From: Doug Marcy, NOAA, October 25, 2013

Mean High Water Delineation for Jekyll Island, GA

I was asked both by Ben Carswell (bcarswell@jekyllisland.com) and Sonny Emmert (sonny.emmert@dnr.state.ga.us) to delineate an approximate Mean High Water (MHW) shoreline for Jekyll Island, GA. Mean High Water is defined as the average of all the high water heights observed over the National Tidal Datum Epoch, a period of approximately 19 years.

Data/Model Used

I used the best available topographic data available for the Jekyll Island region which was 2007 Glynn County Lidar. This data has an 18.3cm RMSE vertical accuracy and 0.43m horizontal accuracy. The point spacing of the Lidar was approximately 1.5m. For another mapping project I am working on, the Coastal Services Center created a 5m Digital Elevation Model from the LIDAR data to map SLR for the state of GA, and the whole country (www.csc.noaa.gov/slr). This is what was used. The LIDAR and DEM are proprietary datasets licensed by Glynn County, so we do not freely distribute them via our NOAA Digital Coast data registry.

Lidar data in marshes has known bias. As noted in the following paper, http://www.csc.noaa.gov/digitalcoast/_/pdf/Lidar_marshes_slamm_CSC.pdf, up to a foot of elevation bias can be introduced in Spartina marshes due to the marsh thickness and the light energy not being able to penetrate to the marsh surface. Therefore Lidar elevations in the marsh may be higher than in reality.

I used the NOAA VDATUM model (http://vdatum.noaa.gov/), to approximate the Mean High Water surface. This surface is the result of hydrodynamic modeling of the tidal surface for the Southeast over a period of a month and a half. The average MHW tidal surface is calibrated with NOAA tide gages and error reports are created. **The vertical uncertainty for the Georgia/South Carolina/North Carolina grid is 12.5cm.** The MHW surface was subtracted from the NAVD88 surface based on Geoid 2012a (also in VDATUM) to get it in the same datum as the Lidar based DEM (NAVD88).

Mapping Process

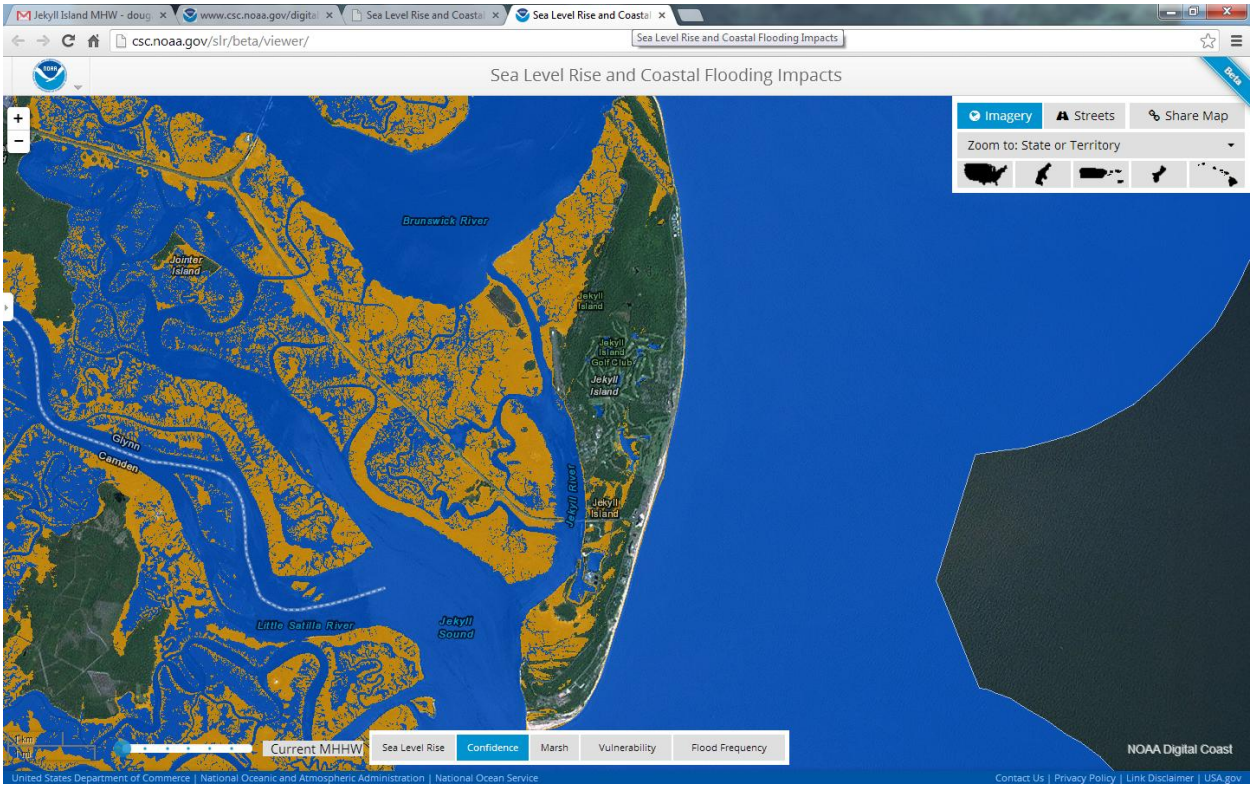
The Lidar based DEM was subtracted from the MHW surface grid from VDATUM. The resulting grid represented the depth of water. I then extracted the zero contour line from the depth grid, which delineates the approximate location of MHW. No smoothing of the contour was done, so because it was generated using a GIS, there are a lot of small closed areas and irregularities.

It should be noted that because the Lidar based DEM may have bias towards higher elevations in marsh areas, more area above MHW will be the result. Many of these areas may, in actuality, be below MHW.

Uncertainty

The uncertainty in the Lidar data is reported at 18.3cm RMSE and the vertical uncertainty in the VDATUM grid is reported at 12.1cm. This gives a total of 30.4cm RMSE [15.5 inches]. Elevation data of this quality is really only suitable for mapping at 2FT contours, based on NSSDA (http://www.fgdc.gov/standards/projects/FGDC-standards-projects/accuracy/part3/chapter3) Therefore a +/- 2FT above and below MHW should be assumed. That will impact the location of the MHW line significantly both in a landward and seaward direction, making a big impact on total land area above MHW.

In our Sea Level Rise and Coastal Flooding Impacts Viewer we have a "mapping confidence" tab. Levels of confidence are depicted on this map at MHHW (just slightly above MHW). Blue areas denote a high confidence of inundation, **orange areas denote a high degree of uncertainty**, and unshaded areas denote a high confidence that these areas will be dry given the chosen water level.



In this application 80% is considered a high degree of confidence such that, for example, the blue areas denote locations that may be correctly mapped as 'inundated' more than 8 out of 10

times. Areas with a high degree of uncertainty represent locations that may be mapped correctly (either as inundated or dry) less than 8 out of 10 times. **Please note the amount of orange (not confident) areas in the marshes around Jekyll Island. This is based on the combined uncertainty of the Lidar based DEMs and VDATUM model.**

Disclaimer

Due to the above noted uncertainty in the Lidar and the VDATUM model data, the MHW line I delineated would require the following disclaimer to any use.

*The Mean High Water shoreline delineation data provided should be used only as a screening-level tool for management decisions**. As with all remotely sensed data, all features should be verified with a site visit or quantified with traditional surveying techniques.** The data we provided are "as is," without warranty to their performance, merchantable state, or fitness for any particular purpose. The entire risk associated with the results and performance of these data is assumed by the user. **This data should be used strictly as a planning reference tool and not for navigation, permitting, or other legal purposes.***

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