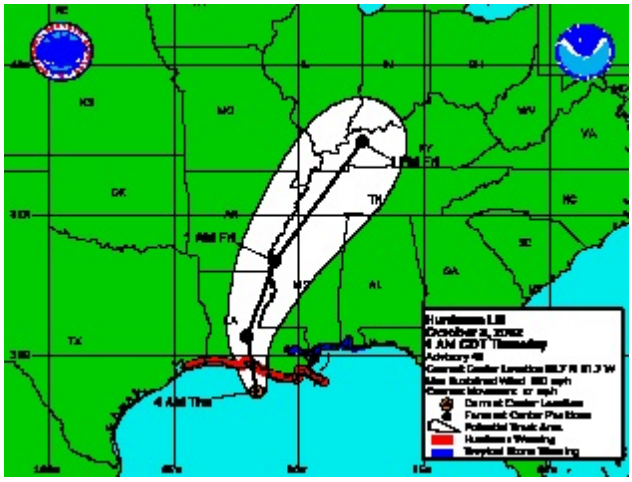
A REPORT ON THE
EFFECTS OF HURRICANE LILI
ON WATER LEVELS
ALONG THE GULF COAST



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National Ocean Service
CO-OPS
Center for Operational Oceanographic
Products and Services

*For the purpose of timely release, data contained within this report have undergone "limited" NOS Quality Assurance/Control; however, the data have not yet undergone final verification. All data subject to NOS verification.

CO-OPS Tide Gauge Data for Hurricane Lili

NOAA's Center for Operational Oceanographic Products And Services (CO-OPS) maintains a network of tide gauges along the Gulf Coast from Brownsville, TX eastward to Key West, FL. During the hurricane season (June through November) CO-OPS personnel actively maintain and monitor these gauges which provide useful information about water levels along the Gulf Coast during storm events. Presently there are 38 gauges in the Gulf Coast region of which 25 recorded valuable data during the recent passing of Hurricane Lili. Nine of the Gulf Coast Florida gauges were of sufficient distance from the storms center that water level data from those locations is not included in this report. The other five stations all recorded data during the storm. Both of the Alabama gauges recorded data during the storm The Mississippi gauge at Waveland was still not operational. The four Louisiana gauges functioned properly supplying water level data throughout the storm although the Lake Charles gauge is not included in this report as no datum has been calculated for this station. All sixteen of the Texas gauges functioned properly, however, datum calculations do not exist for Brownsville and the Manchester gauge appears to have experienced some type of datum shift and they are not included. The locations of selected Gulf Coast tide stations are presented in figure 1 below.

Figure 1. Locations of select Gulf Coast Tide Stations

Table 1 below summarizes the peak observed, predicted and storm surge water levels for the 25 Gulf Coast gauges included in this report. Hydrographs of individual tide stations follow Table 1.

Table 1. Tide Gauge Data for Hurricane Lili
Oct 3-4, 2002

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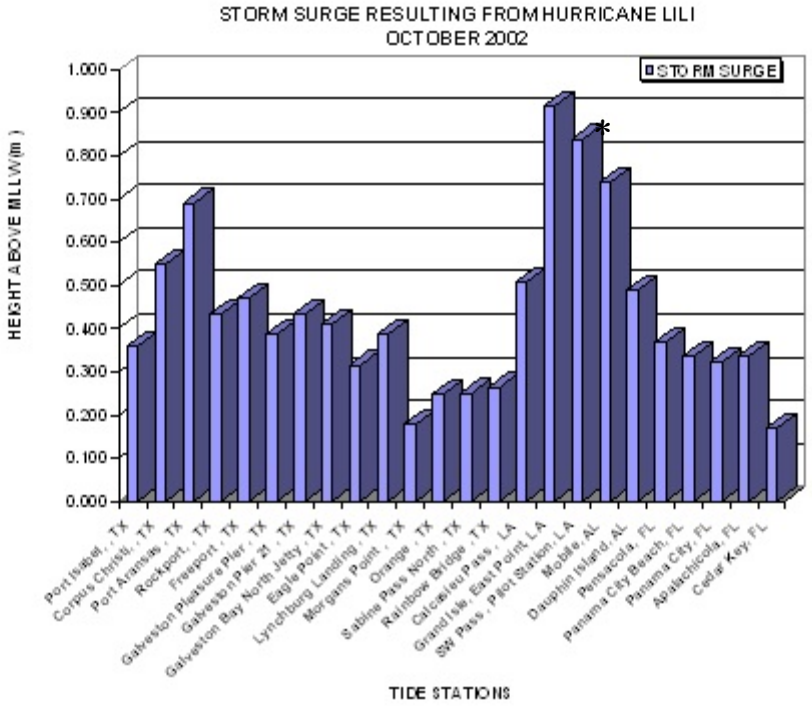
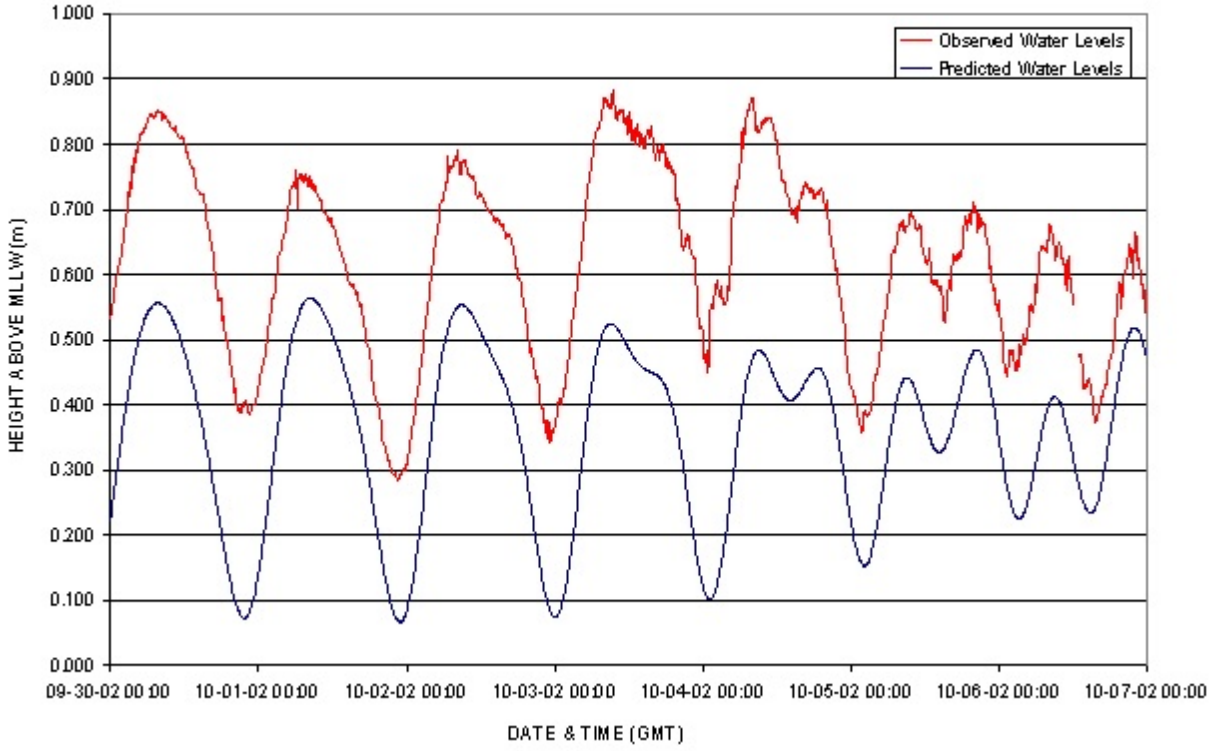
Tide Gauge Description	Station ID	Date/Time (GMT)	Elevation above MLLW(m)			Latitude	Longitude
			Observed	Predicted	Storm Surge		
Port Isabel, Laguna Madre, TX	8779770	10-03-02 09:30	0.881	0.523	0.358	26° 3.6' N	97° 12.9' W
Corpus Christi, Gulf of Mexico, TX	8775870	10-03-02 12:54	1.087	0.539	0.548	27° 34.8' N	97° 13.0' W
Port Aransas, TX	8775237	10-03-02 12:12	0.748	0.057	0.691	27° 50.3' N	97° 3.6' W
Rockport, Aransas Bay, TX	8774770	10-03-02 20:42	0.630	0.197	0.433	28° 1.3' N	97° 2.8' W
Freeport, Dow Barge Canal, TX	8772440	10-03-02 09:54	1.103	0.634	0.469	28° 56.9' N	95° 18.5' W
Galveston Pleasure Pier, TX	8771510	10-03-02 07:24	1.246	0.858	0.388	29° 17.1' N	94° 47.3' W
Galveston Pier 21, Galveston Channel, TX	8771450	10-03-02 11:54	0.916	0.483	0.433	29° 18.6' N	94° 47.6' W
Galveston Bay Entrance, North Jetty, TX	8771341	10-03-02 07:42	1.046	0.636	0.410	29° 21.5' N	94° 43.5' W
Eagle Point, Galveston Bay, TX	8771013	10-03-02 13:00	0.836	0.52	0.316	29° 28.8' N	94° 55.1' W
Lynchburg Landing, San Jacinto R., TX	8770733	10-02-02 17:24	0.747	0.36	0.387	29° 45.9' N	95° 4.7' W
Morgans Point, Barbours Point, TX	8770613	10-02-02 16:18	0.724	0.545	0.179	29° 40.9' N	94° 59.1' W
Orange, Old Navy Base, TX	8770597	10-02-02 20:12	0.469	0.22	0.249	30° 5.9' N	93° 43.3' W
Sabine Pass North, TX	8770570	10-03-02 10:24	0.898	0.647	0.251	29° 43.8' N	93° 52.2' W
Rainbow Bridge, Neches R., TX	8770520	10-03-02 11:48	0.531	0.267	0.264	29° 58.8' N	93° 52.9' W
Calcasieu Pass, East Jetty, LA	8768094	10-03-02 05:48	1.070	0.564	0.506	29° 45.9' N	93° 20.6' W
Grand Isle, East Point, LA	8761724	10-03-02 12:48	1.364	0.449	0.915	29° 15.8' N	89° 57.4' W
SW Pass, Pilot Station, LA *	8760943	10-03-02 00:00	n/a	n/a	n/a	28° 55.6' N	89° 25.1' W
Mobile, Mobile Channel, AL	8737048	10-03-02 17:30	1.276	0.538	0.738	30° 42.5' N	88° 2.6' W
Dauphin Island, Mobile Bay, AL	8735180	10-03-02 14:48	0.971	0.483	0.488	30° 15.0' N	88° 4.5' W
Pensacola, Pensacola Bay, FL	8729840	10-03-02 14:30	0.913	0.543	0.370	30° 24.2' N	87° 12.7' W
Panama City Beach, FL	8729210	10-03-02 10:54	0.888	0.552	0.336	30° 12.8' N	85° 52.8' W
Panama City, ST. Andrew Bay, FL	8729108	10-03-02 12:30	0.830	0.507	0.323	30° 9.1' N	85° 40.0' W
Apalachicola, Apalachicola R., FL	8728690	10-03-02 15:54	0.855	0.519	0.336	29° 43.6' N	84° 58.9' W
Cedar Key, FL	8727520	10-04-02 16:54	1.462	1.294	0.168	29° 8.1' N	83° 1.9' W
* Maximum elevation inferred							

Figure 2. Maximum storm surge at water level stations during Hurricane Lili, October 3, 2002

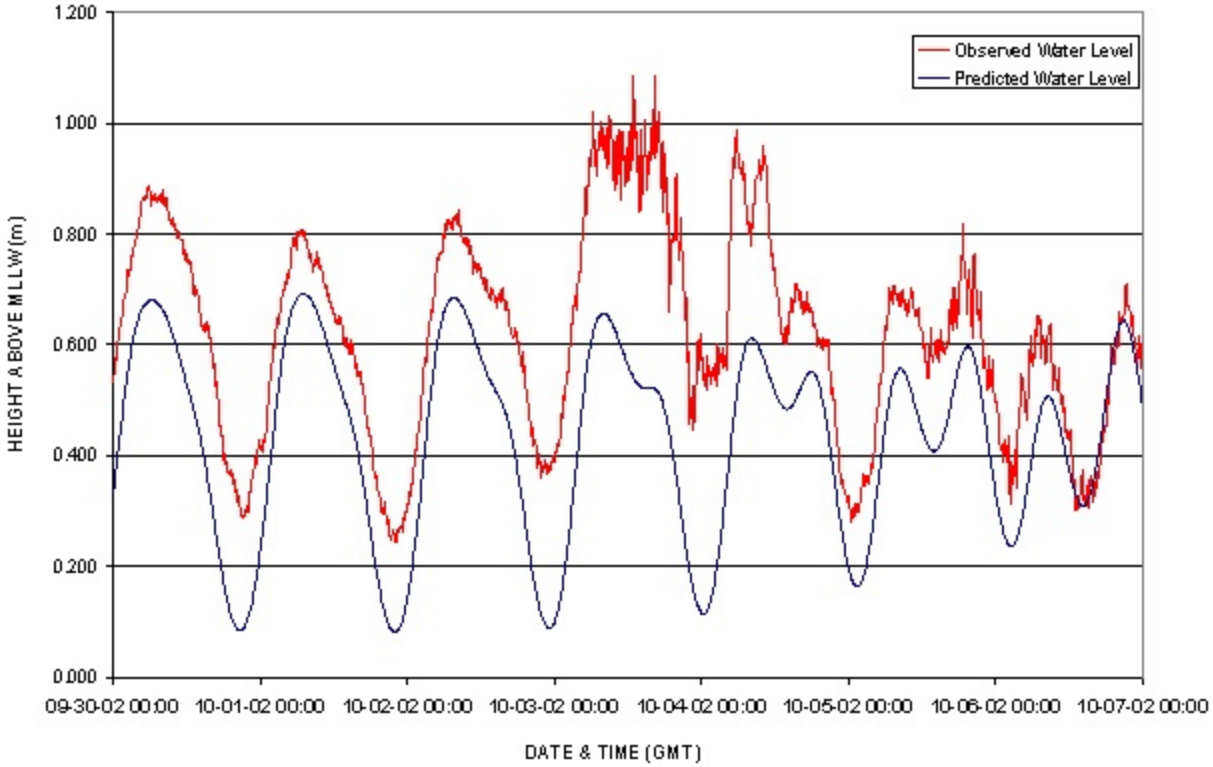


***SW Pass, LA Inferred**

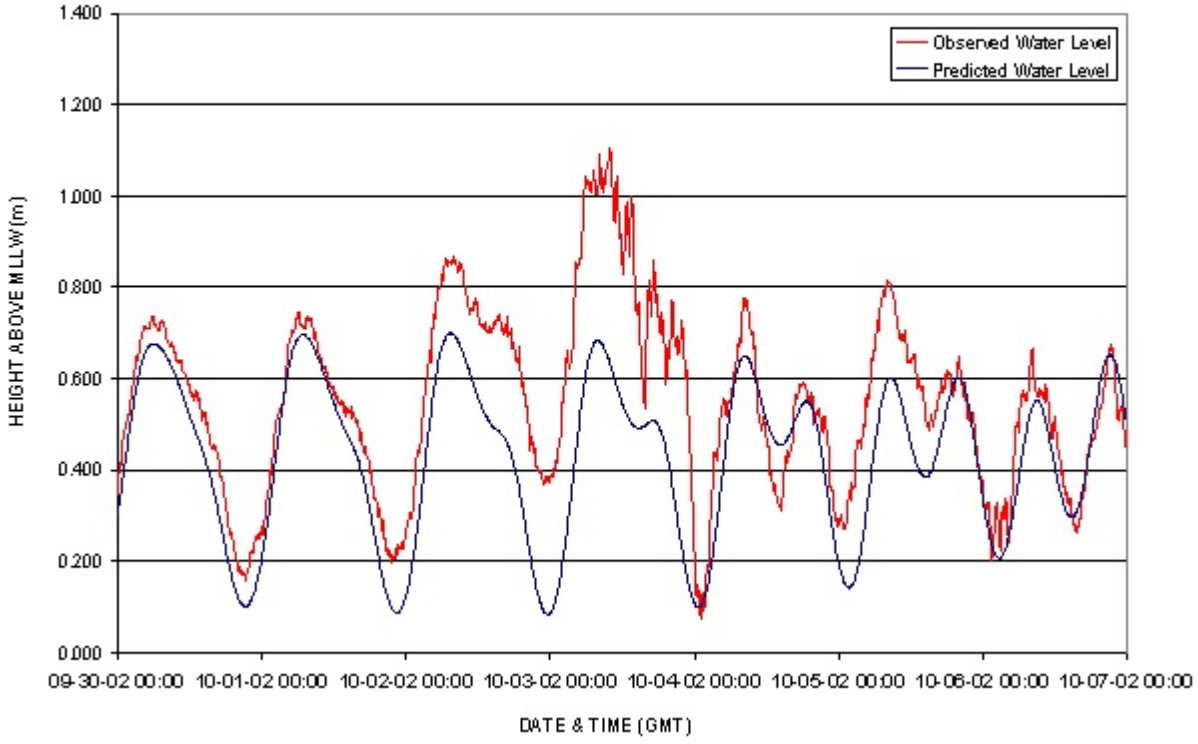
PORT ISABEL, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Evelation 0.881 10-03-02 09:30



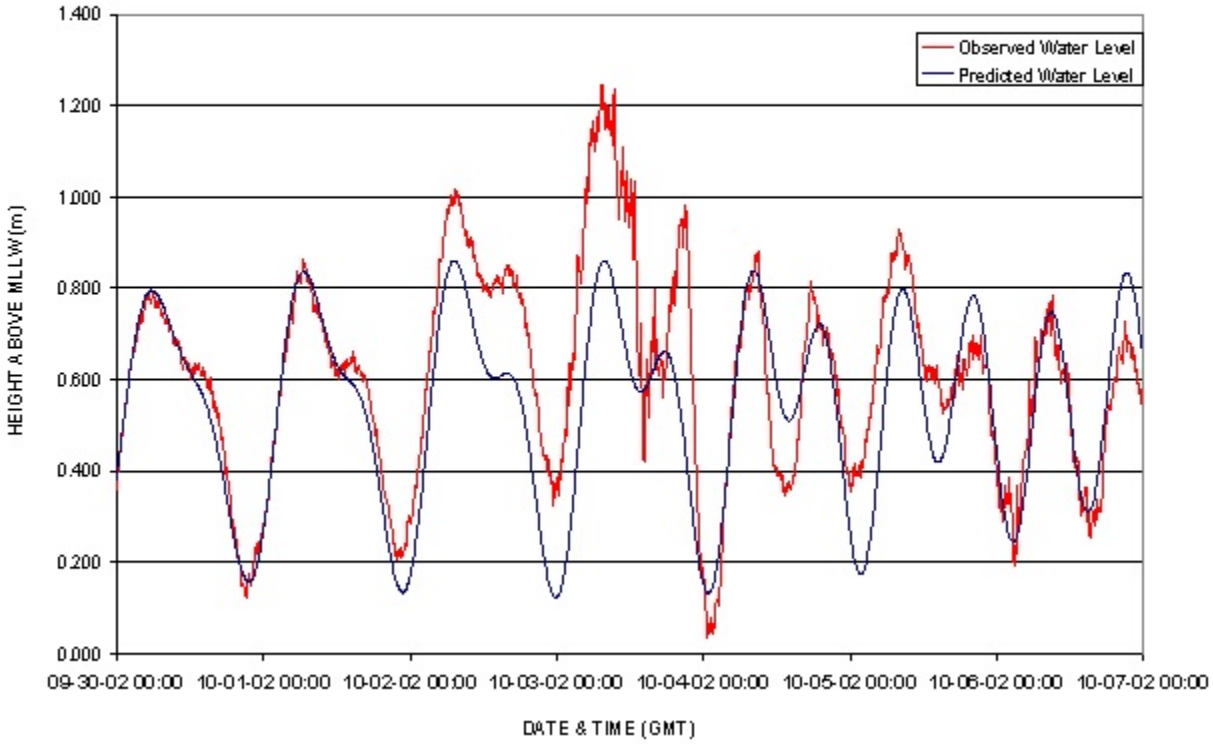
CORPUS CHRISTI, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.087 10-03-02 12:54



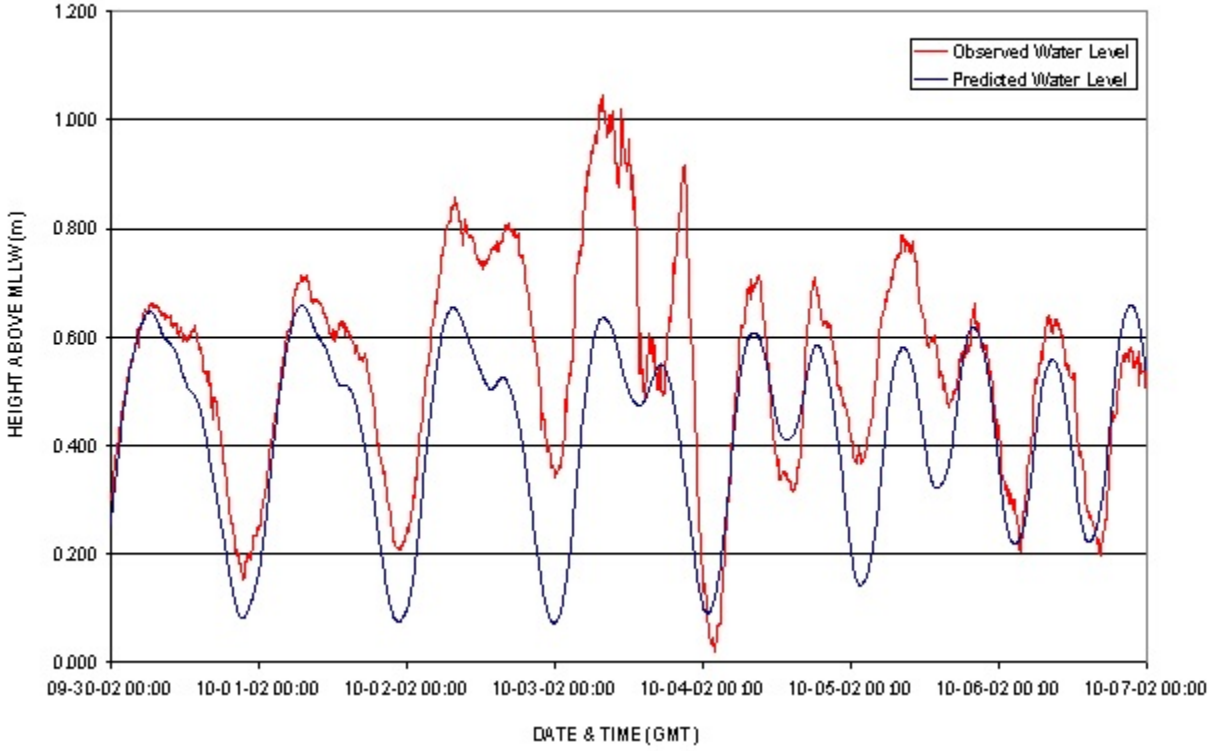
FREEPORT, DOW BARGE CANAL, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.103 10/03/02 09:54



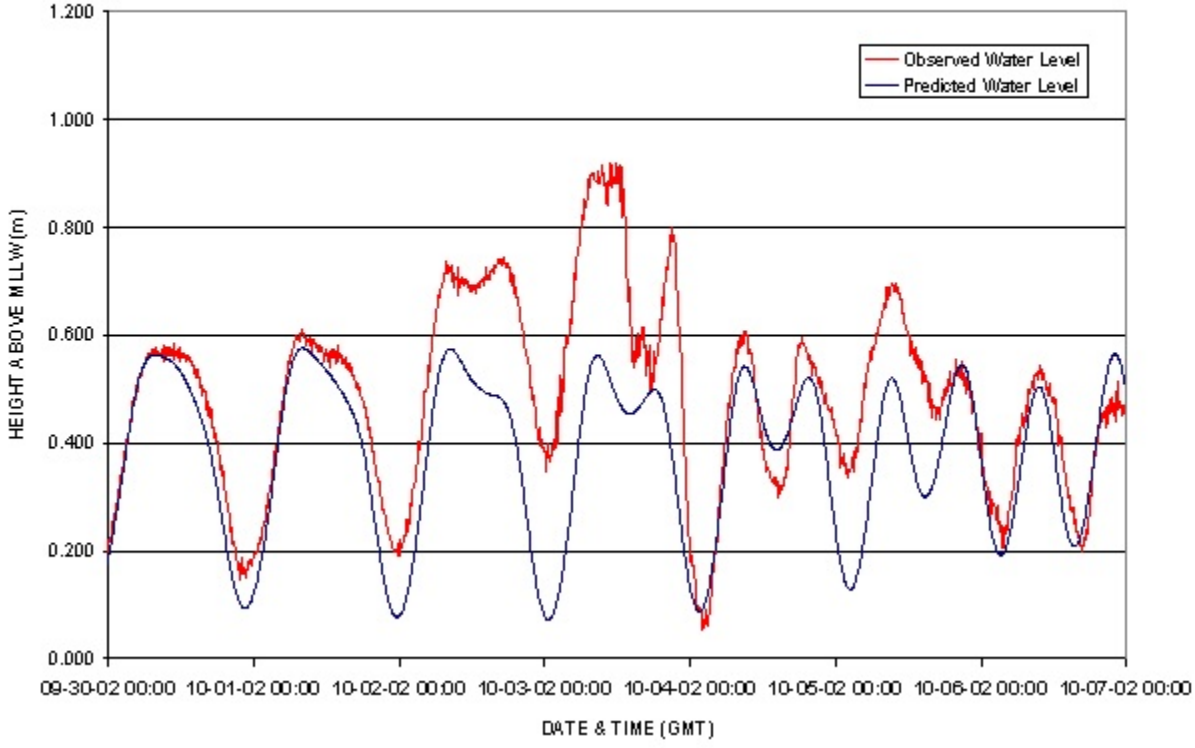
GALVESTON PLEASURE PIER, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.246 10-03-02 07:24

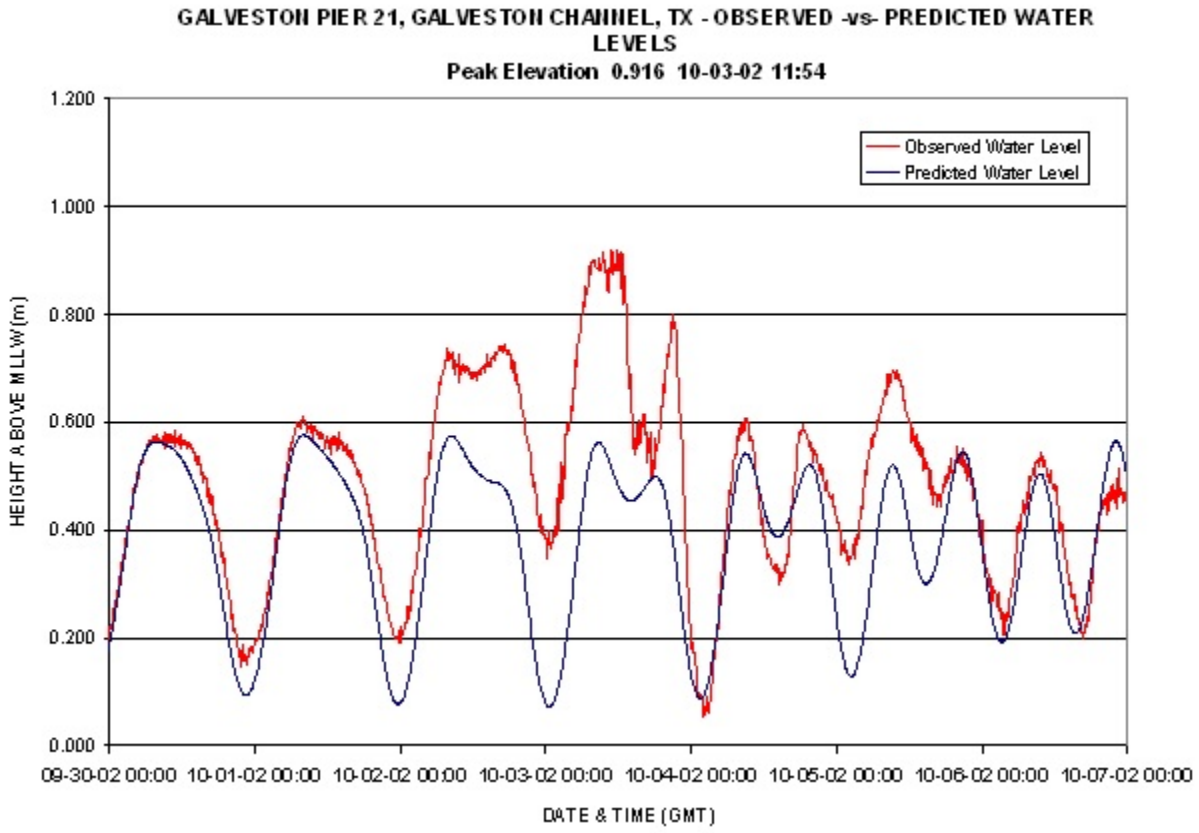


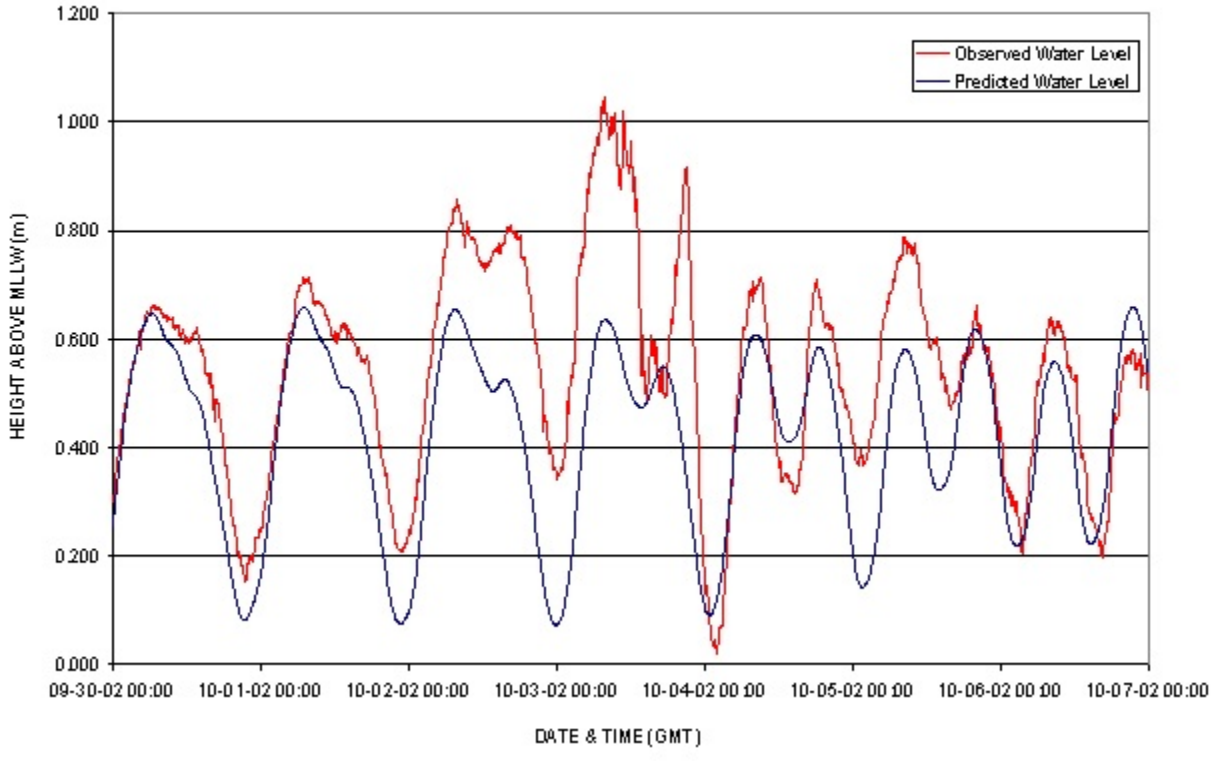
GALVESTON BAY ENTRANCE, NORTH JETTY, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.046 10-03-02 07:42



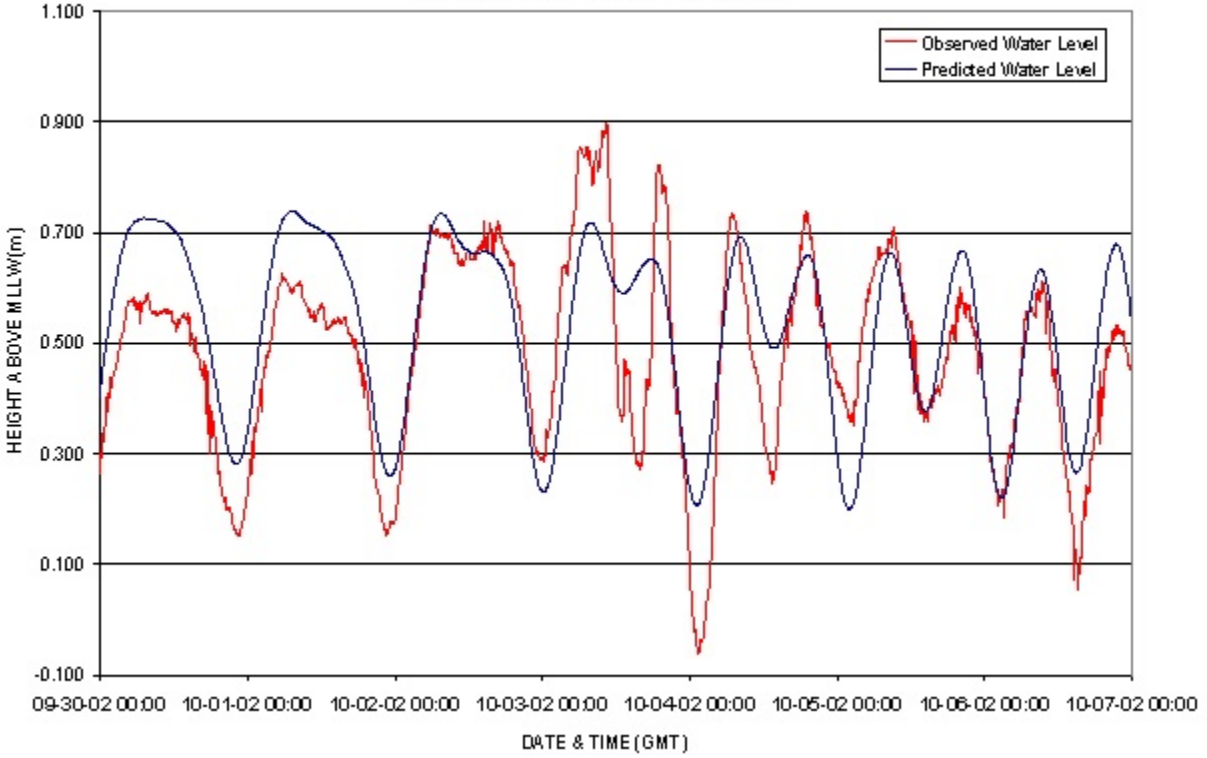
GALVESTON PIER 21, GALVESTON CHANNEL, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 0.916 10-03-02 11:54



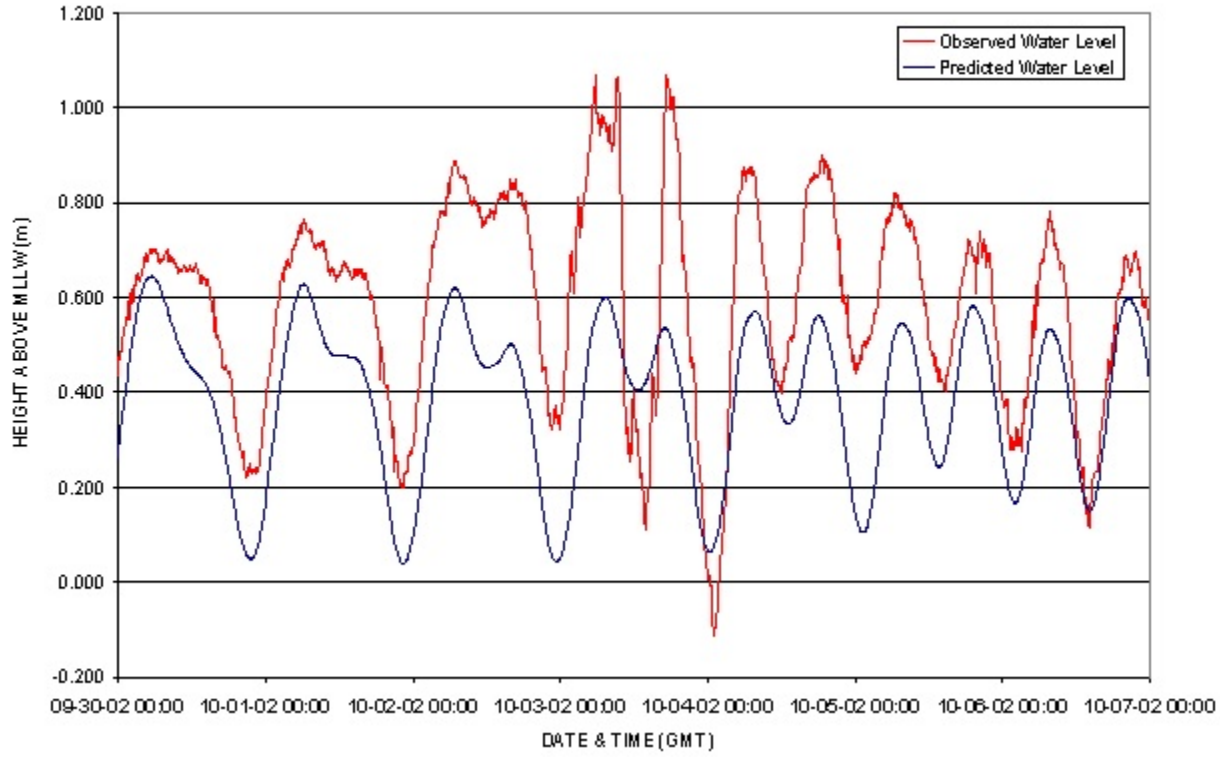

GALVESTON PIER 21, GALVESTON CHANNEL, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 0.916 10-03-02 11:54
Observed Water Level
Predicted Water Level
HEIGHT ABOVE MLLW (m)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
09-30-02 00:00
10-01-02 00:00
10-02-02 00:00
10-03-02 00:00
10-04-02 00:00
10-05-02 00:00
10-06-02 00:00
10-07-02 00:00
DATE & TIME (GMT)


GALVESTON BAY ENTRANCE, NORTH JETTY, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.046 10-03-02 07:42
Observed Water Level
Predicted Water Level
HEIGHT ABOVE MLLW (m)
1.200
1.000
0.800
0.600
0.400
0.200
0.000
09-30-02 00:00
10-01-02 00:00
10-02-02 00:00
10-03-02 00:00
10-04-02 00:00
10-05-02 00:00
10-06-02 00:00
10-07-02 00:00
DATE & TIME (GMT)

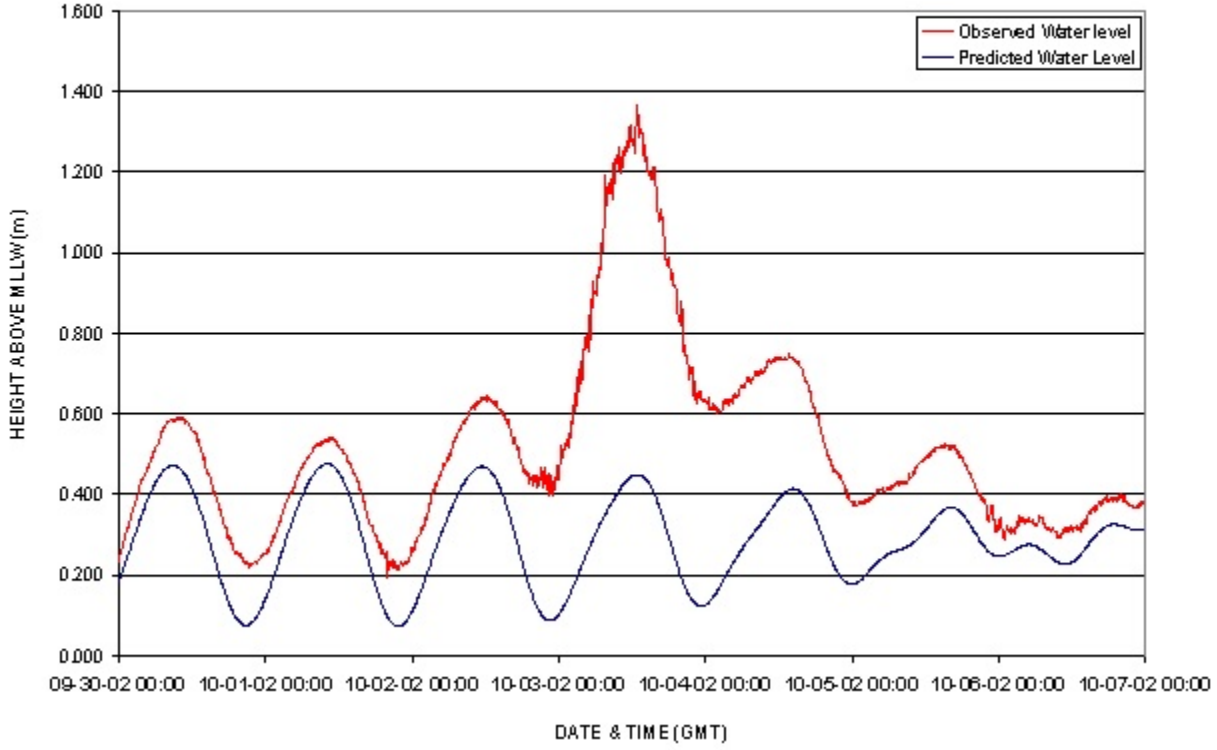
SABINE PASS NORTH, TX - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 0.898 10-03-02 10:24



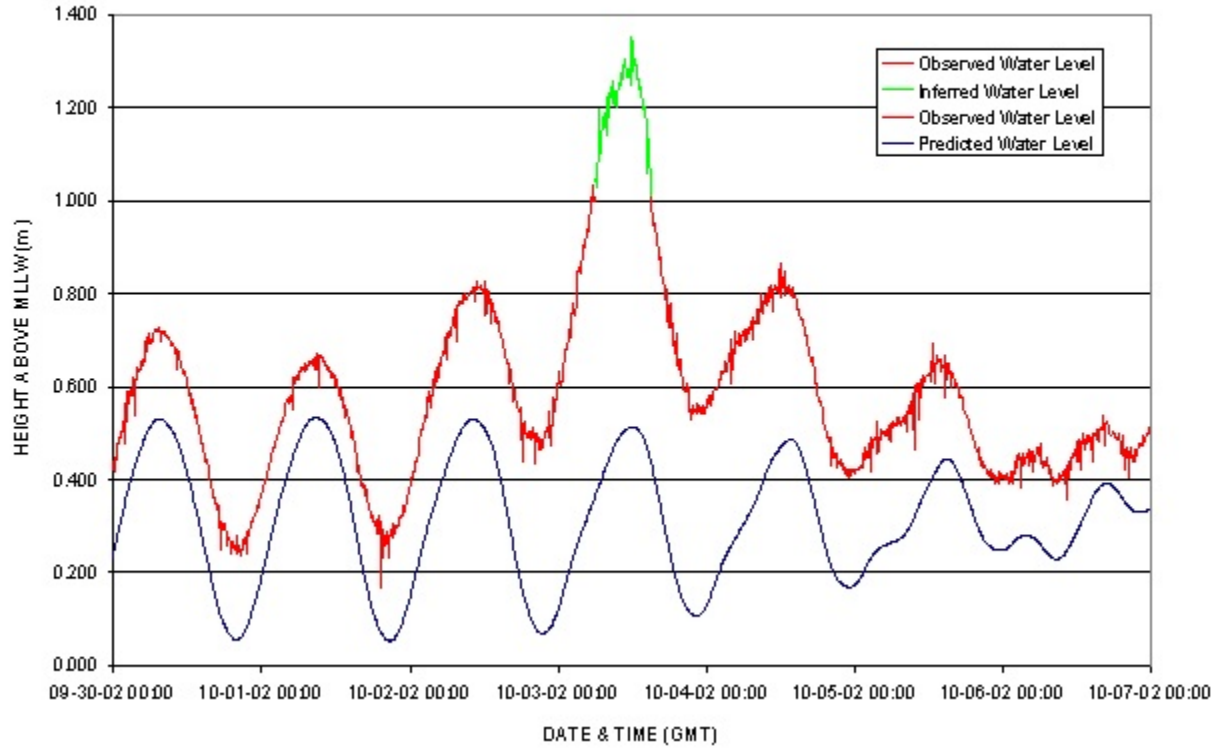
CALCASIEU PASS, EAST JETTY, LA - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.070 10-03-02 05:48

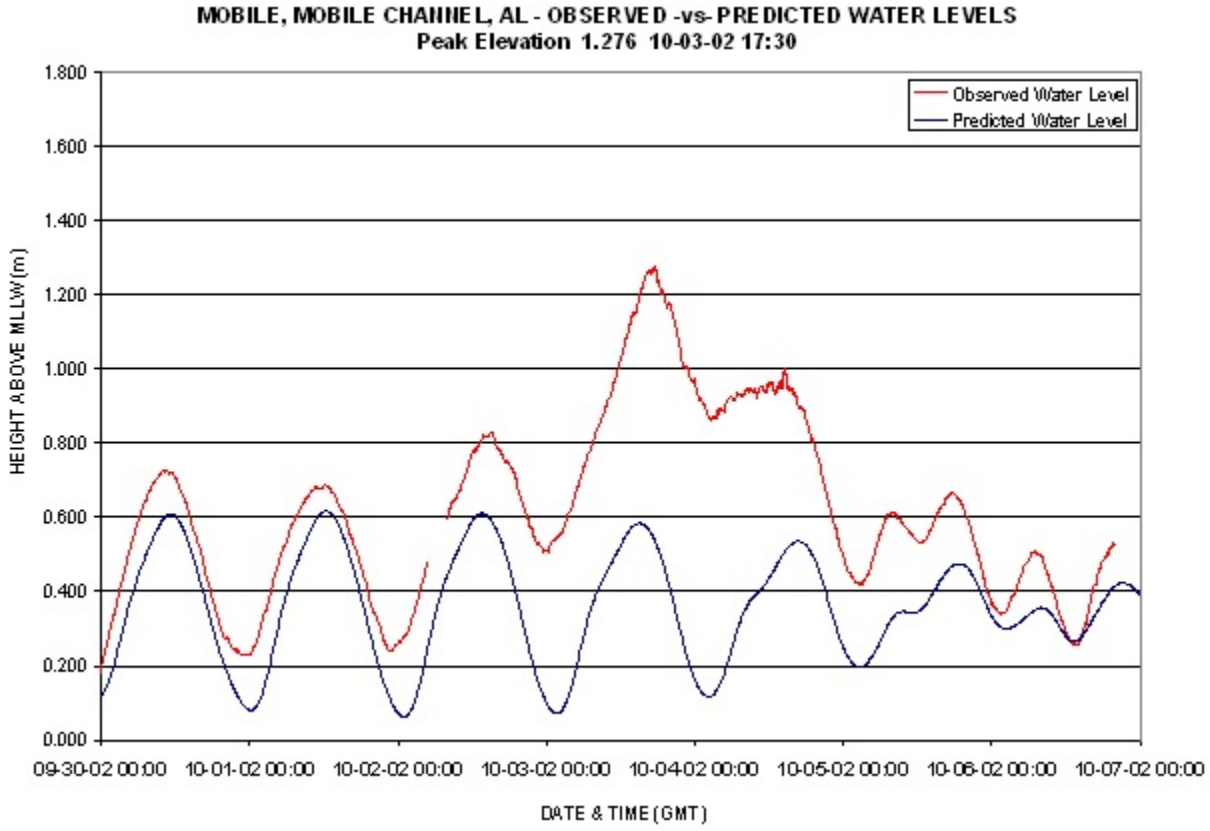


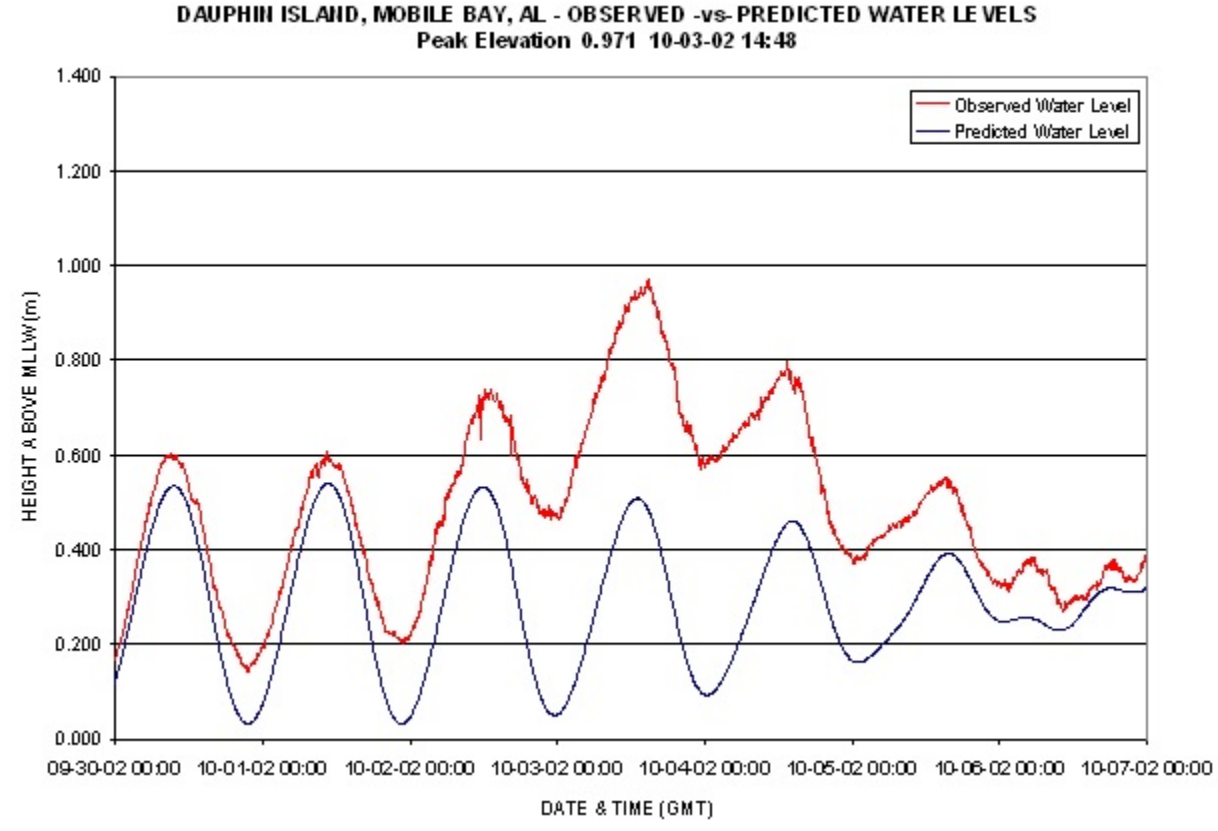
GRAND ISLE, EAST POINT, LA - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.364 10-03-02 12:48



PILOT STATION, SW PASS, LA - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.351 10-03-02 11:54




MOBILE, MOBILE CHANNEL, AL - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 1.276 10-03-02 17:30
Observed Water Level
Predicted Water Level
HEIGHT ABOVE MLLW (m)
1.800
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
09-30-02 00:00
10-01-02 00:00
10-02-02 00:00
10-03-02 00:00
10-04-02 00:00
10-05-02 00:00
10-06-02 00:00
10-07-02 00:00
DATE & TIME (GMT)


DAUPHIN ISLAND, MOBILE BAY, AL - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 0.971 10-03-02 14:48
Observed Water Level
Predicted Water Level
HEIGHT ABOVE MLLW (m)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
09-30-02 00:00
10-01-02 00:00
10-02-02 00:00
10-03-02 00:00
10-04-02 00:00
10-05-02 00:00
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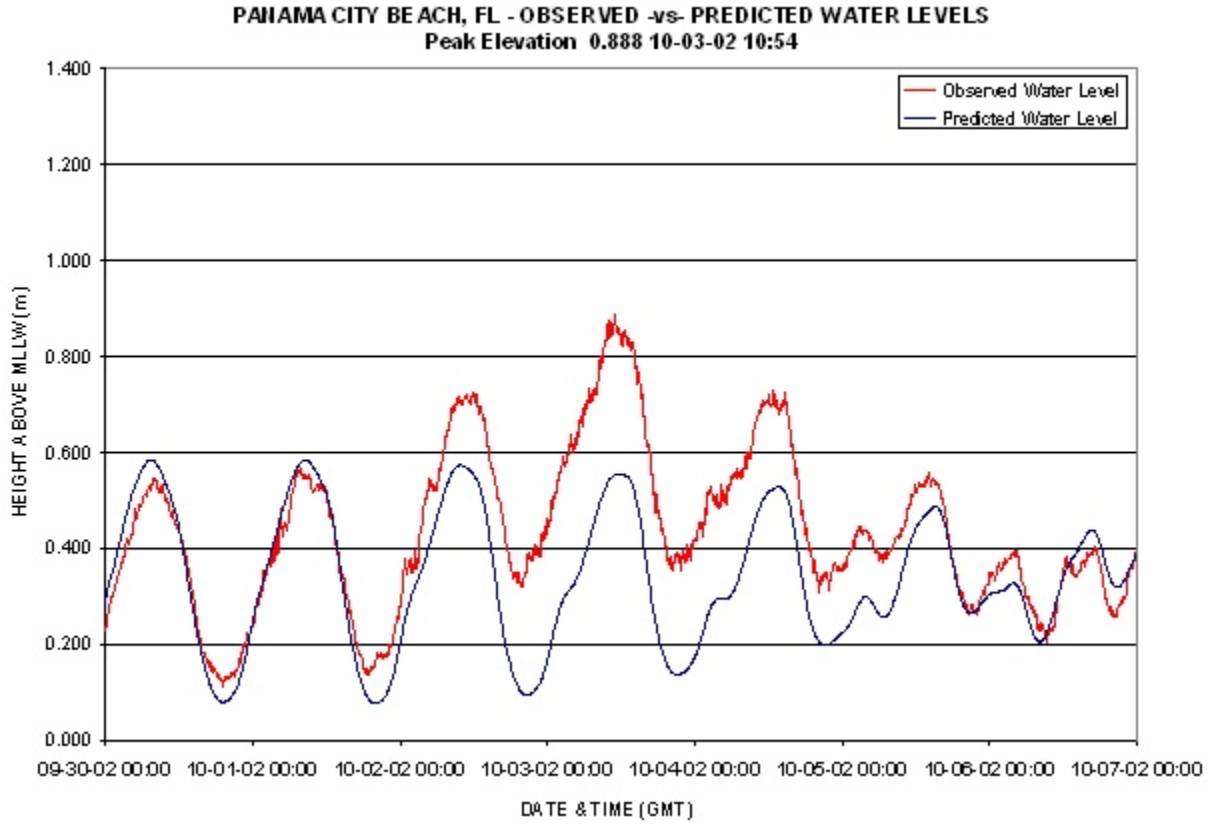
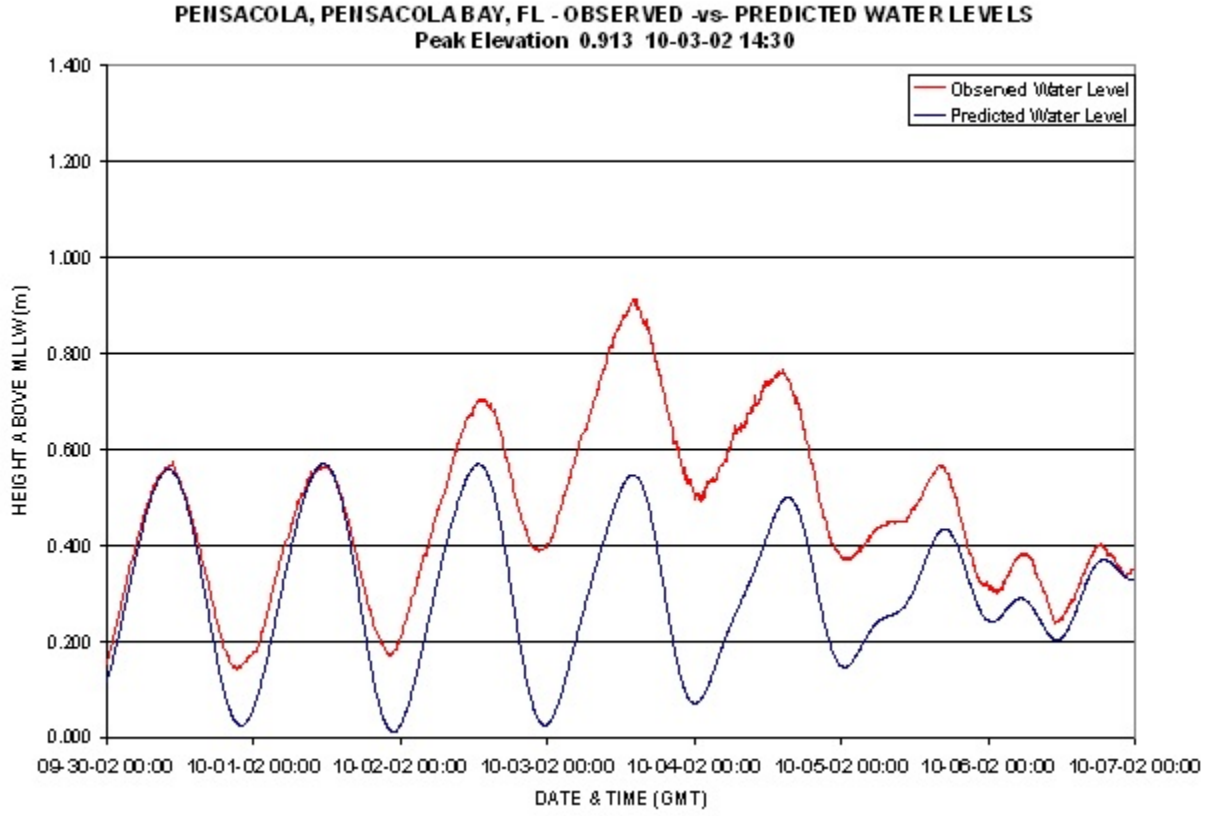
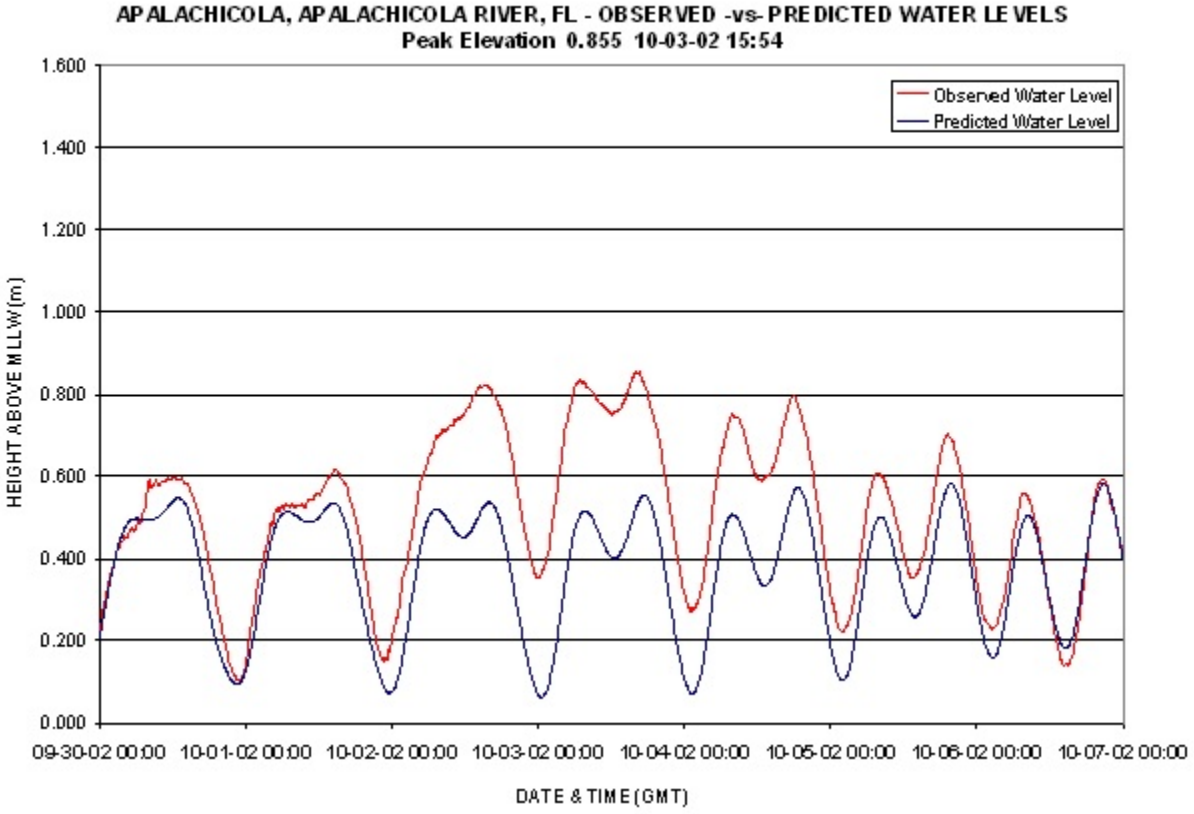
10-07-02 00:00
DATE & TIME (GMT)


PANAMA CITY BEACH, FL - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 0.888 10-03-02 10:54
Observed Water Level
Predicted Water Level
HEIGHT ABOVE MLLW (m)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
09-30-02 00:00
10-01-02 00:00
10-02-02 00:00
10-03-02 00:00
10-04-02 00:00
10-05-02 00:00
10-06-02 00:00
10-07-02 00:00
DATE & TIME (GMT)


PENSACOLA, PENSACOLA BAY, FL - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 0.913 10-03-02 14:30
Observed Water Level
Predicted Water Level
HEIGHT ABOVE MLLW (m)
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
09-30-02 00:00
10-01-02 00:00
10-02-02 00:00
10-03-02 00:00
10-04-02 00:00
10-05-02 00:00
10-06-02 00:00
10-07-02 00:00
DATE & TIME (GMT)

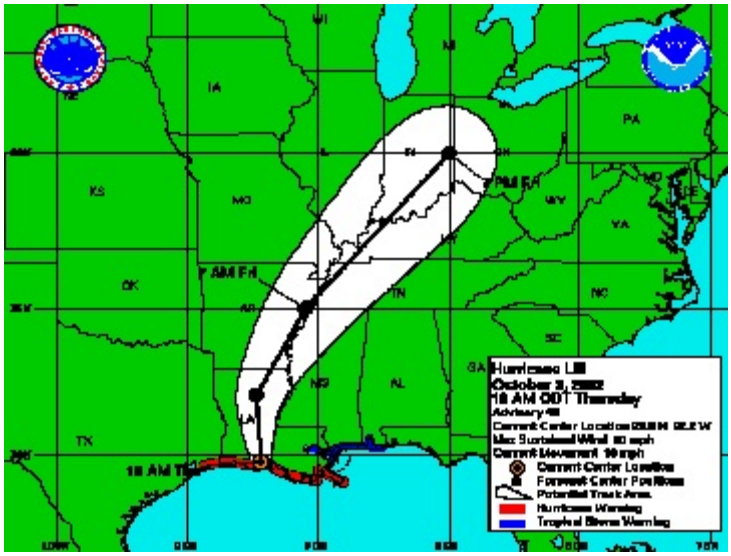

APALACHICOLA, APALACHICOLA RIVER, FL - OBSERVED -vs- PREDICTED WATER LEVELS
Peak Elevation 0.855 10-03-02 15:54
Observed Water Level
Predicted Water Level
HEIGHT ABOVE MLLW (m)
1.600
1.400
1.200
1.000
0.800
0.600
0.400
0.200
0.000
09-30-02 00:00
10-01-02 00:00
10-02-02 00:00
10-03-02 00:00
10-04-02 00:00
10-05-02 00:00
10-06-02 00:00
10-07-02 00:00
DATE & TIME (GMT)

The thirteenth named Tropical System of the 2002 Atlantic Hurricane Season formed in the eastern Atlantic on September 21, 2002 at 10.4N 45.7W near St. Vincent and The Grenadines. TD 13 was upgraded to Tropical Storm Lili on September 22, 2002. Tropical Storm Lili was downgraded to an open wave in the central Caribbean Sea before regenerating and reclassified as a Tropical Storm. TS Lili was upgraded to Hurricane Lili on September 30 and began heading north towards the Gulf of Mexico. Hurricane Lili had sustained winds of 75 kts. with gusts to 85 kts. and a central pressure of 984 mb. See figure 2 below.

Figure 2. Projected path of Hurricane Lili, September 30, 2002.

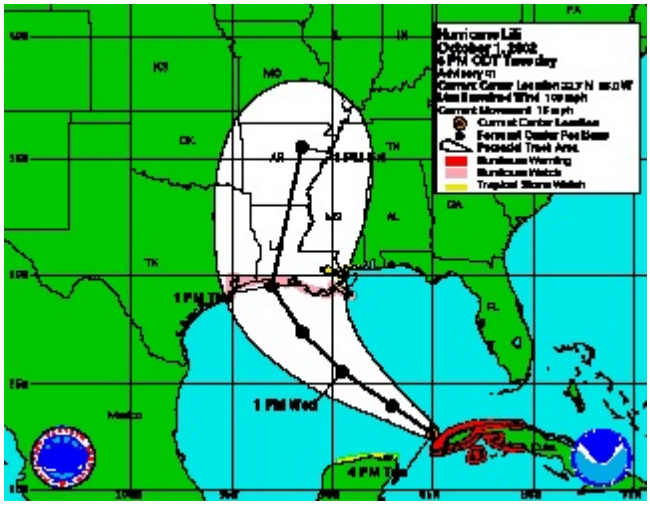
By October 1st Hurricane Lili had moved off the northwest coast of Cuba and a hurricane watch was issued for the Louisiana coastline. The projected path of Lili was expected to pass over western Louisiana between new Iberia and Lake Charles. Hurricane Lili had sustained winds of 90 kts. with gusts to 110 kts. and a central pressure of 970 mb. See figure 3 below.

Figure 3. Projected path of Hurricane Lili, October1, 2002.



On October 2, 2002, Hurricane Lili was just off the coast of Louisiana and had maximum sustained winds of 125 kts. with gusts of 155 kts. and a central pressure of 938 mb. However, at landfall on the morning of October 3rd Lili's characteristics had lessened to maximum sustained winds of 105 kts. with gusts to 130 kts., central pressure 957 mb, and by 1500 its maximum sustained winds were only 80 kts. with gusts to 100kts., central pressure 965 mb. See figure 4 below.

Figure 4. Landfall of Hurricane Lili October 3, 2002.



During landfall of Hurricane Lili CO-OPS tide gauges along the Gulf recorded changes in water level barometric pressure and water temp. Below are data from the Grand Isle gauge. See figures 5 & 6 below.

Figure 5. Water levels above MLLW and barometric pressure recorded at Grand Isle, LA, during landfall of Hurricane Lili October 3, 2002

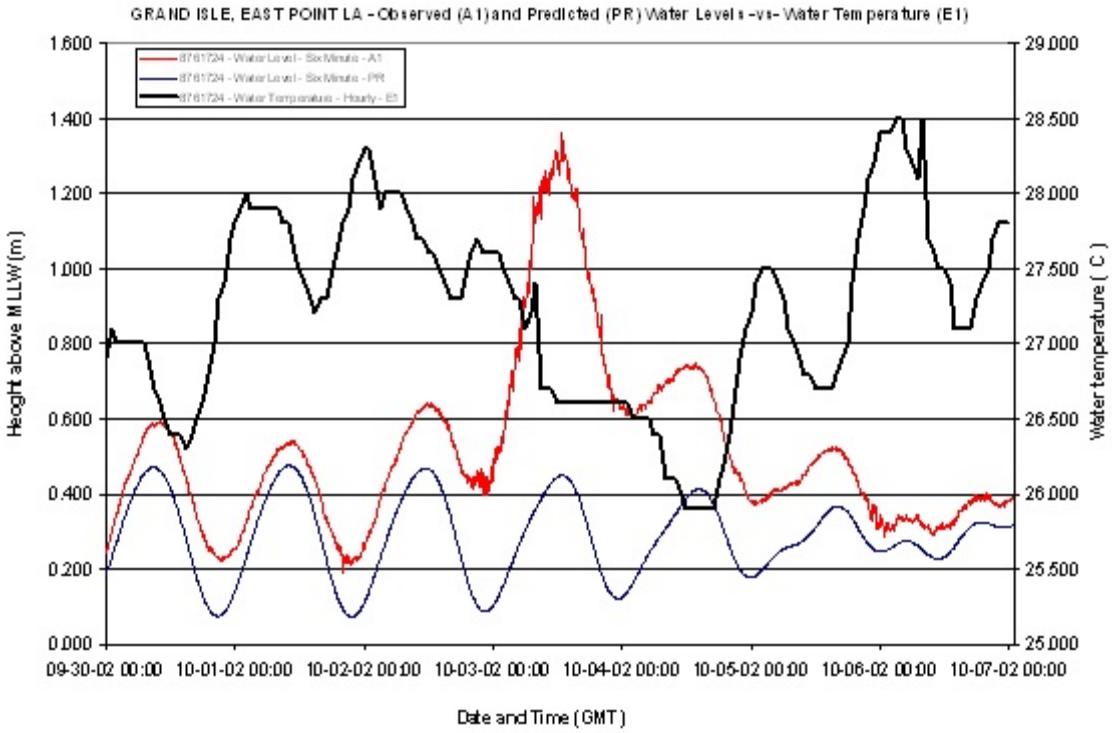
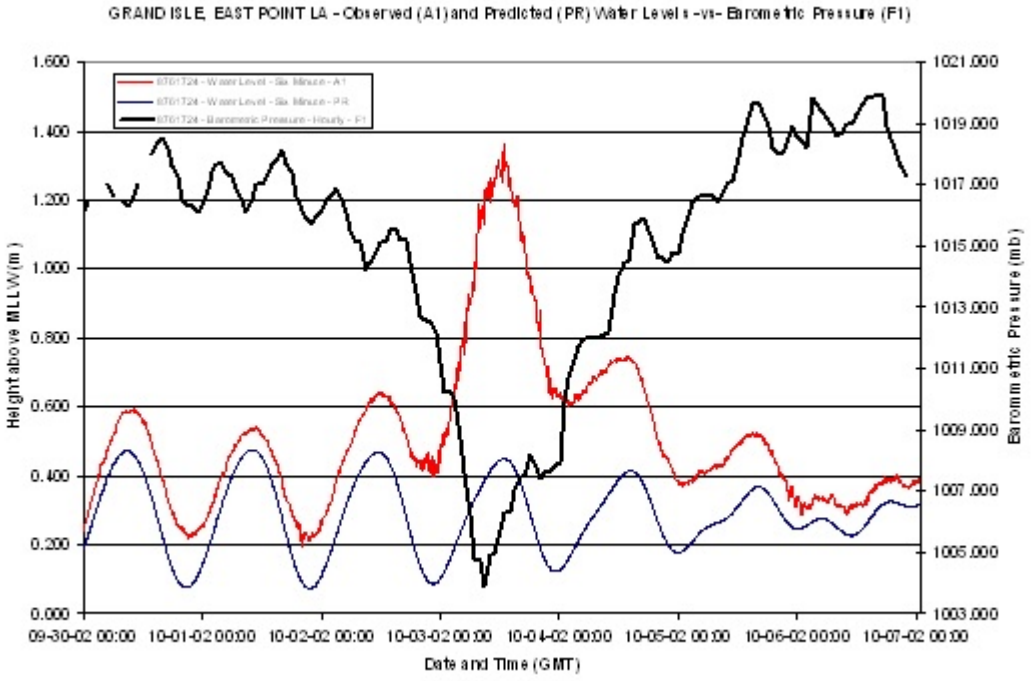


Figure 6 Water levels above MLLW and water temperature recorded at Grand Isle, LA, during landfall of Hurricane Lili October 3, 2002



For comparison I have included the same data plotted over the entire duration of both Tropical Storm Isidore and Hurricane Lili. See figures 7 and 8 below.

Figure 7 Water levels above MLLW and barometric pressure recorded at Grand Isle, LA, during the landfalls of Tropical Storm Isidore and Hurricane Lili September 20 - October 7, 2002

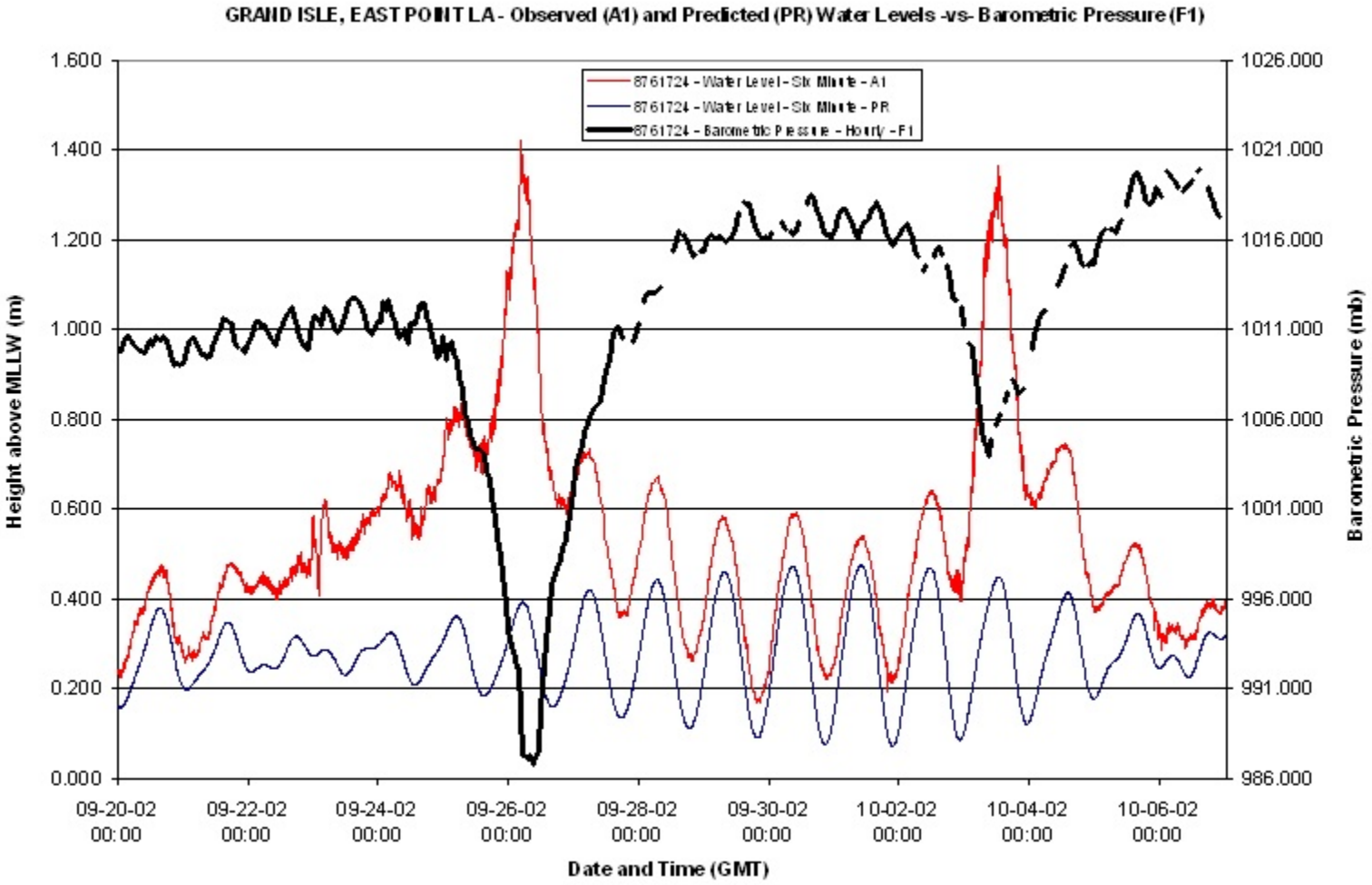


Figure 8. Water levels above MLLW and water temperature recorded at Grand Isle, LA, during the

landfalls of Tropical Storm Isidore and Hurricane Lili September 20 - October 7, 2002