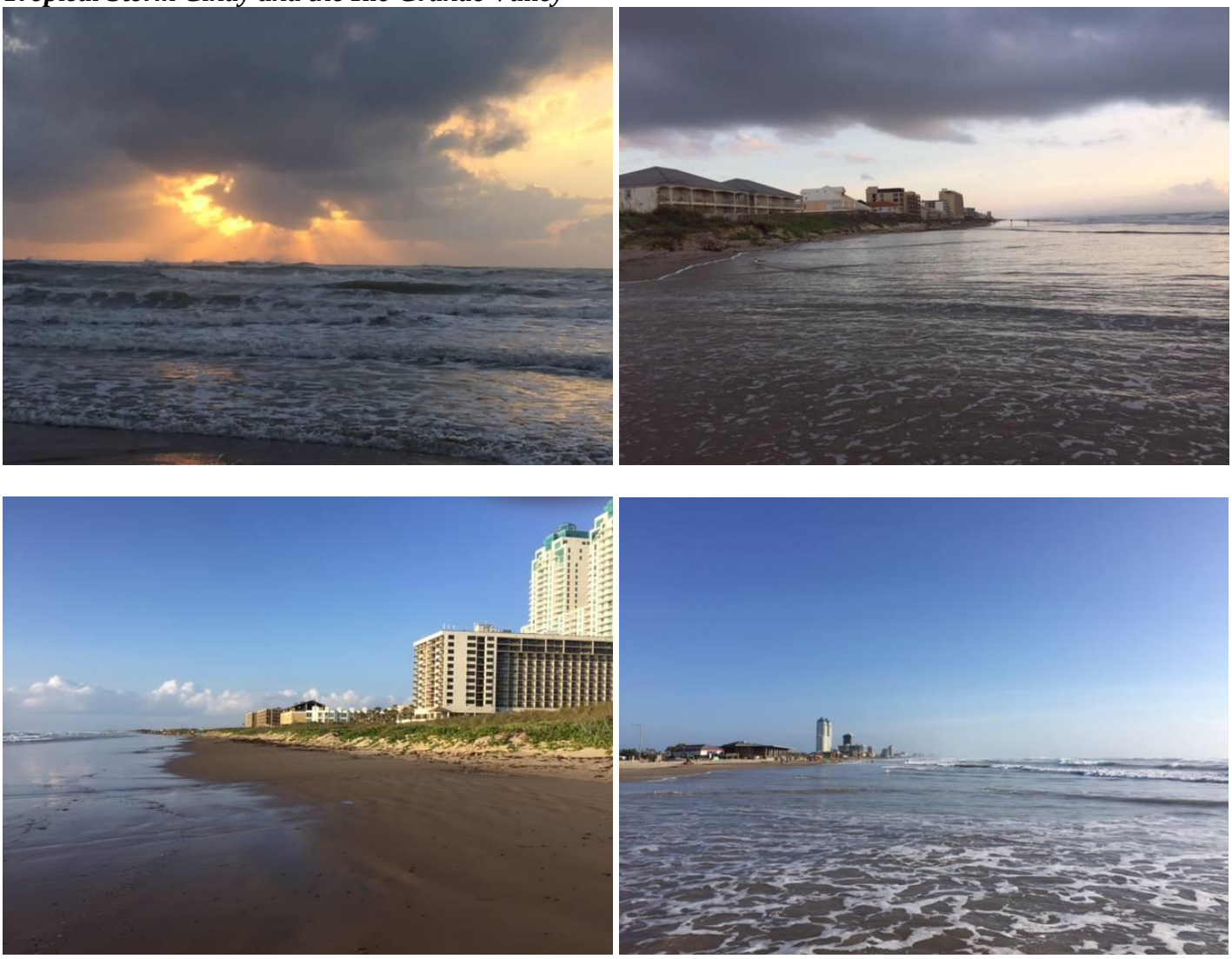
Tropical Storm Cindy and the Rio Grande Valley



Above: Photos taken at and just after sunrise, June 21 (first day of summer) 2017, as Tropical Storm Cindy was churning in the northwest Gulf. ***Top Left:*** Sunrise surf, estimated at 6 to 8 feet in the resort area. ***Top Right:*** Wave run-up to the dune line, north end of the resort area. ***Bottom Left:*** Wave run-up to the dune line, south end of resort area. ***Bottom Right:*** Surf action just north of the Isla Blanca jetty.

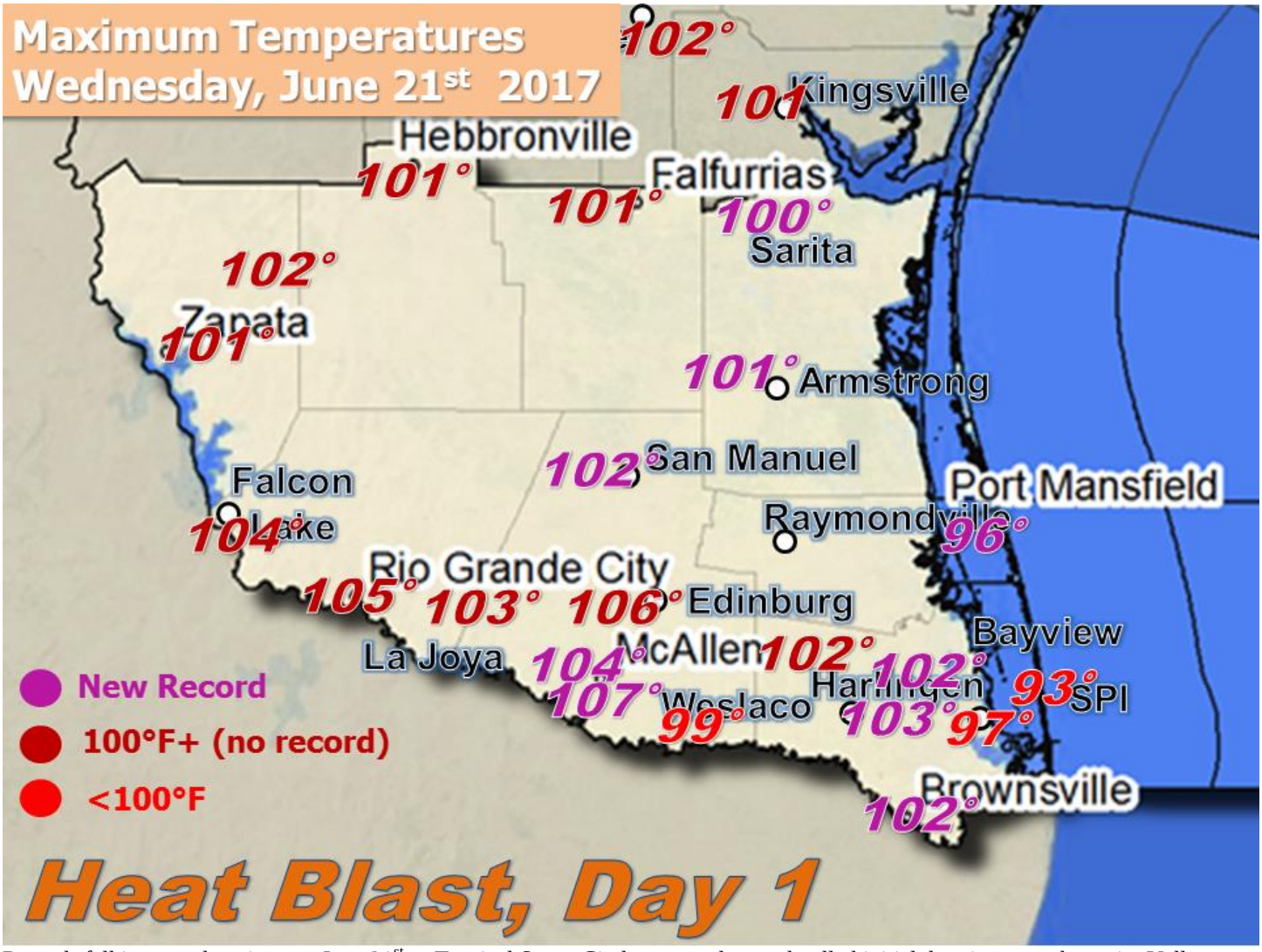
High Surf, Brutal Heat: Tropical Storm Cindy, La Canícula Bring Summer in Strong to RGV

All-Time High Temperature Record Melts Away in McAllen on June 22, 2017

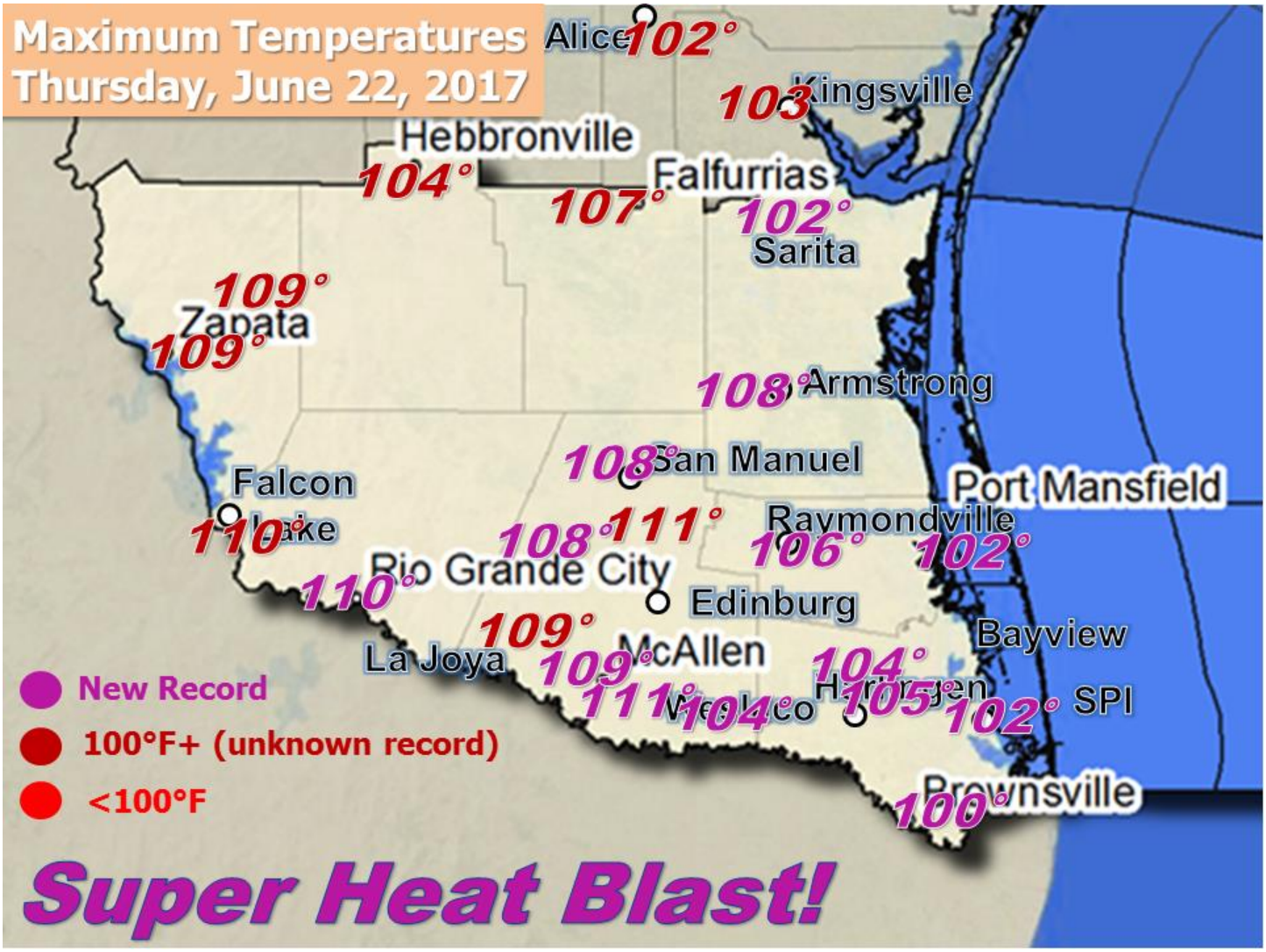
Brief Overview

Tropical Storm Cindy, a cyclone dominated by wind shear and dry air (below), tracked into the northwest Gulf of Mexico on June 21 and 22, making landfall in southwest Louisiana but causing impacts far and wide around the western half of the Gulf, from the western Florida Panhandle to the Rio Grande Valley. The wind shear aided the development of the surface low – in a similar fashion to a mid-latitude non-tropical cyclone – which aided an atmospheric "river" of deep tropical moisture that ultimately dropped more than a foot of rain in locations such as southern Mississippi and Alabama, far remove from the center of circulation. From the location of the low level center extending to the west and southwest, subsiding dry air associated with a record-breaking southwestern U.S./northern Mexico upper level high pressure ridge – a classic example of La Canícula – ramped up the in-place heat wave to heights not seen since June 1998, peaking with an all-time record high of 111°F at McAllen's Miller Airport, with several other locations along and west of U.S. 281/IH 69C reaching 110°F – a rare feat for the Rio Grande Valley.

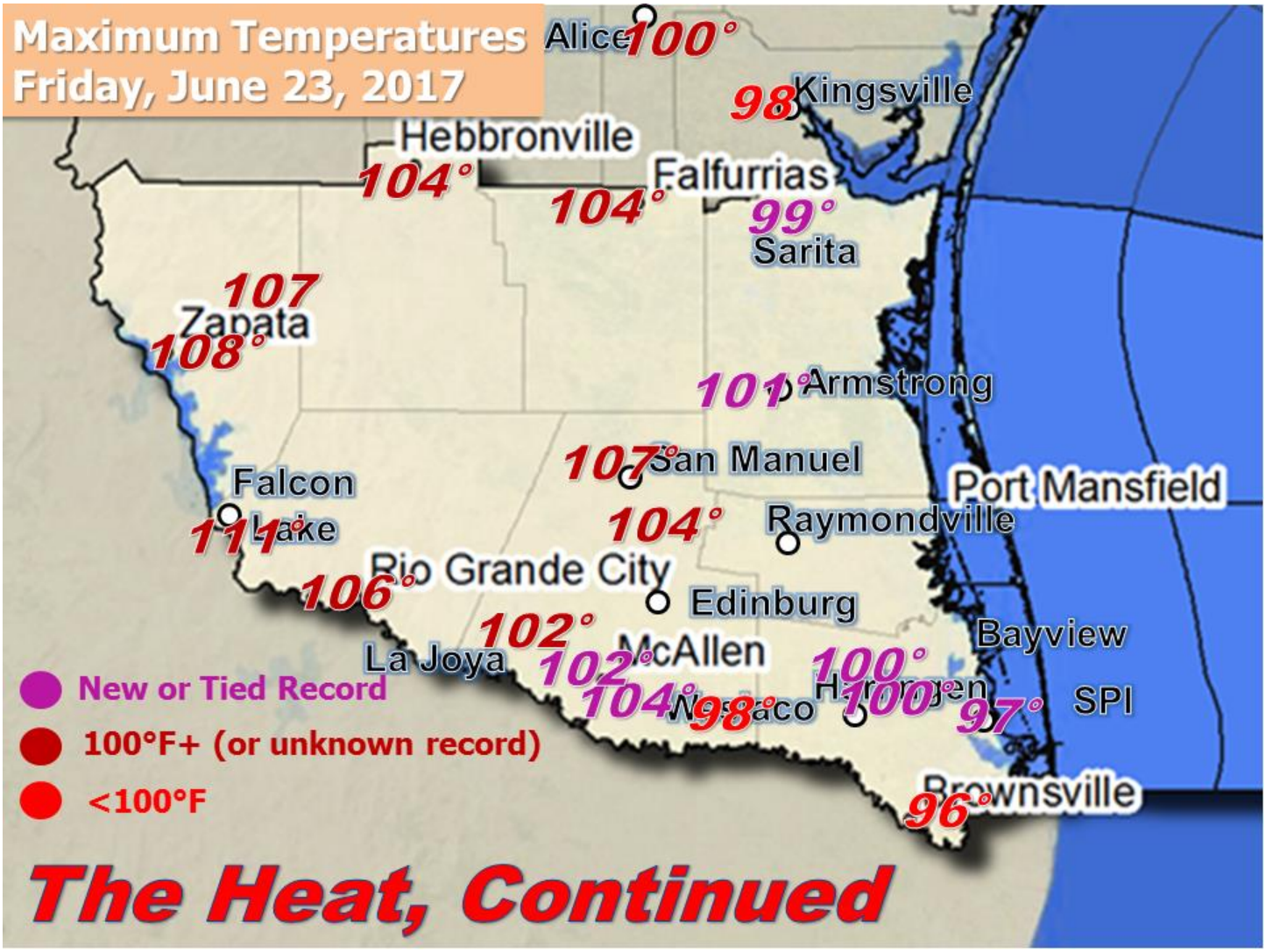
While the atmospheric circumstances were different, the sensible weather outcomes from sea to steppe were nearly identical to those associated with Tropical Storm Lee on Labor Day Weekend 2011. Surf rose and tides washed up toward the dunes, but only for a 24-hour period before conditions receded. Gusty southerly winds would follow later on the 22nd and into the 23rd, maintaining rough and choppy waters on Bay, Gulf, and Beach.



Records fell in many locations on June 21st as Tropical Storm Cindy wrapped up and pulled initial dry air across the entire Valley, compressing dry air in an already hot atmosphere into a blast-furnace feel.

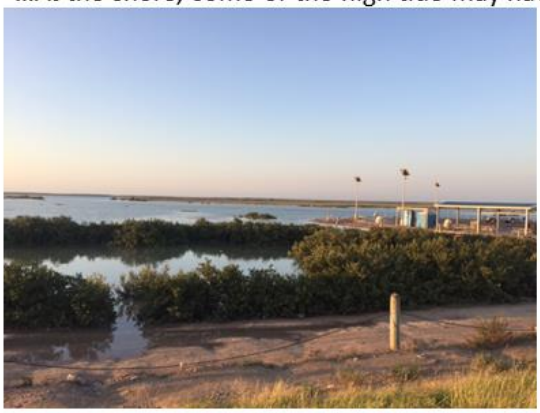


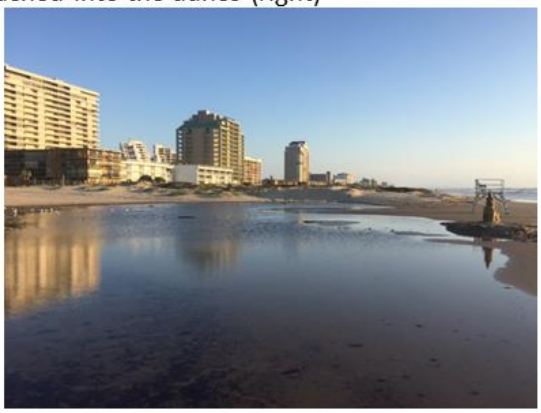
The heat peaked on June 22, as a warm morning jump started into a clear, windy, “blast-furnace” afternoon. Southwest flow just off the earth’s surface compressed air from higher elevations in northern Mexico. By noon, many areas had already reached the century mark! June 22 – the second full day of summer 2017 – was one of the hottest on record for the entire Valley and Deep South Texas ranchlands.

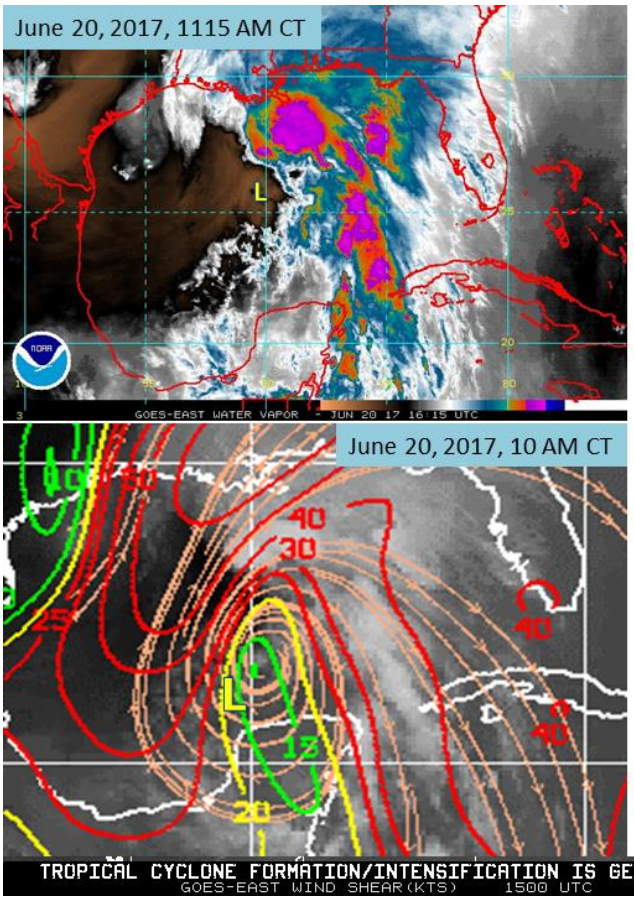


One more day of blast-furnace heat occurred on June 23,2017. More daily records fell across the Rio Grande Valley, but not as many as on the 22nd. However, an uptick in humidity compensated for the 3 to 7 degree lower temperatures. The heat index, or "feels-.like" temperature, soared to between 111 and 115 for most of the Rio Grande Valley, and up to 110°F across parts of the ranchlands.

- Inshore Tide Levels: Brazos Santiago Gage, Entrance to Brownsville Ship Channel
- Datum shown is Mean Higher High Water, A close proximity to height above predicted tide at the shoreline (1.5 feet in this case before sunrise on June 22)
- The inshore tide flooded out canals at the SH 48 Boat Ramp just east of the Port of Brownsville (below left)…
- …At the shore, some of the high tide may have reached into the dunes (right)

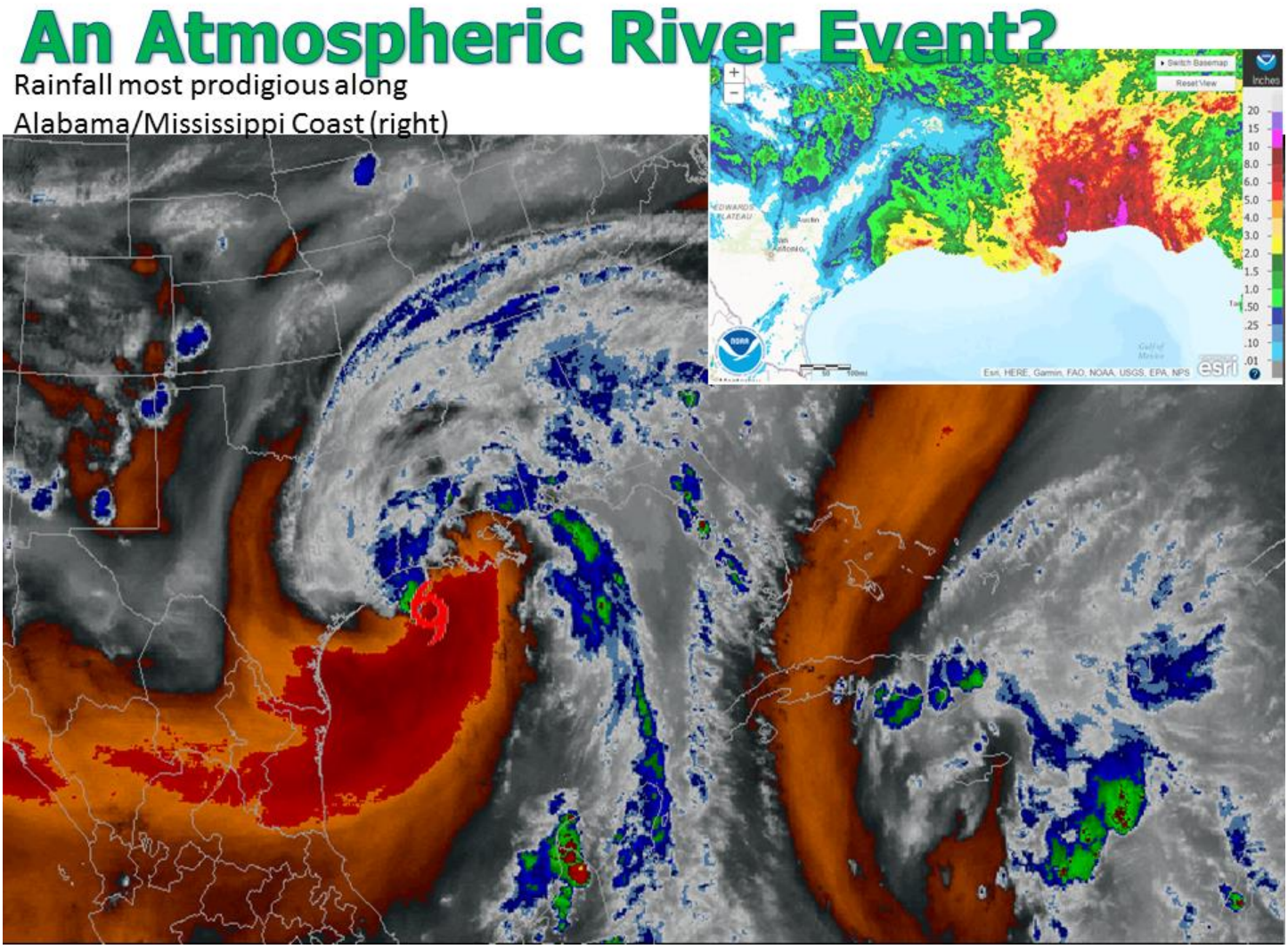






Tropical Storm Cindy: What Took So Long? 'Twas the Enemies!

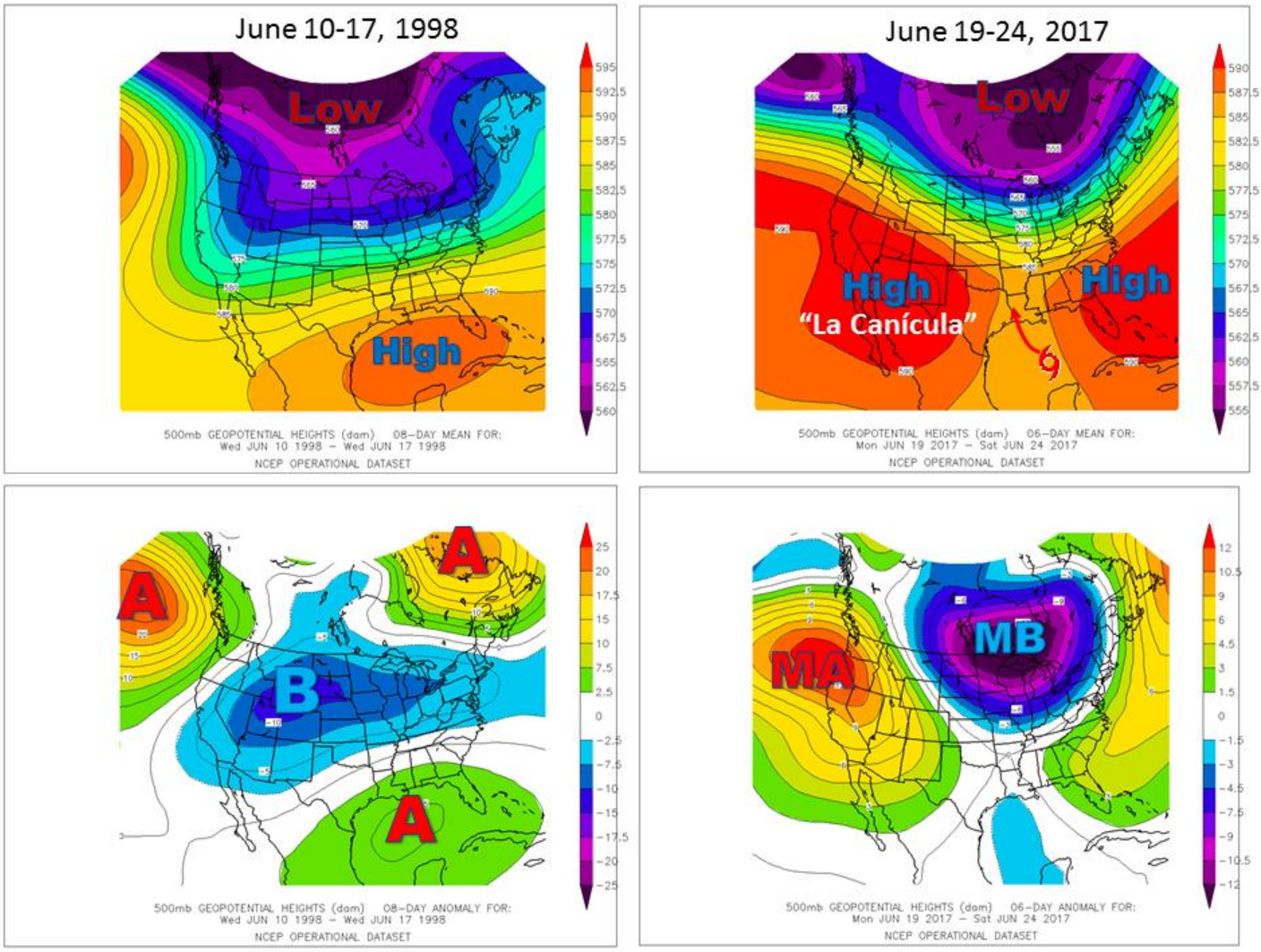
- Dry Air (Upper Left) kept the surface center (yellow L) exposed
- Depth of moisture in the atmosphere was limited (black and brown colors)
- Wind Shear (Lower Left, red lines) unfavorable for pure tropical development…
- But Wind Shear is favorable for enhancing a "river" of deep tropical moisture well east of the surface center
- ***Cindy*** finally formed in a small core around the center, but **impacts (rain and wind)** will be felt well to the north and east



Tropical Storm Cindy, around time of lowest central pressure – 5 PM June 21, 2017. Note the displaced position of the surface center – well within the atmospheric dry air, whose southwest flank covered the Rio Grande Valley and led to the peak of the late June heat wave. The broad south to north plume of moisture (gray, blue, and green colored areas) was an atmospheric river event that originated from a broad low pressure area that festered in the western Caribbean for several days prior. That river of deep tropical moisture created the primary impact that Cindy will be remembered for – flooding rain in coastal Alabama, Mississippi, and extreme western Florida (inset, upper right). Storm surge flooding on southerly flow peaked in the shallows of southern Louisiana, and a 120-mph tornado struck central Alabama along the outer bands of the cyclone – enhanced for large tornado formation by the aforementioned dry air and wind shear in the large atmospheric system.

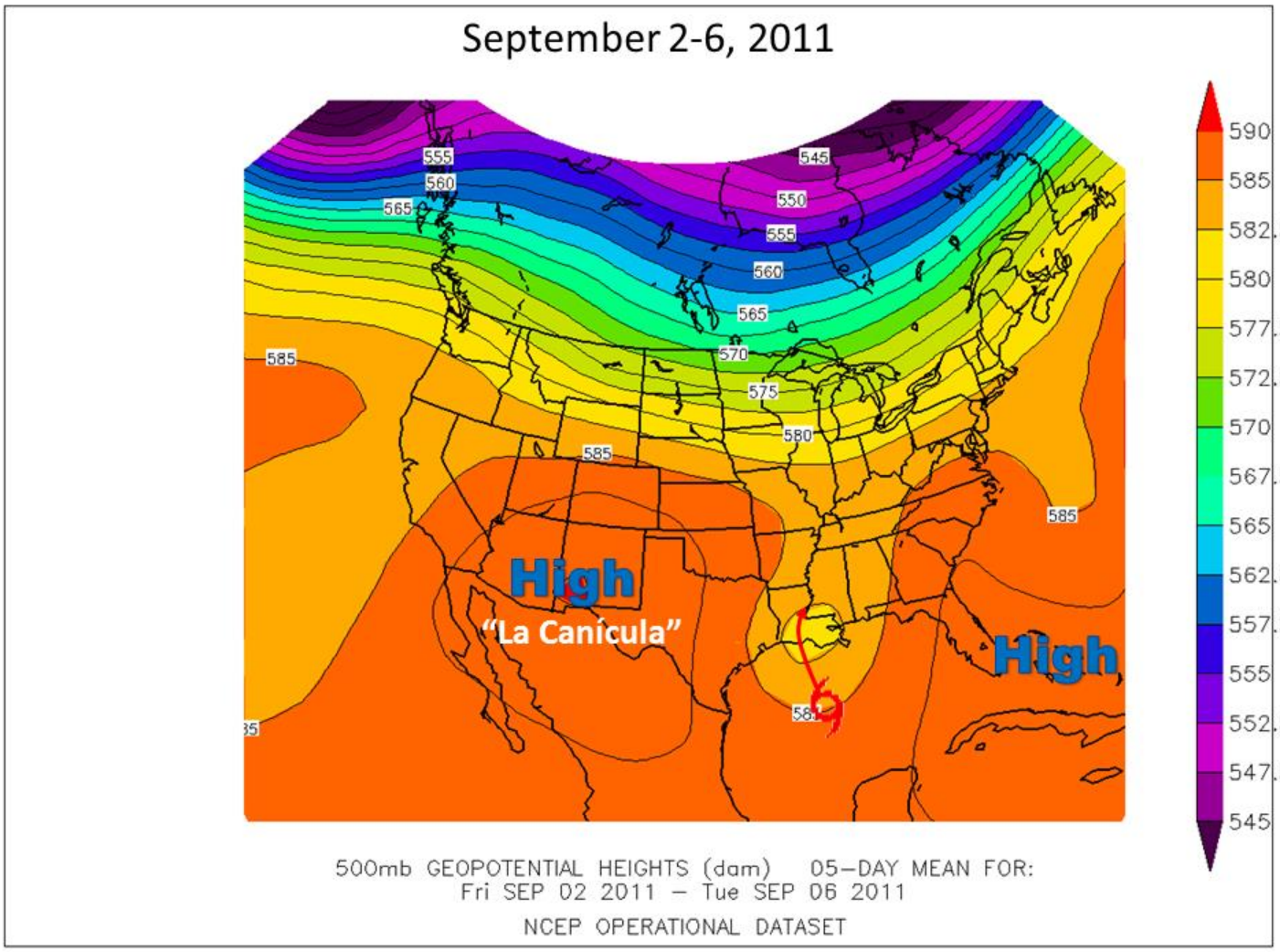
Pattern Matters

The hottest three-day stretch in the Rio Grande Valley since June 13-15, 1998 was due to a completely different atmospheric pattern (below). The 1998 heat wave was driven by anomalously high atmospheric pressure that stretched from northern Mexico through the Florida Peninsula (left two images in the graphic on the next page). That setup was intriguing, with record heat across much of the Gulf states. June 1998 was dry from Texas to Florida and will be remembered as the season of heat, drought, and fire. Record monthly temperatures fell across the region, unirrigated agriculture withered under the heat. Florida was scorched by fire, which burned nearly 500 thousand acres in Florida, and more than 140,000 acres in Texas. Check out the Climate of 1998 June Extremes summary for full details. The June 2017 mountaintop of the heat (June 21-23) occurred with the more traditional “La Canícula” ridge across the southwest United States – the same ridge that broke records across Nevada, Arizona, and New Mexico – extending into Texas while Tropical Cyclone Cindy formed in the gap between the weaker Bermuda High and La Canícula and tracked into southwest Louisiana. This track allowed the earlier described subsiding air, already in place on the east side of La Canícula, to maximize impact over the June 21-23 period.



Above: The difference in steering pattern, and anomalies, from June 10-17, 1998 and June 19-24, 2017 (dates chosen to incorporate the peak of the heatwave in each case). For each case, note the tight difference between above to much above average anomalies and below to much below anomalies, especially in 2017.

Even though the calendar months are different, perhaps the more apt comparison for the June 21-23 heat wave and back side of Tropical Cyclone Cindy is September, 2011, when La Canícula also dominated and was punctuated by subsidence on the back side of Tropical Storm Lee. The pattern is eerily similar, but one difference was what followed: In 2017, a break in the pattern where general upper level troughing over the western Gulf and a retrograding Canícula allowed rain and lower temperatures to break the heat wave, at least temporarily; in 2011, September returned to unusually hot and dry weather, which ensured drought and water shortage problems during the following winter and spring.



Déjà vu? Compare the pattern above with that of the prior graphic (top right). Note the similarities? You should; this was a very similar setup and produced similar Valley-wide temperatures, including a number of new calendar day records, between the 3rd and 5th (Labor Day Weekend).