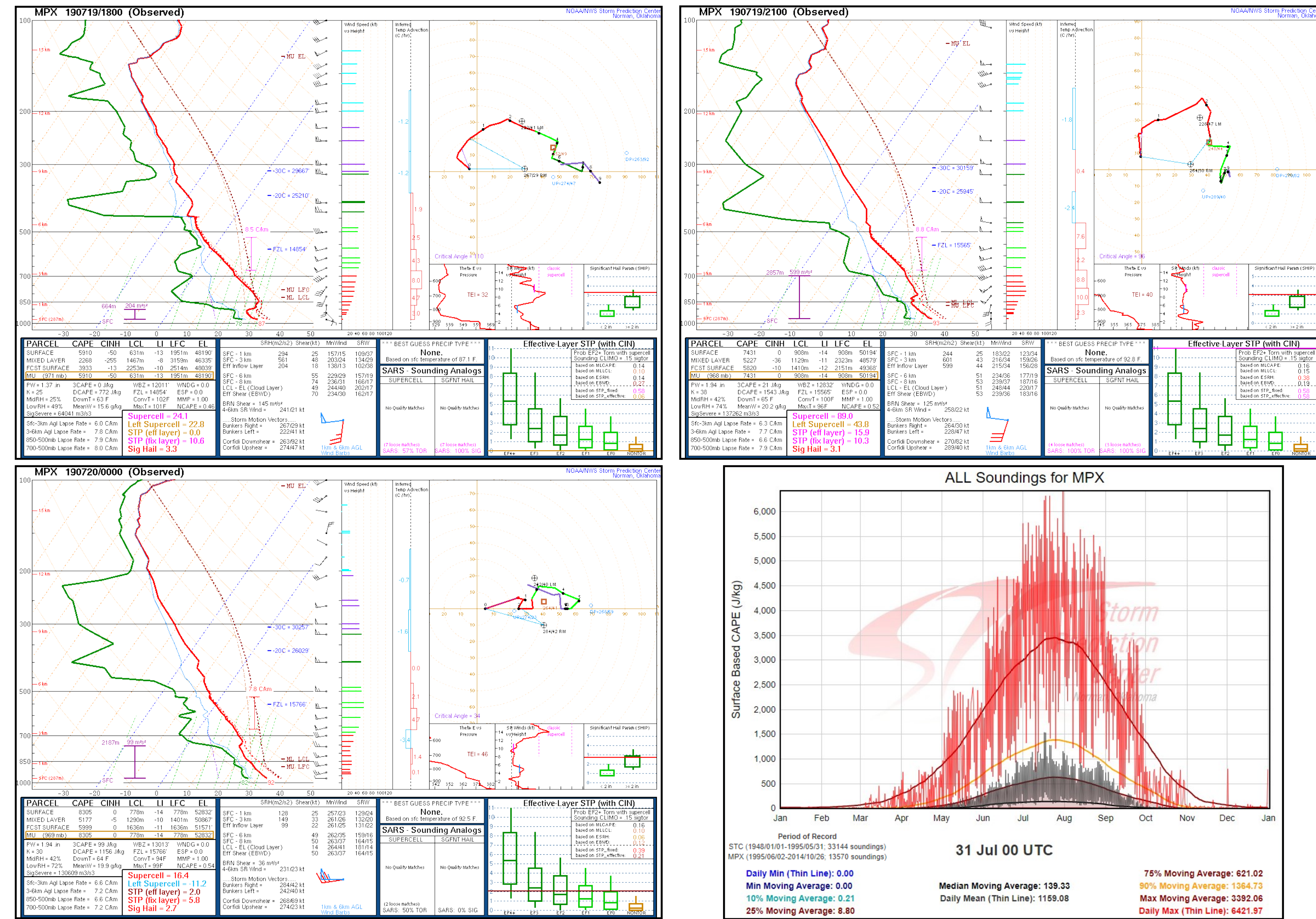


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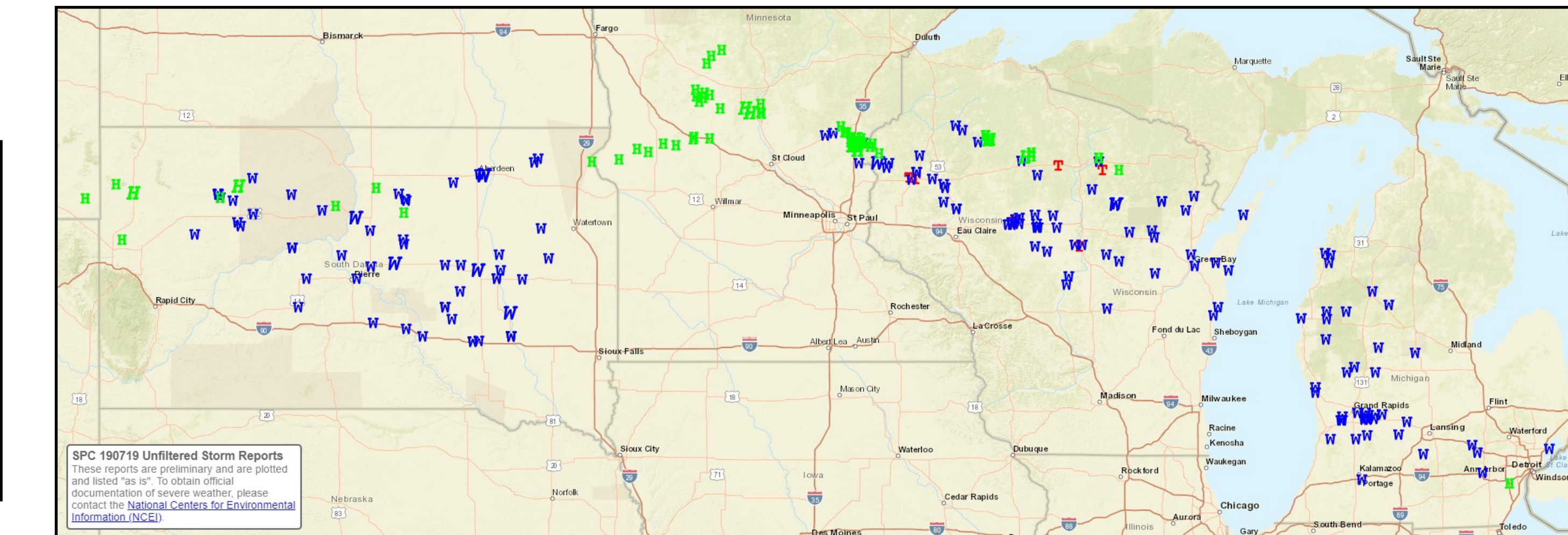
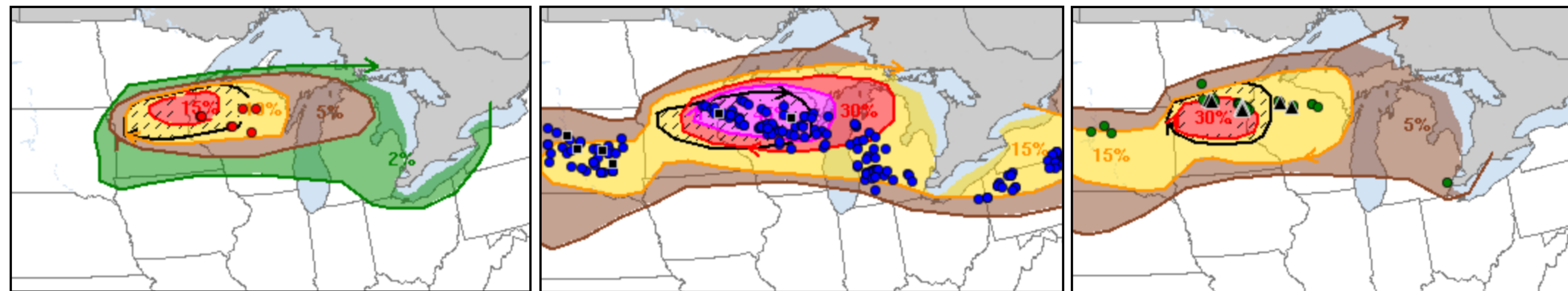
Hot, Very Humid, Record Instability

Mesoanalysis 21 UTC 19 July 2019



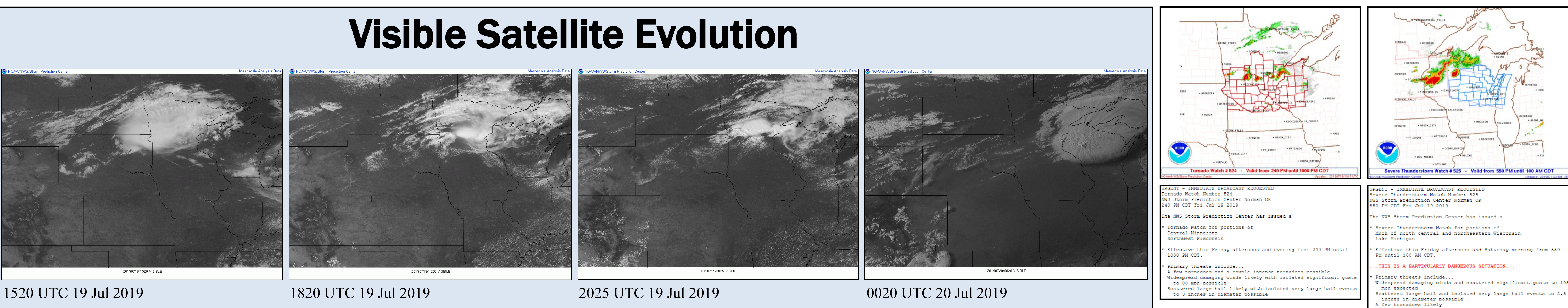
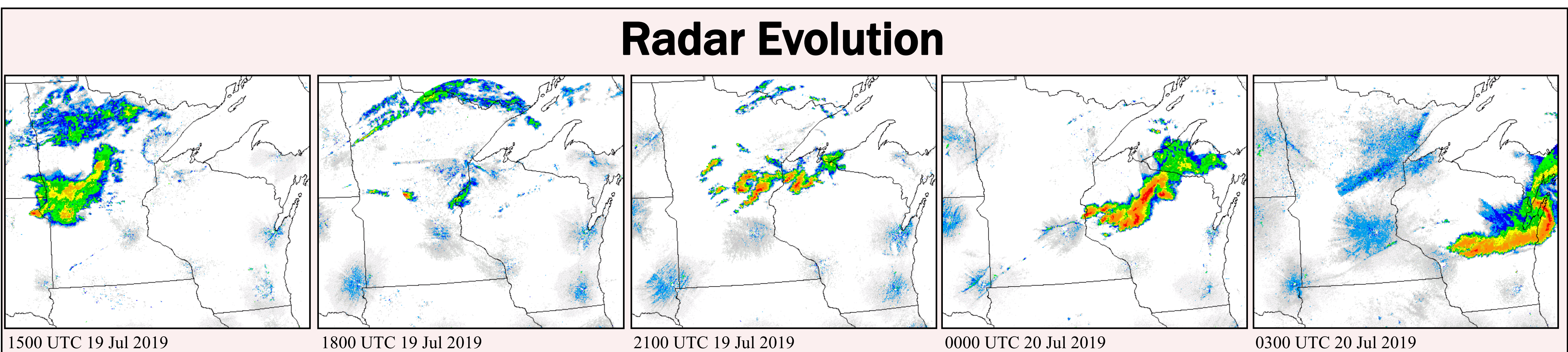
An explosive atmosphere for severe thunderstorms evolved throughout the day ahead of a decaying mesoscale convective system (MCS) that trekked across South Dakota overnight. The meso low from that complex enhanced forcing and low level flow, as evident by the 18 UTC 850 hPa moisture transport map (top center). Isolated to scattered severe thunderstorms developed most of the afternoon along a strong warm front across central Minnesota, posing a large hail threat. By later in the afternoon, a cluster of supercells formed near Interstate 35 north of Minneapolis, MN and quickly grew upscale into a line segment that produced occasional significant severe wind gusts (>33 m/s) along its path across central Wisconsin during the evening.

Observed soundings from 190719 18 UTC (top left), 21 UTC (top right), and 190720 00 UTC (bottom left). The 18 UTC and 00 UTC soundings broke the all time record surface based CAPE at KMPX.



Ingredients appeared to be there for a tornado outbreak. What happened?

- 1.) Storms appeared to initiate on the nose of stronger moisture transport at 850 hPa and on the outflow left from a decayed mesoscale convective system (MCS).
- 2.) Observed sounding from KMPX measured an inversion at 850 hPa during storm initiation.
- 3.) Low level storm dynamics may have been hampered by this stable layer and/or by the effect on the boundary layer from the overnight MCS.
- 4.) 700 hPa temperatures were around +14°C, which could have also limited storm coverage during initiation.
- 5.) The storms that did develop quickly evolved into a quasi-linear convective system (QLCS) and later became a derecho in Wisconsin. A few QLCS tornadoes did occur.
- 6.) The window for classic supercells was small. The few storms that became supercells did not produce tornadoes.



1656 UTC, 0.5° dBZ (left) and MEHS (right) 1930 UTC, 0.5° dBZ (left) and 0.5° SRM (right) 2023 UTC (only Tornado Warnings shown) 2101 UTC 2149 UTC 2230 UTC 2337 UTC

Surveys the damage was difficult due to the tornadic winds as strong as the straight line wind.

