The National Oceanic and Atmospheric Administration is investigating inaccuracies in tidal predictions for the upper Hudson River Estuary thanks to observations first made using HRECOS data.

Our partner at the USGS, Gary Wall, observed that the 2009 high water levels at the HRECOS Schodack Island station were consistently earlier than the NOAA tide tables predicted.

To calculate these differences, Dr. Wall determined the distance between the HRECOS station and the nearest NOAA tidal station and calculated the expected time shift based on these distances. By adding this expected shift to the tidal predictions, he was able to calculate the difference in minutes between predicted and observed high water levels.

As I described in a previous HRECOS Story, we expect differences between the predicted high tides and the actual high water levels. The tide predictions do not take into consideration short term influences such as strong winds, high or low pressure systems, or watershed runoff,
all of which can influence water levels.

If the tide tables are accurate, however, these differences should be equally distributed around zero. There should be as many high water events that come earlier than the tide tables predict as come later than predicted. This is because the short term influences are random and can occur at any time.

At Schodack Island, however, 2009 high water levels arrived consistently earlier than the tide tables predicted. In fact, 97% of the high water events occurred earlier than predicted. This consistent and unexpected shift indicates that the tidal predictions may be inaccurate.

We repeated this analysis for high and low water level data collected in 2009 from the USGS gauge in Albany and all HRECOS stations. The USGS gauge at Albany showed a similar shift from the high tide predictions as was observed at Schodack Island. High water levels at the HRECOS Tivoli Bays South and Norrie Point stations also showed a slight shift but the difference was smaller than the time resolution of our system so the results were inconclusive. Finally, none of the stations showed a shift from the low tide predictions.

Gary Wall submitted these findings to NOAA's Center for Operational Oceanographic Products and Service. In response, this department produced a Notice to Mariners and intends to reinstall a station at Albany on a temporary basis to gather data for future predictions.

According to Natalia Donoho, the Team Leader of CO-OPS User Services at NOAA, the tidal predictions for the Albany region were developed based on river observations made in 1934. The river channel has experienced both natural and man-made change since this date so it is not surprising that the predictions may be inaccurate.

The stretch of river from Athens to Troy, NY was once shallow and braided around numerous islands. In 1831, just six years after the completion of the Erie Canal, the Army Corps of Engineers began altering the river bottom to improve navigation. Over the next century, they built spur dikes, longitudinal dikes, blocked and filled secondary channels and, eventually,
dredged the main channel in order to create passage for the larger barges to pass through.

The result is a narrow river from Hudson to Troy with a reliable depth of at least 32 feet. Approximately 30% of the river's surface area in this region was filled and 44 islands became part of the flood plain (Miller, Ladd, and Nieder, 2006; Collins and Miller, in preparation). The most recent dredging operations were authorized by Congress in 1954, twenty years after NOAA collected their river observations used for today's tidal predictions.

Next time you venture into the river keep these time shifts in mind. High water levels at Schodack Island are about 30 minutes early, on average, but can be as much as 1 hour and 40 minutes early. Although short term events such as winds and rainfall will always create outliers, you will be more likely to ride the high tide.

References:
