INTRODUCTION

Crescent City (Figure 1), about 100 km north of Humboldt Bay, has a historic record of damaging events. Crescent City Harbor, located approximately 100 km north of Humboldt Bay, is able to record an observable change in velocity. This sensitivity may be evidence for a dampening effect by Humboldt Bay, as the model does not consistently replicate the signal. Amplitudes were consistently underestimated by the MOST model in the first 2.5 hours after the initial arrival with a 50% underestimation of the peak amplitude.

In 2010, the tsunamis produced by the Mw 8.8 Chile earthquake on February 27, 2010 and the Mw 9.0 Japan earthquake on March 11, 2011 caused 1,500 deaths and resulted in approximately 500,000 people being displaced. The 2010 Chile event caused over $200 million in damage, while the 2011 Japan event caused about $20 million in damage. The tsunami was recorded by NOAA’s NOS tide gauges in Humboldt Bay and Crescent City and was calibrated using video footage from the California Department of Fish and Game, Haida Gwaii, Northern British Columbia. The tsunami event was recorded by a security camera on the Harbor Master’s building at 20:23 UTC (Figure 1). The tsunami arrived close to low tide in Humboldt Bay at 21:36 UTC and in Crescent City at 00:00 UTC. This resulted in a 2.5 hour time window. The left panel shows the observed current for the 2010 Chile, 2011 Japan and 2012 British Columbia events in Humboldt Bay. The middle panel is the tsunami signal after it was filtered using a 4th order, high-pass Butterworth filter. The right panel displays the 12 hours before the tsunami arrived and the following 45 hours time window. The peak currents reached 4.5 m/s with 6 cycles exceeding 3 m/s. The model predicted attenuation after 4 hours but the observed signal persisted at a nearly constant level for more than 48 hours. The 2010 tsunami was very small and therefore the 2010 signal is not visible in the observed velocity. All 3 events show an initial positive velocity corresponding to a flood surge into Humboldt Bay which was validated by the water level recorded at the Humboldt Bay NOS tide gauge station approximately 1 km north of downtown Crescent City.