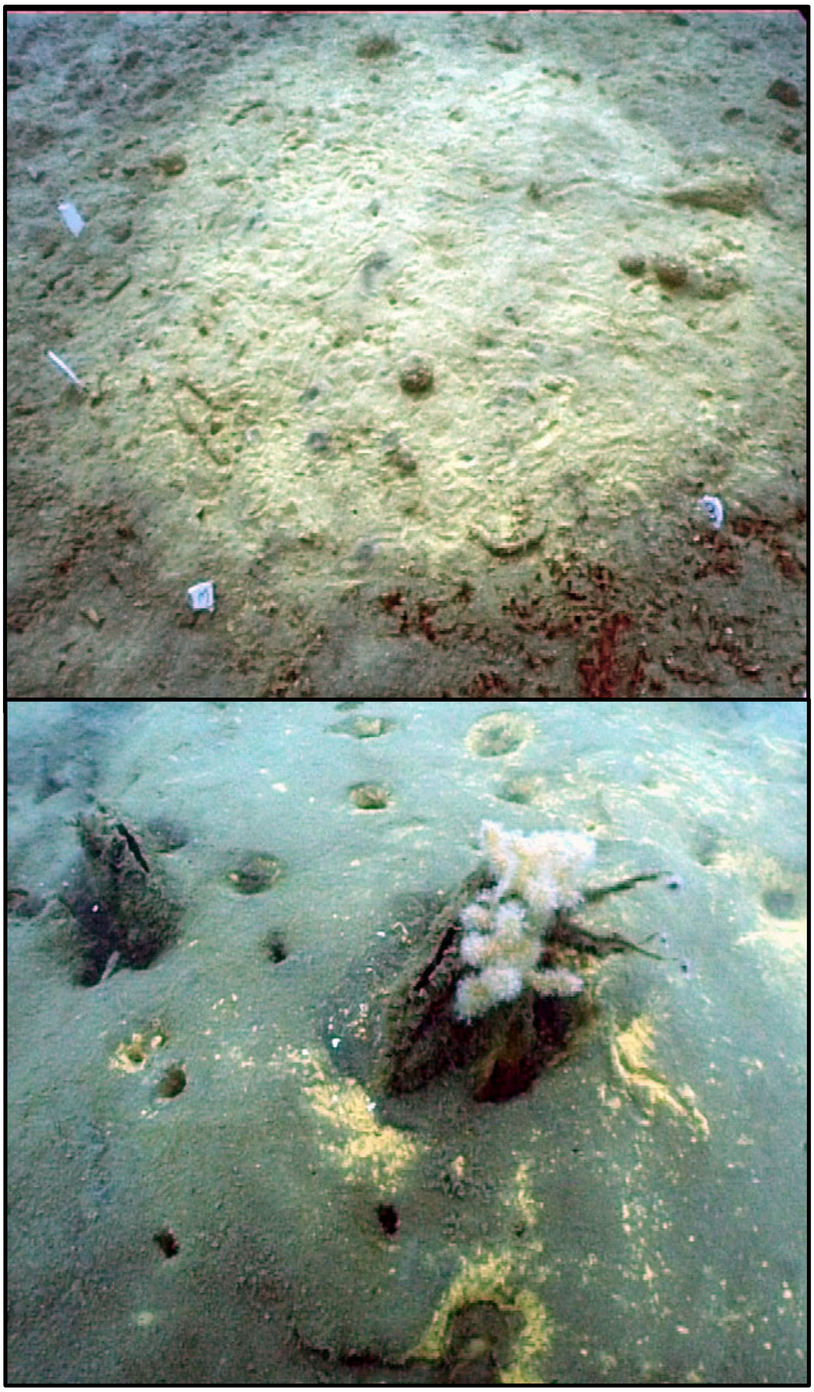

Picture 12: Top panel: a 3 mm plot at MI on Day 3, viewed from above. The edges of the plot are less defined, and more tracks and trails are apparent in the plot, relative to Day 1 (see Pictures 2 and 6). Experimental plots at TK had more silt coverage and more/larger animal burrows. Two *Atrina* are pictured, one with a soft-coral colony (*Alcyonium aurantiacum*) on top.

3.2 Physical data: currents, waves, and suspended sediments

Because of the duration of this experiment (30 days), the physical instruments logged data during spring and neap tides (Fig. 5) and during at least one stormy period. Site MI, despite its coastal location, was often protected from large swells and wind-driven waves. Inside Mahurangi Harbour, Site TK may have been partially protected from large swells, but the tidal currents were noticeably stronger at TK than at MI.

The currents at Site TK flowed northward on flooding tides and southward at the ebb (Figs. 6 and 7). The easterly and westerly components of the tide were small in comparison to the north-south flow, which regularly exceeded 20 cm per second. A large storm event that peaked on Days 7 and 8 appeared to affect current velocity and variability, though the influence of tides still largely dominated (Figs. 8 and 9). Maximum current magnitudes at the TK seabed exceeded 25 cm/s during spring tides (Fig. 8), but peaked between 15 and 20 cm/s during calm neap tide conditions (Fig. 9).

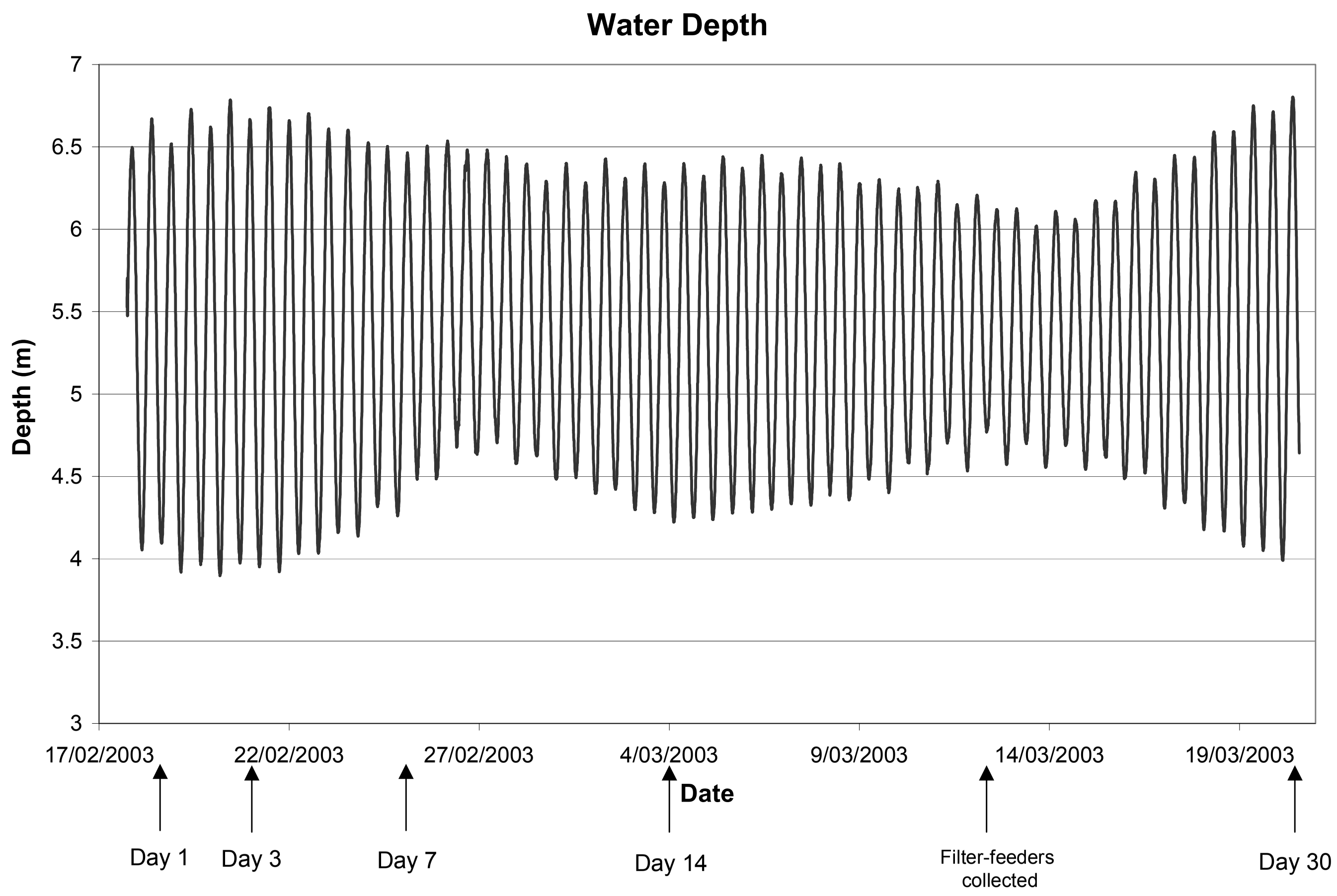

Figure 5: Water depth at Site TK during entire experimental period. Dates when site was sampled are indicated along the x-axis.

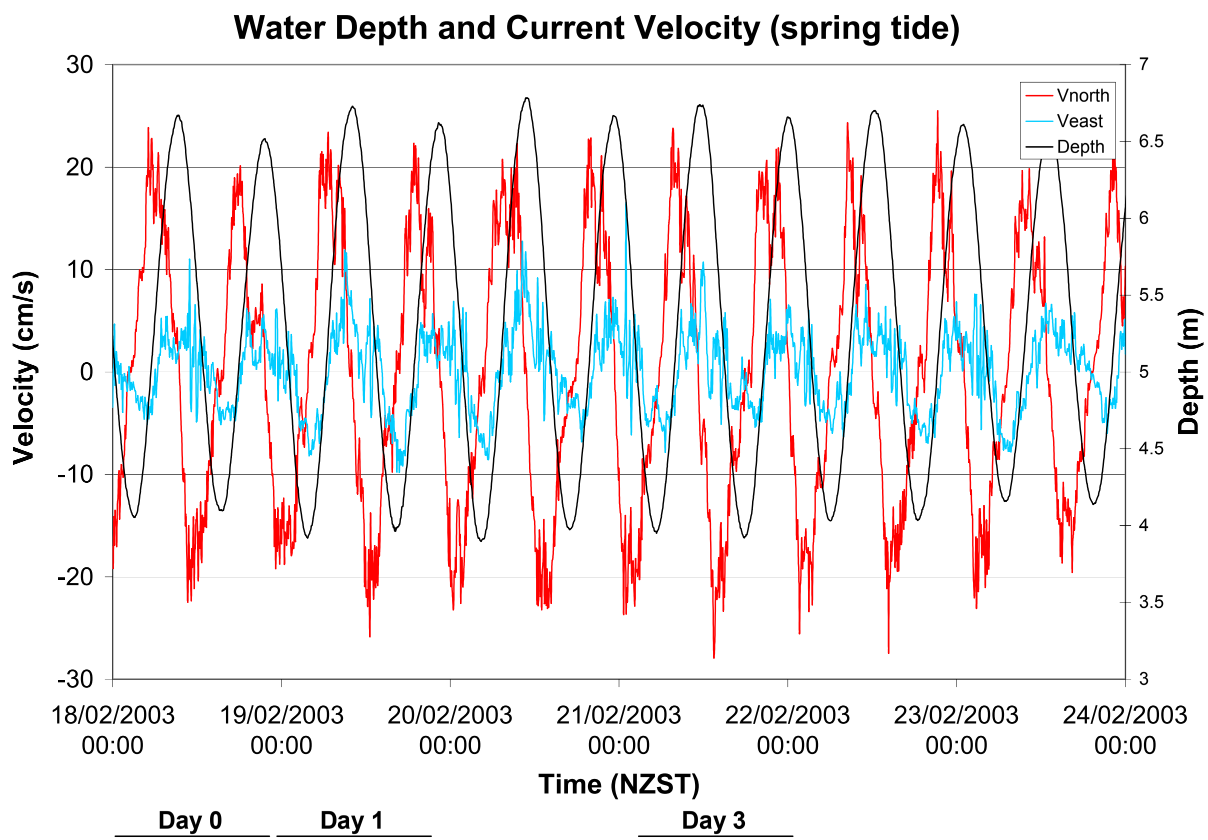

Figure 6: Northward and eastward water velocity components at Site TK, early in the deployment (during spring tides). Values on the left-hand axis indicate current speeds; positive values indicate flows to the north and east, while negative values denote southward and westward movement. North-south currents dominated the tidal flow at TK. Water depth (black line) indicates tidal state.

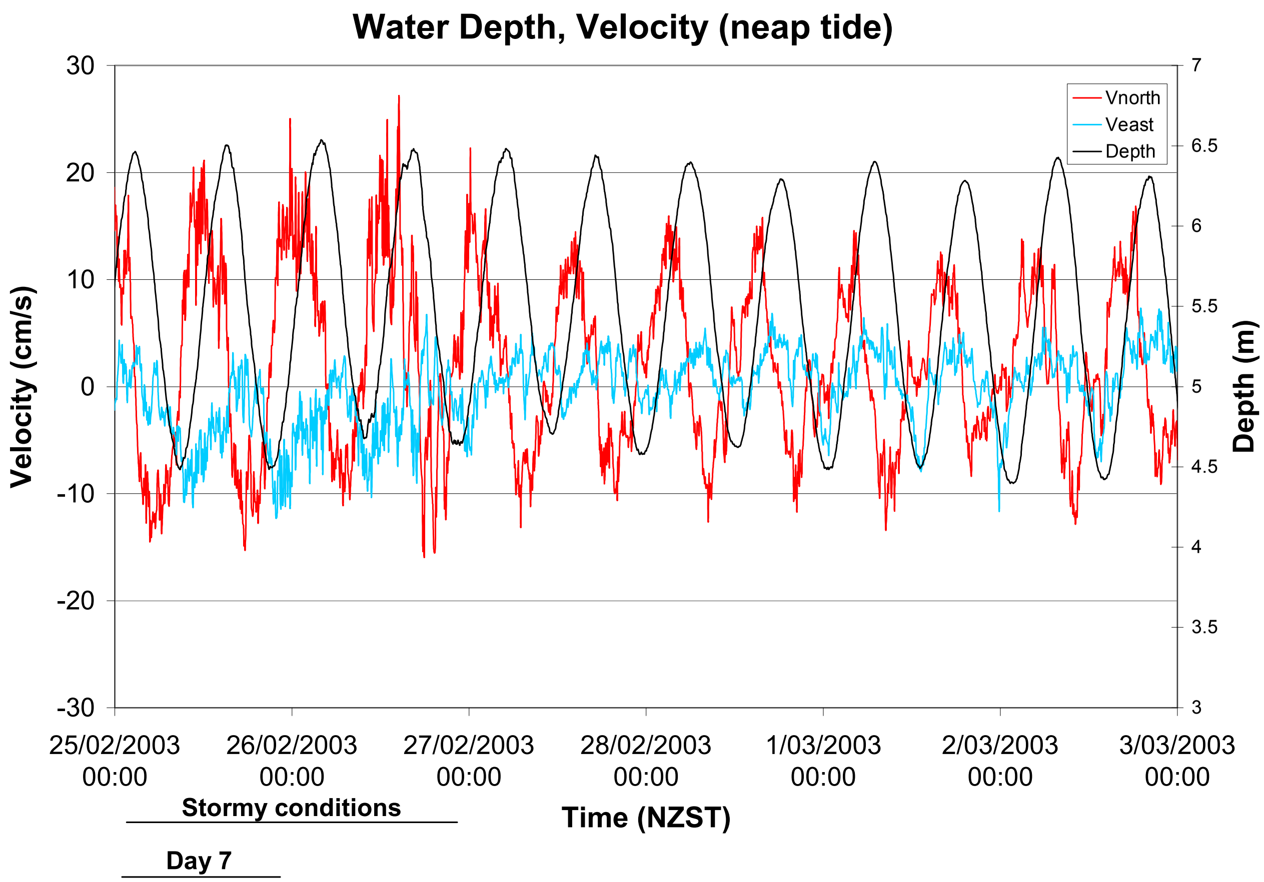

Figure 7: Northward (red) and eastward (blue) water velocity components at Site TK, mid-way through the deployment during neap tides. Values on the left-hand axis are current speeds; positive values indicate flows to the north and east, while negative values denote southerly and westerly movement. North-south currents dominated the tidal flow at TK. Water depth (black line) indicates tidal state.

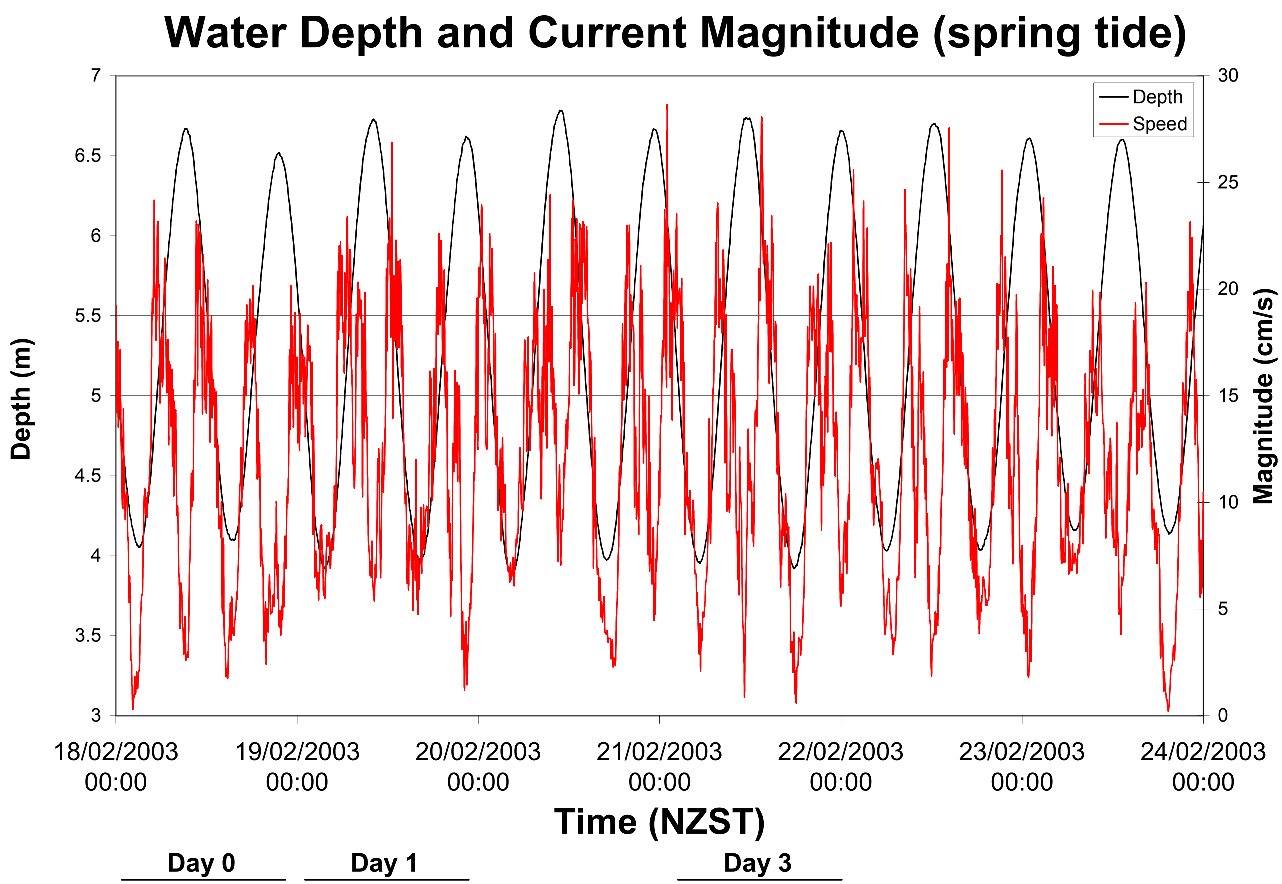

Figure 8: Spring tide current magnitudes at Site TK (calculated as a directional vector with north and east components combined) are shown in red. Water depth as an indication of tidal state is given in black.

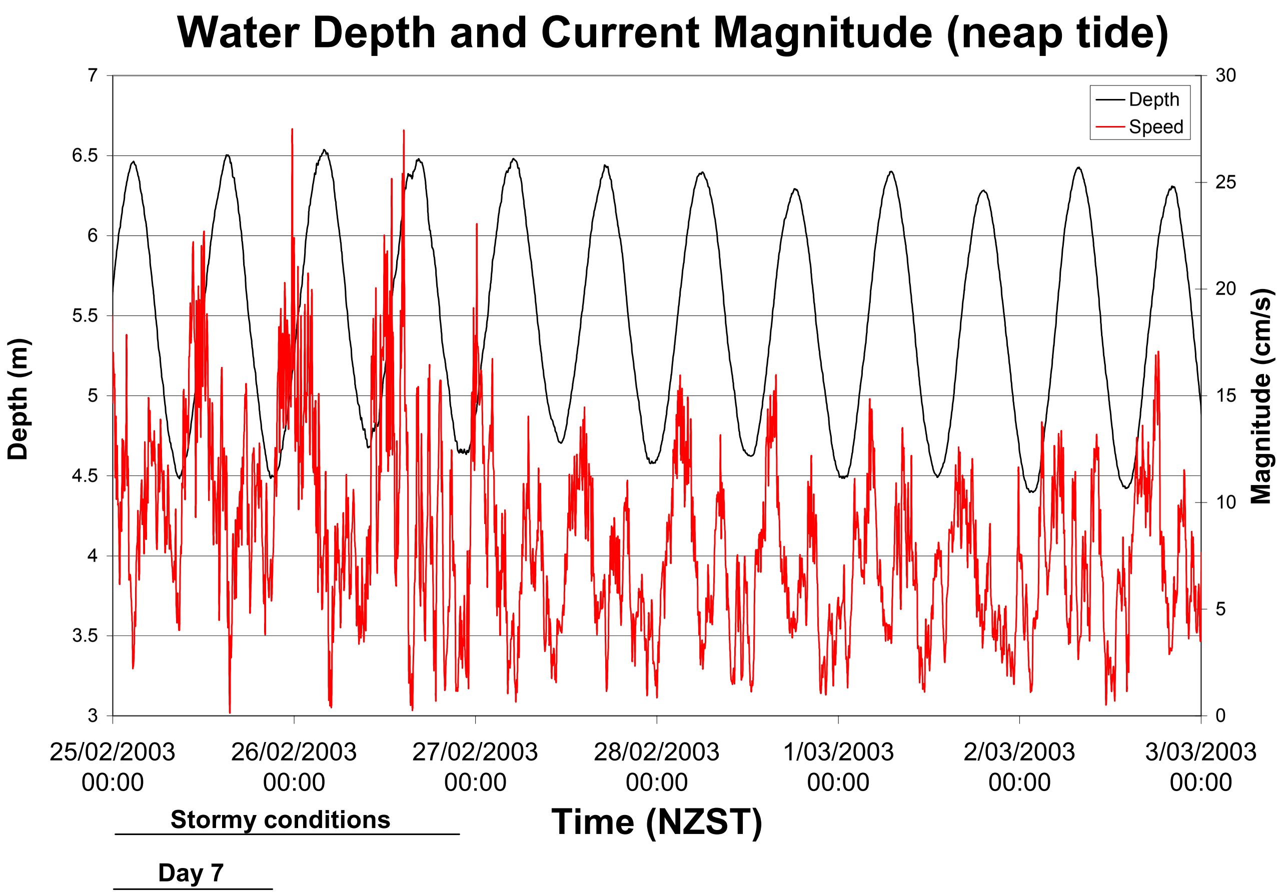

Figure 9: Neap tide current magnitudes at Site TK (calculated as a directional vector with north and east components combined) are shown in red. Water depth as an indication of tidal state is given in black.

Waves, tides, and suspended sediment concentrations.

During the first part of the experiment, the currents were strong due to the effects of spring tides, but weather conditions were generally calm. At both sites, the average significant wave height (H_{sig}) was below 5 cm, and was almost nil inside Mahurangi Harbour at Site TK. Energy from waves of this size essentially did not penetrate to the bed at either site (U_{sigb} values <2.5 cm/s). Site MI had almost no measurable suspended sediment for the first week of the experiment, and the clarity of the water at this site was noticeable to divers (Fig. 10).

Divers also noted that visibility was greatly reduced during low tide in Mahurangi Harbour, and the DOBIE-OBS's registered tidally-correlated changes in suspended sediment concentration (SSC, Fig. 12). Peak turbidity was at slack low water, with SSC values exceeding 10 mg/l on many occasions. At high tide, when the harbour was flooded by marine coastal waters, SSC values generally dropped to nearly zero.

The storm that intensified during Days 7 and 8 produced average significant wave heights of 15-20 cm. Wave heights were often highest at high tide, perhaps because of greater fetch during tidal inundation. Wave heights were actually greater inside the harbour than they were on the leeward side of Motuketekete Island, likely related to average wind direction (Figs. 11 and 13). Some of the wave energy did penetrate to the bed at both sites. Orbital bed velocity (U_{sigb}) was generally <15 cm/s at Site MI, but was >25 cm/s at Site TK. These velocities indicate that storm-related wave energy can be comparable to tidal energy at the seabed in TK and can be much greater than tidal energy at MI.

The concentration of suspended sediments increased during the storm at both sites. Because the sediments are coarse at MI, however, there was little fine sediment available for resuspension and transport during the storm, and SSC values peaked at about 20 mg/l. At Site TK, SSC values reached over 150 mg/l during the storm. The tidally driven changes in suspended sediment concentration at Site TK usually vary between 0 and 15 mg/l, so the storm increased SSC by about an order of magnitude.

There was no obvious resuspension of terrigenous material from the 7 mm plots, judging from the physical data (Figs. 10 and 12). Divers placed instruments in locations where we were likely to capture this phenomenon, but plumes streaming off the plots (if they occurred) might have been diluted and mixed prior to reaching the optical sensors. The instruments cannot distinguish terrigenous particles from marine-derived particles, and therefore detection sensitivity was perhaps an issue.