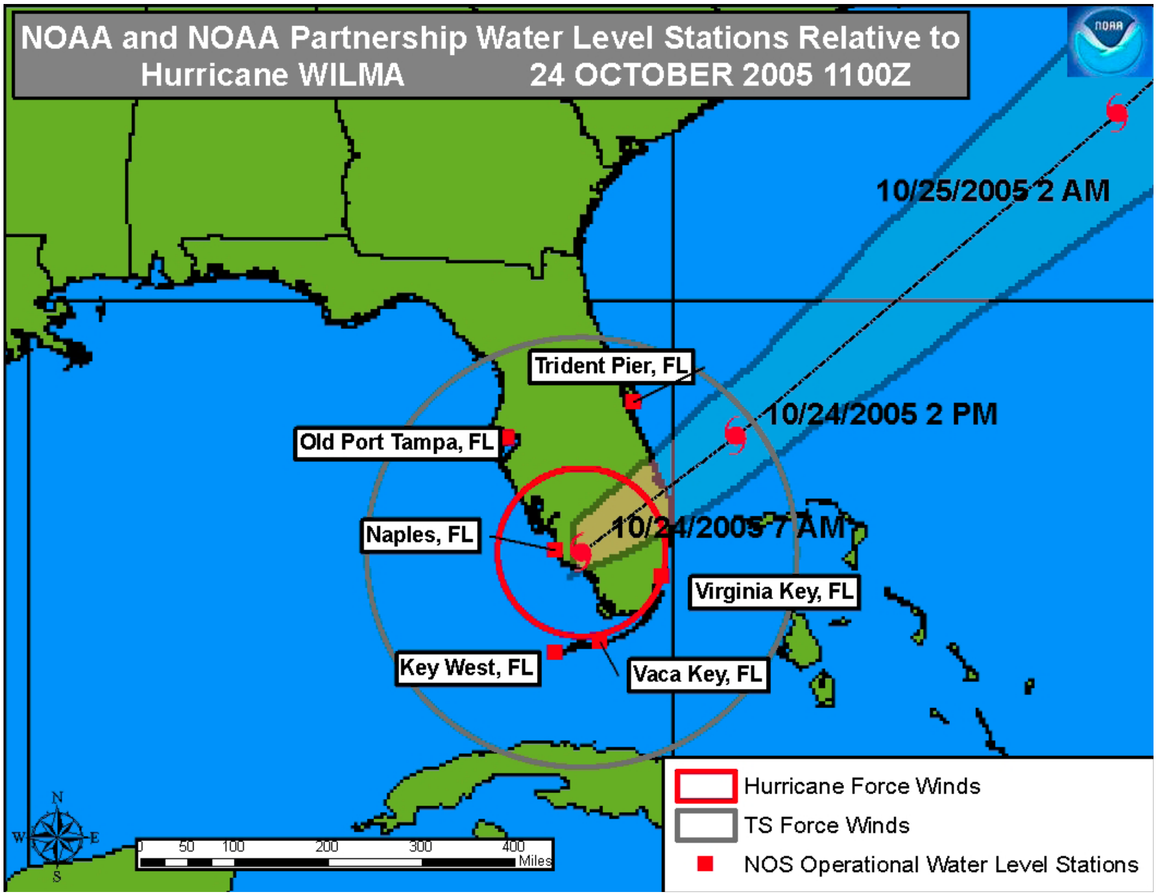
Hurricane Wilma Preliminary Water Levels Report



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

November 4, 2005

noaa National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF COMMERCE
National Ocean Service
Center for Operational Oceanographic Products and Services

SUMMARY

Water level stations operated by NOAA's National Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS) recorded elevated water levels during the landfall of Hurricane WILMA from Fort Myers, FL to Trident Pier, TX. Station location information is contained in Appendix 1. All water level observations are measured above the standard chart datum Mean Lower Low Water (MLLW), based on the National Tidal Datum Epoch 1983-2001 (see Appendix 2). Water level heights are plotted in meters, and tabular values are given in both feet and meters. This report summarizes the highest observed water levels, referred to as the Storm Tide, which is the sum of the storm surge and the astronomic tide. Differences between observed water levels and predicted astronomical tides are also provided. For the purposes of this preliminary report, any occurrence of Storm Tide Anomaly is discounted.

Hurricane WILMA made landfall on **24 October 2005 at 06:30 EDT (1030 GMT)** around Cape Romano, 22 miles south of Naples, FL. WILMA was the twenty-first named storm and third Category 5 hurricane of the 2005 Atlantic hurricane season. The storm reached the lowest barometric pressure for an Atlantic hurricane recording 882mb on October 19 (Cat-5) located just northeast of the Yucatan Peninsula. WILMA made landfall on the south western Florida coast as a Category 3 hurricane with sustained winds of 125 mph, and weakened into a Category 2 hurricane as it passed over Florida and into the Atlantic Ocean.

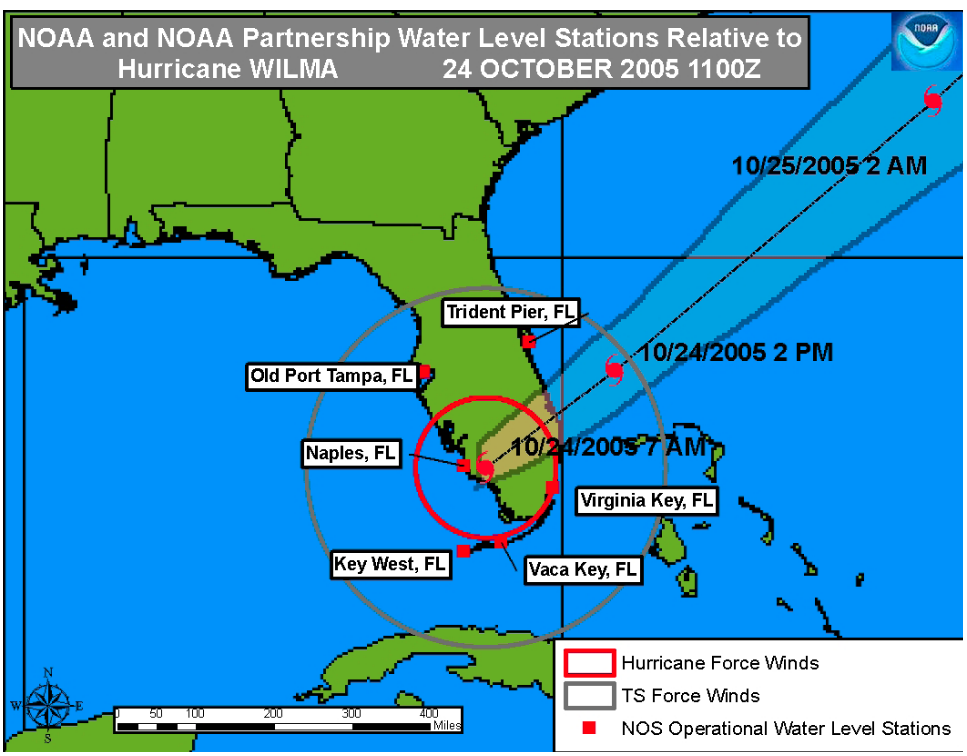


Figure 1: Regional overview of water level stations impacted by Hurricane WILMA, showing extent of hurricane and tropical storm force winds during landfall.

CO-OPS recorded initial elevated water levels a ILMA passed just north of Key West, FL on 24 October 2005. The storm's major impact on Florida occurred in the Florida Keys, elevating water levels at Vaca Key (2.064m, 6.77ft), K y West (1.507m, 4.95ft), and Virginia Key (1.459m, 4.79ft). Water level censors ceased ansmission at Key Colony Beach, FL on 24 October at 0600 GMT, thus failing to record a aximum elevation. Elevated water levels were also recorded at Naples, FL (1.470m, 4.82ft). As WILMA passed over Florida and into the Atlantic Ocean, a maximum water level elevation was recorded at Trident Pier of 1.587m, 5.21ft.

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Table 1: **Maximum water levels** for Hurricane WILMA, September 2005. All preliminary data subject to NOS verification.

Station Name	Station ID	Date & Time (GMT)	MLLW (m) Max Water Level above	Levels (m) Predicted Water	Difference (m)	MLLW (ft) Max Water Level above	(ft) Predicted Water Levels	Difference (ft)
Vaca Key, FL	8723970	10-24-05 15:42	2.064	0.105	1.959	6.77	0.34	6.43
Trident Pier, FL	8721604	10-24-05 19:30	1.587	1.095	0.492	5.21	3.59	1.61
Key West, FL	8724580	10-24-05 08:42	1.507	0.540	0.967	4.95	1.77	3.1 7
Naples, FL	8725110	10-24-05 15:54	1.470	0.226	1.244	4.82	0.74	4.0 8
Virginia Key, FL	8723214	10-24-05 12:30	1.459	0.227	1.232	4.79	0.74	4. 04

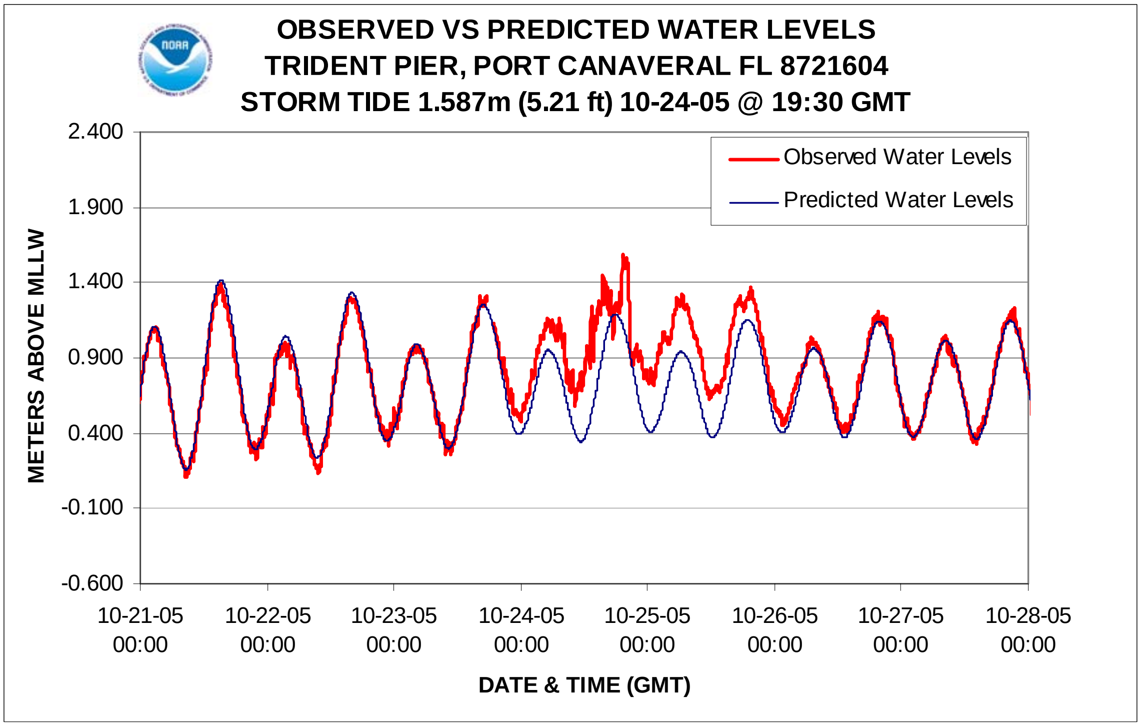

Figure 2 . Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Trident Pier, Port Canaveral, FL during Hurricane Wilma.

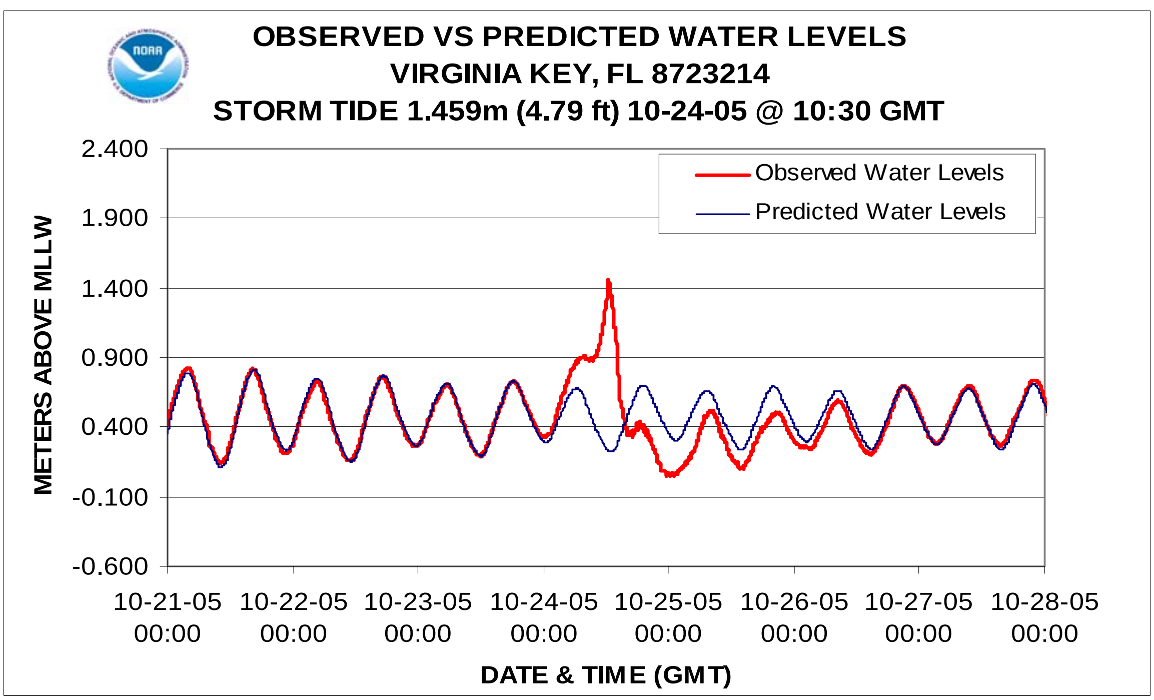

Figure 3 . Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Virginia Key, FL during Hurricane Wilma.

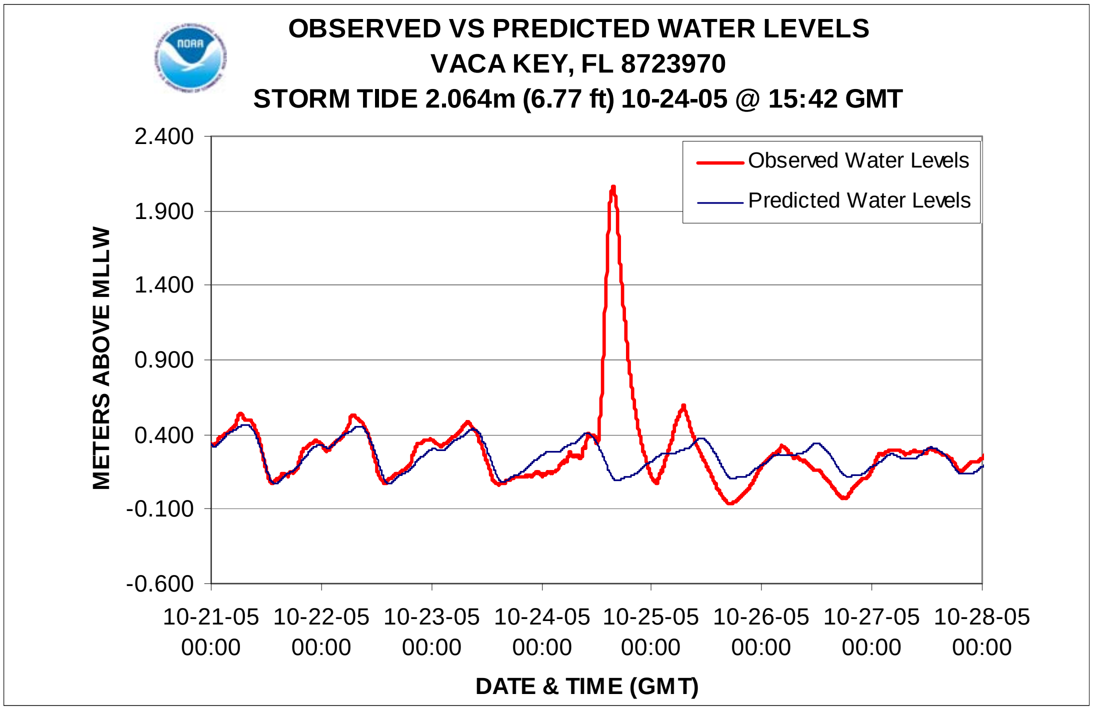

Figure 4. Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Vaca Key, FL during Hurricane Wilma.

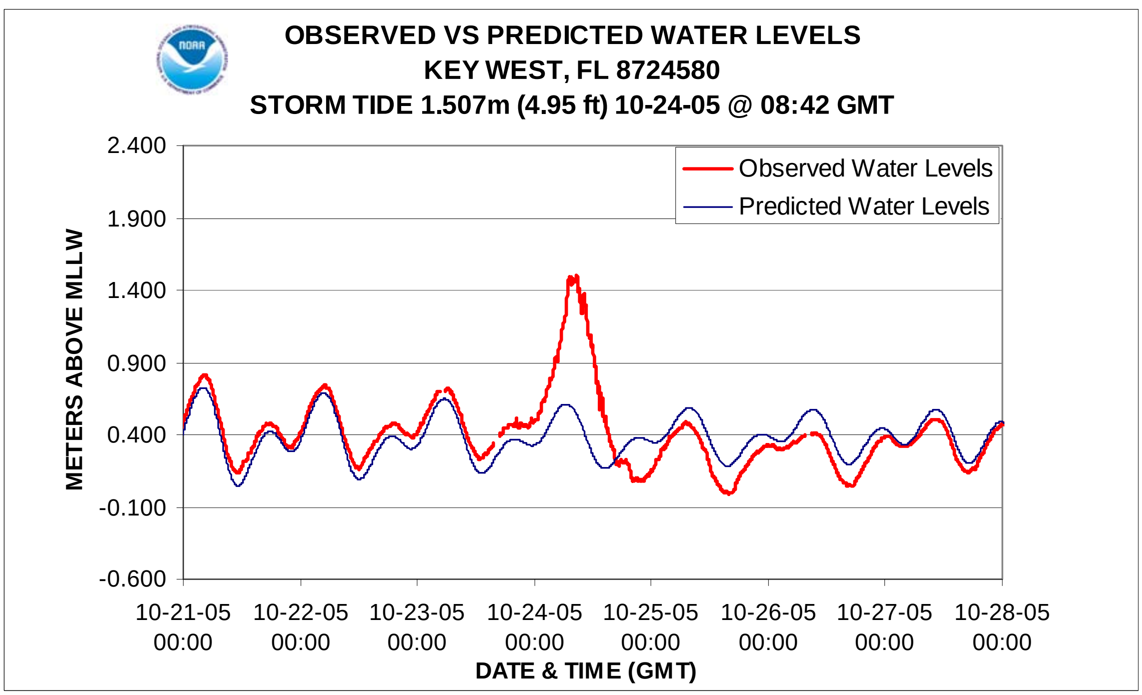

Figure 5. Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Key West, FL during Hurricane Wilma.

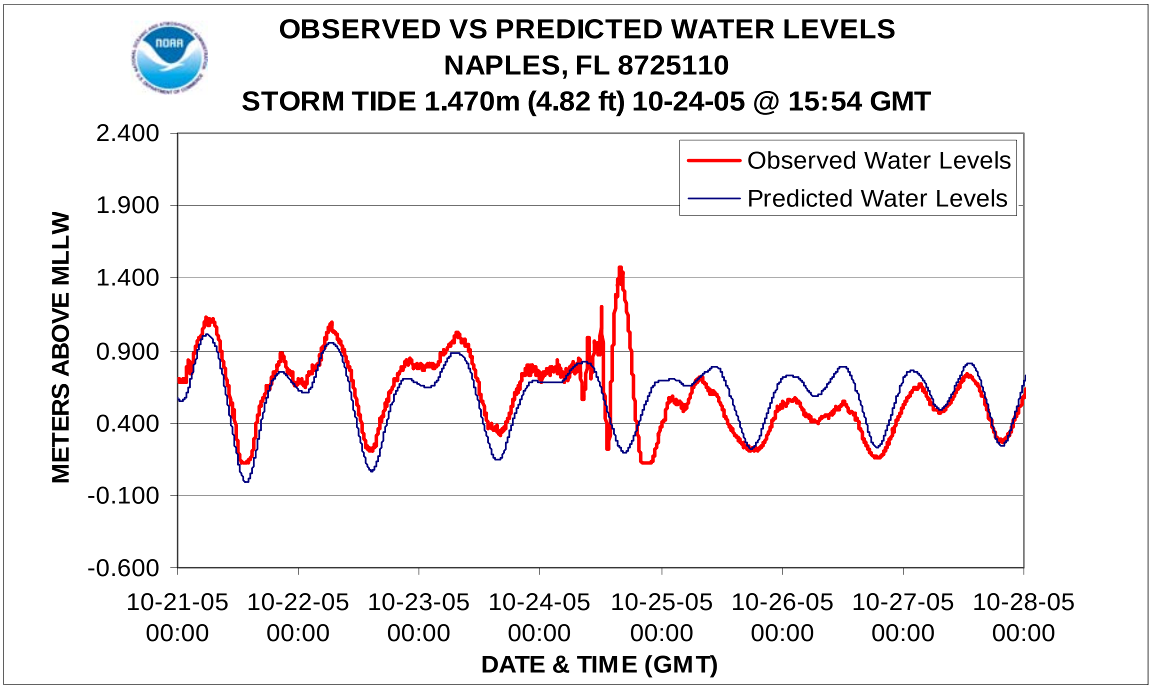

Figure 6. Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Naples, FL during Hurricane Wilma.

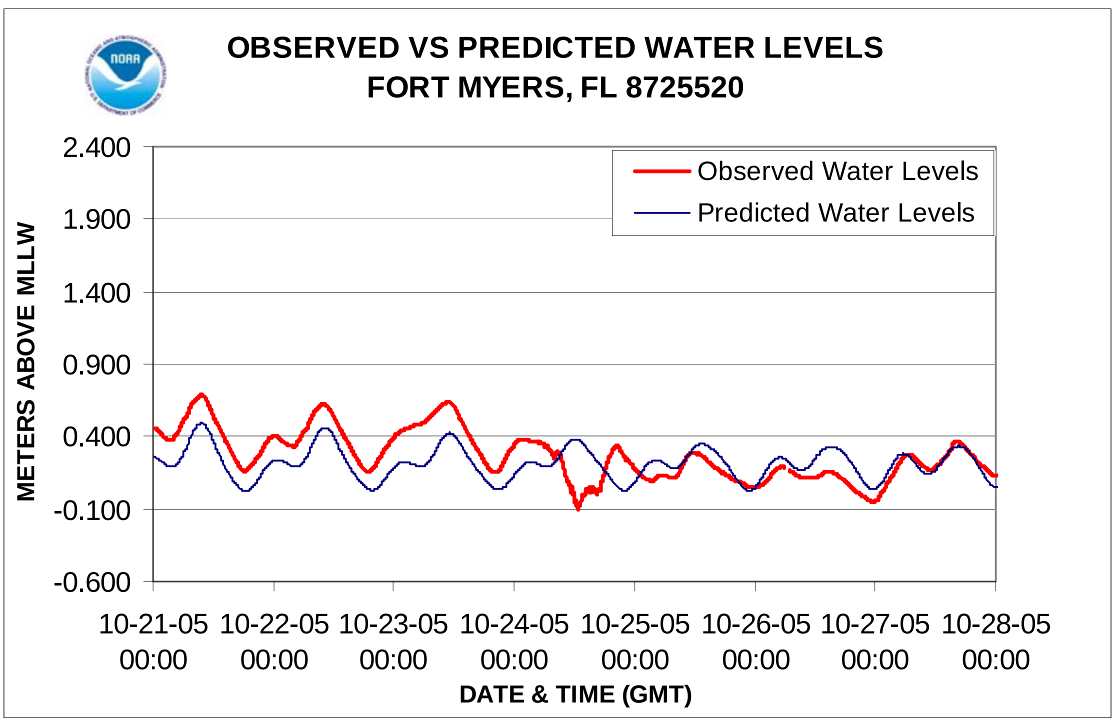

Figure 7. Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Fort Myers, FL during Hurricane Wilma.

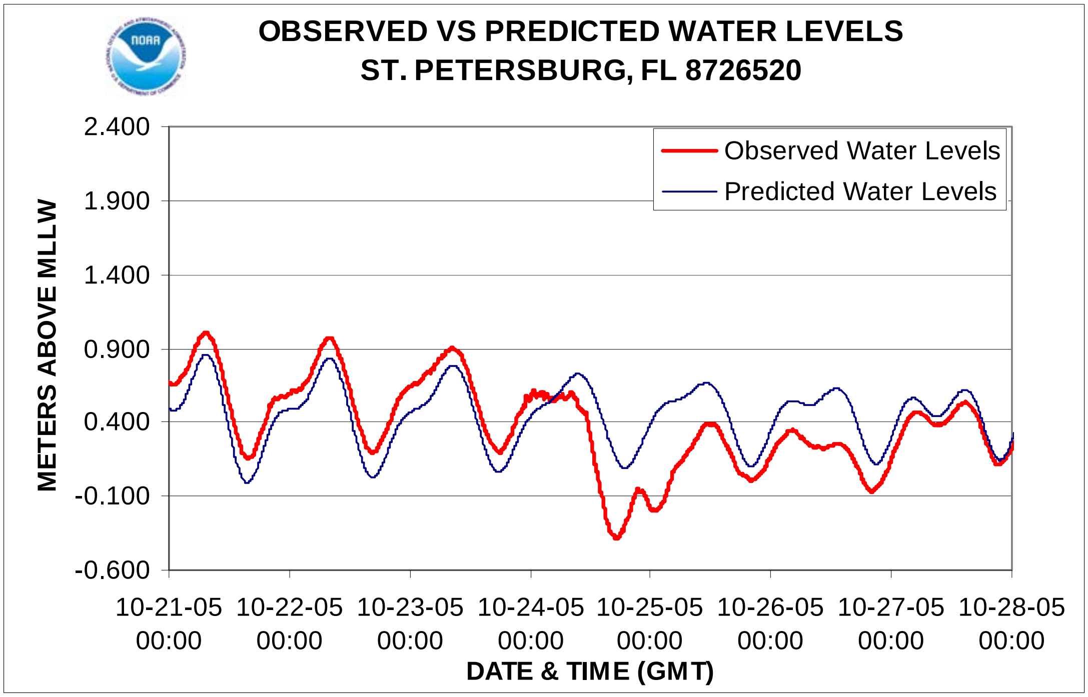

Figure 8. Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at St. Petersburg, FL during Hurricane Wilma.

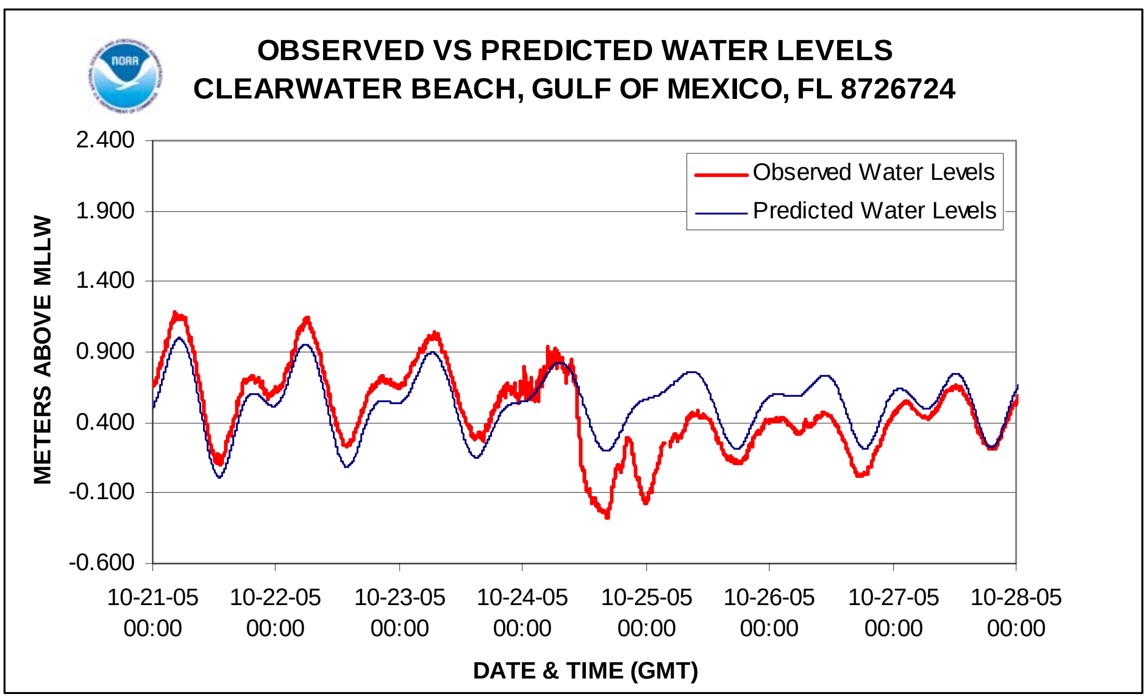

Figure 9. Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Clearwater Beach, Gulf of Mexico, FL during Hurricane Wilma.

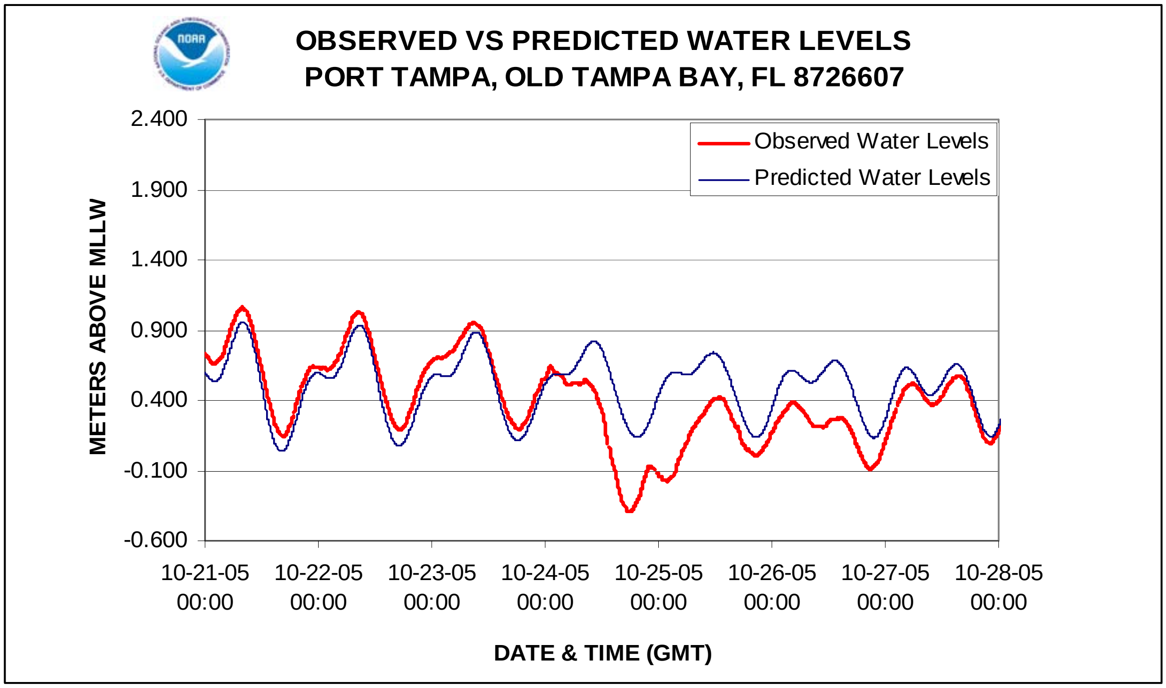

Figure 10. Time Series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Port Tampa, Old Tampa Bay, FL during Hurricane Wilma.

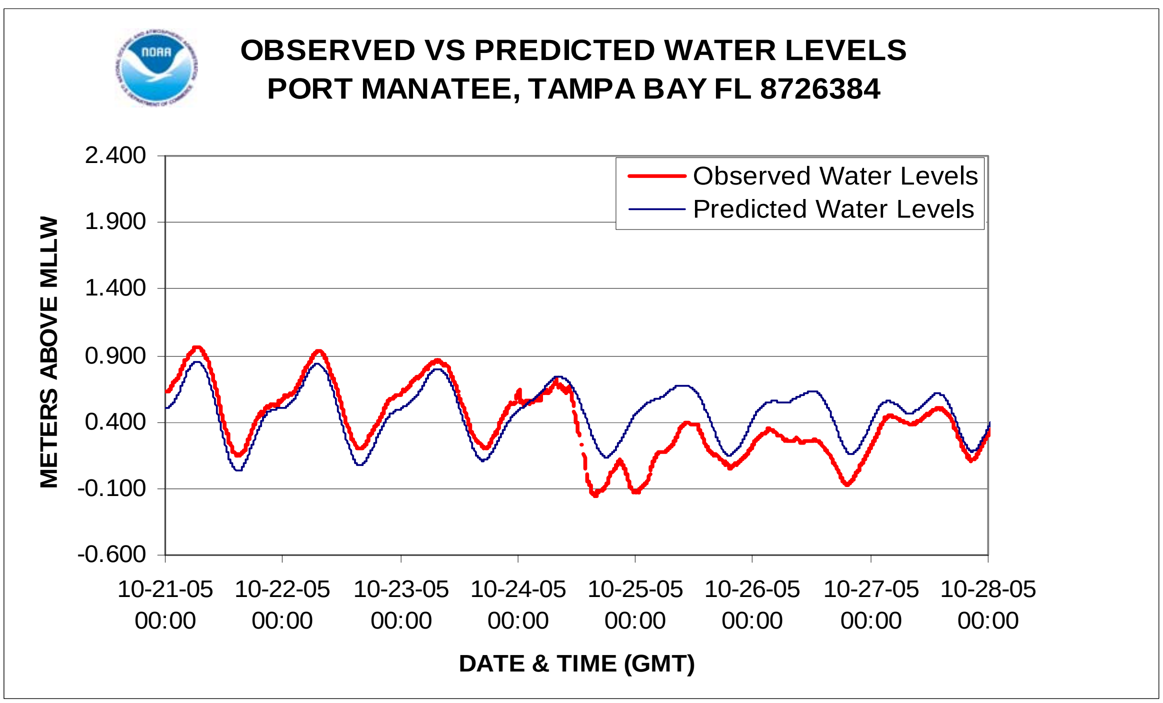

Figure 11. Time series of observed and predicted water levels above Mean Lower Low Water (MLLW) at Port Manatee, Tampa Bay, FL during Hurricane Wilma.

Appendix 1

Station Name	Station ID	Latitude N	Longitude W
Trident Pier, FL	8721604	28.42	-80.59
Virginia Key, FL	8723214	25.73	-80.16
Vaca Key, FL	8723970	24.71	-81.11
Key West, FL	8724580	24.55	-81.81
Naples, FL	8725110	26.13	-81.81
Fort Myers, FL	8725520	26.65	-81.87
Port Manatee, FL	8726384	27.64	-82.56
St. Petersburg, FL	8726520	27.76	-82.63
Old Port Tampa, FL	8726607	27.86	-82.55
Clearwater Beach, FL	8726724	27.98	-82.83

Appendix 2

Excerpt From:

Tide and Current Glossary, NOAA National Ocean Service, Silver Spring, MD, 2000.

Bench mark (BM): A fixed physical object or mark used as reference for a horizontal or vertical datum. A tidal bench mark is one near a tide station to which the tide staff and tidal datums are referred. A primary bench mark is the principal mark of a group of tidal bench marks to which the tide staff and tidal datums are referred.

Chart datum: The datum to which soundings on a chart are referred. It is usually taken to correspond to a low-water elevation, and its depression below mean sea level is represented by the symbol Z_o. Since 1980, chart datum has been implemented to mean lower low water for all marine waters of the United States, its territories, Commonwealth of Puerto Rico, and Trust Territory of the Pacific Islands. See datum and National Tidal Datum Convention of 1980.

Datum (vertical): For marine applications, a base elevation used as a reference from which to reckon heights or depths. It is called a tidal datum when defined in terms of a certain phase of the tide. Tidal datums are local datums and should not be extended into areas which have differing hydrographic characteristics without substantiating measurements. In order that they may be recovered when needed, such datums are referenced to fixed points known as bench marks. See chart datum and bench marks.

Geodetic datum: See National Geodetic Vertical Datum of 1929 (NGVD 1929) and North American Vertical Datum of 1988 (NAVD 1988).

Mean Lower Low Water (MLLW): A tidal datum. The average of the lower low water height of each tidal day observed over the National Tidal Datum Epoch. See National Tidal Datum Epoch. For stations with shorter series, comparison of simultaneous observations with a control tide station is made in order to derive the equivalent datum of the National Tidal Datum Epoch.

North American Vertical Datum of 1988 (NAVD 1988): A fixed reference for elevations determined by geodetic leveling. The datum was derived from a general adjustment of the first-order terrestrial leveling nets of the United States, Canada, and Mexico. In the adjustment, only the height of the primary tidal bench mark, referenced to the International Great Lakes Datum of 1985 (IGLD 1985) local mean sea level height value, at Father Point, Rimouski, Quebec, Canada was held fixed, thus providing minimum constraint. NAVD 1988 and IGLD 1985 are identical. However, NAVD 1988 bench mark values are given in Helmert orthometric height units while IGLD 1985 values are in dynamic heights. See International Great Lakes Datum of 1985, National Geodetic Vertical Datum of 1929, and geopotential difference.

National Tidal Datum Convention of 1980: Effective November 28, 1980, the Convention: (1) establishes one uniform, continuous tidal datum system for all marine waters of the United States, its territories, Commonwealth of Puerto Rico, and Trust Territory of the Pacific Islands, for the first time in history; (2) provides a tidal datum system independent of computations based on type of tide; (3) lowers chart datum from mean low water to mean lower low water along the Atlantic coast of the United States; (4) updates the National Tidal Datum Epoch from 1941 through 1959, to 1960 through 1978; (5) changes the name Gulf Coast Low Water Datum to mean lower low water; (6) introduces the tidal datum of mean higher high water in areas of predominantly diurnal tides; and (7) lowers mean high water in areas of predominantly diurnal tides. See chart datum.

National Geodetic Vertical Datum of 1929 (NGVD 1929): A fixed reference adopted as a standard geodetic datum for elevations determined by leveling. The datum was derived for surveys from a general adjustment of the first-order leveling nets of both the United States and Canada. In the adjustment, mean sea level was held fixed as observed at 21 tide stations in the United States and 5 in Canada. The year indicates the time of the general adjustment. A synonym for Sea-level Datum of 1929. The geodetic datum is fixed and does not take into account the changing stands of sea level. Because there are many variables affecting sea level, and because the geodetic datum represents a best fit over a broad area, the relationship between the geodetic datum and local mean sea level is not consistent from one location to another in either time or space. For this reason, the National Geodetic Vertical Datum should not be confused with mean sea level. See North American Vertical Datum of 1988 (NAVD 1988).

National Tidal Datum Epoch: The specific l9-year period adopted by the National Ocean Service as the official time segment over which tide observations are taken and reduced to obtain mean values (e.g., mean lower low water, etc.) for tidal datums. It is necessary for standardization because of periodic and apparent secular trends in sea level. The present National Tidal Datum Epoch is 1960 through 1978. It is reviewed annually for possible revision and must be actively considered for revision every 25 years.

National Water Level Observation Network (NWLON): The network of tide and water level stations operated by the National Ocean Service along the marine and Great Lakes coasts and islands of the United States.

Storm surge: The local change in the elevation of the ocean along a shore due to a storm. The storm surge is measured by subtracting the astronomic tidal elevation from the total elevation. It typically has a duration of a few hours. Since wind generated waves ride on top of the storm surge (and are not included in the definition), the total instantaneous elevation may greatly exceed the predicted storm surge plus astronomic tide. It is potentially catastrophic, especially on low lying coasts with gently sloping offshore topography. See storm tide.

Storm tide: As used by the National Weather Service, NOAA, the sum of the storm surge and astronomic tide. See storm surge and tide.

Tide: The periodic rise and fall of a body of water resulting from gravitational interactions between Sun, Moon, and Earth. The vertical component of the particulate motion of a tidal wave. Although the accompanying horizontal movement of the water is part of the same phenomenon, it is preferable to designate this motion as tidal current. Same as astronomic tide.

Tide (water level) gauge: An instrument for measuring the rise and fall of the tide (water level).

For further information on tides, tidal predictions, tidal datums and related publications, contact:

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