

4.3.2. M_w 8.5 Tonga-Kermadec subduction zone scenario

The arrival times of the first and maximum waves (as calculated by the method outlined in section 4.1) for the tsunami generated by a M_w 8.5 subduction zone earthquake in the Tonga-Kermadec trench are given in Figures 14-17. A summary of their results is as follows:

Wave arrival times:

First wave: Between 60-170 minutes after fault rupture at the outer coast. Up to 4 hours after fault rupture in the Hokianga and Kaipara harbours.

Largest wave: The first wave is the largest wave for some of the more exposed eastern coast. In enclosed bays and on the west coast the maximum wave may occur considerably after the first wave (up to 3 hours later).

Maximum wave heights for the Tonga-Kermadec M_w 8.5 scenario for the three sea levels are shown in Figures 18, 20 and 22. Maximum water speeds are shown in Figures 19, 21 and 23. Maximum wave heights at MHWS of 4m or greater are recorded around the mainland coast adjacent to the Cavalli Islands and south near Whangamumu Peninsula. However, wave heights around 3m are experienced around much of the Northland coast. Sea level rises of 30 and 50cm lead to corresponding increases in wave heights around the coast. Water velocities reach their maximum generally around the entrance to narrow embayments but also particularly around Whangamumu and Ahipara so there is not a direct correlation between wave heights and velocity.

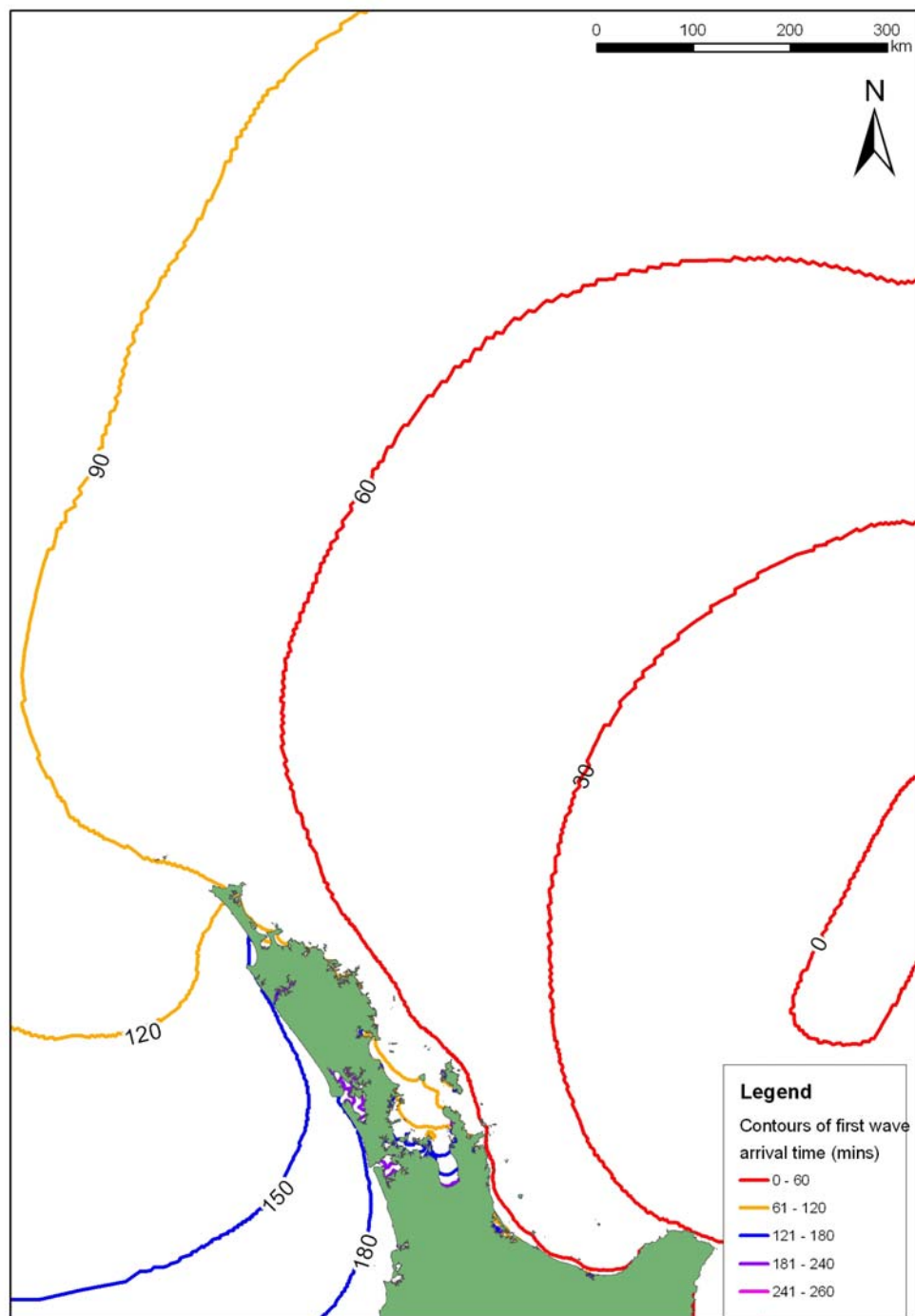


Figure 14: Full domain: 30 minutes interval arrival times for the first wave for the M_w 8.5 Tonga-Kermadec subduction zone scenario.

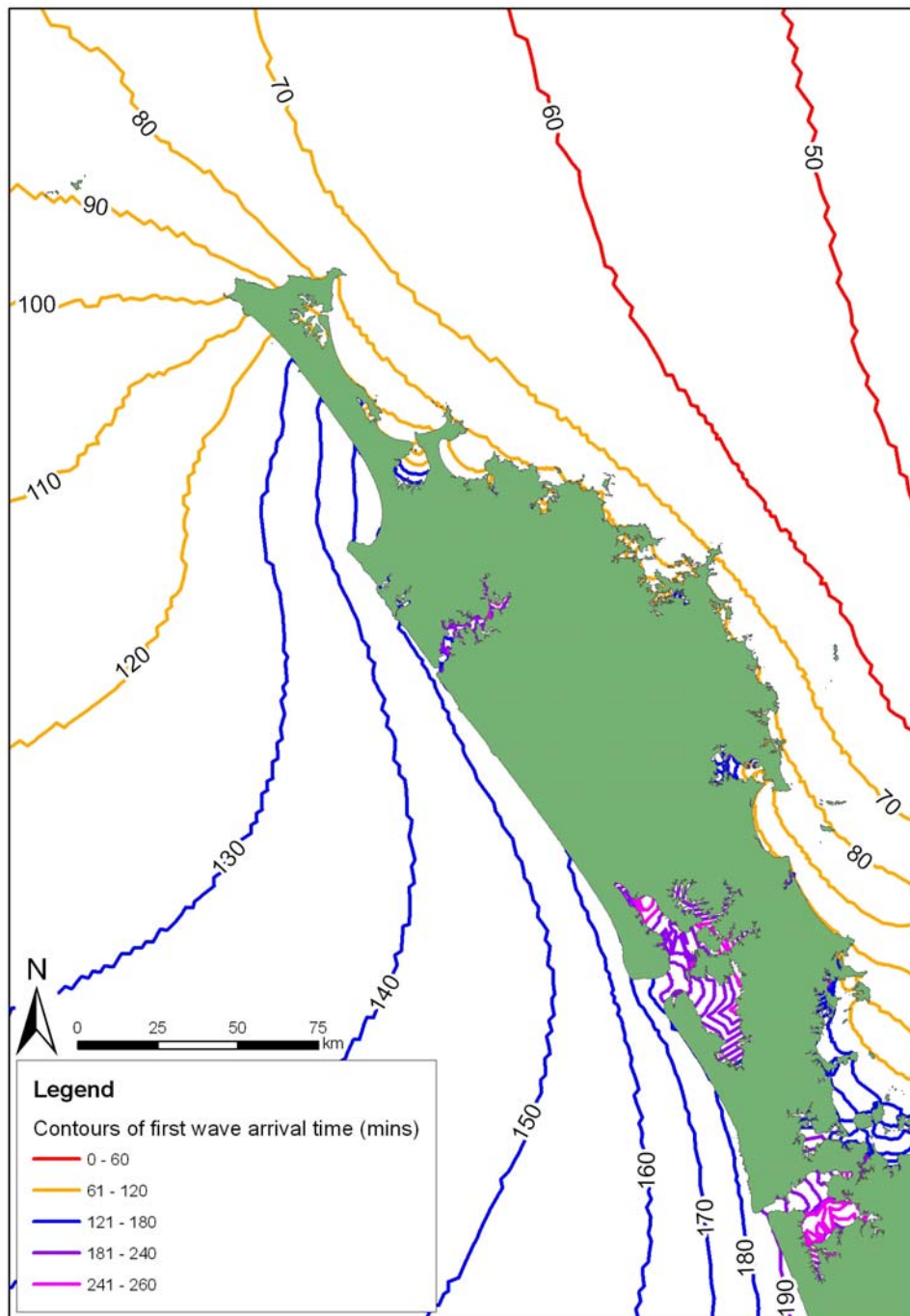


Figure 15: Northland: 10 minutes interval arrival times for the first wave for the $M_w 8.5$ Tonga-Kermadec subduction zone scenario.

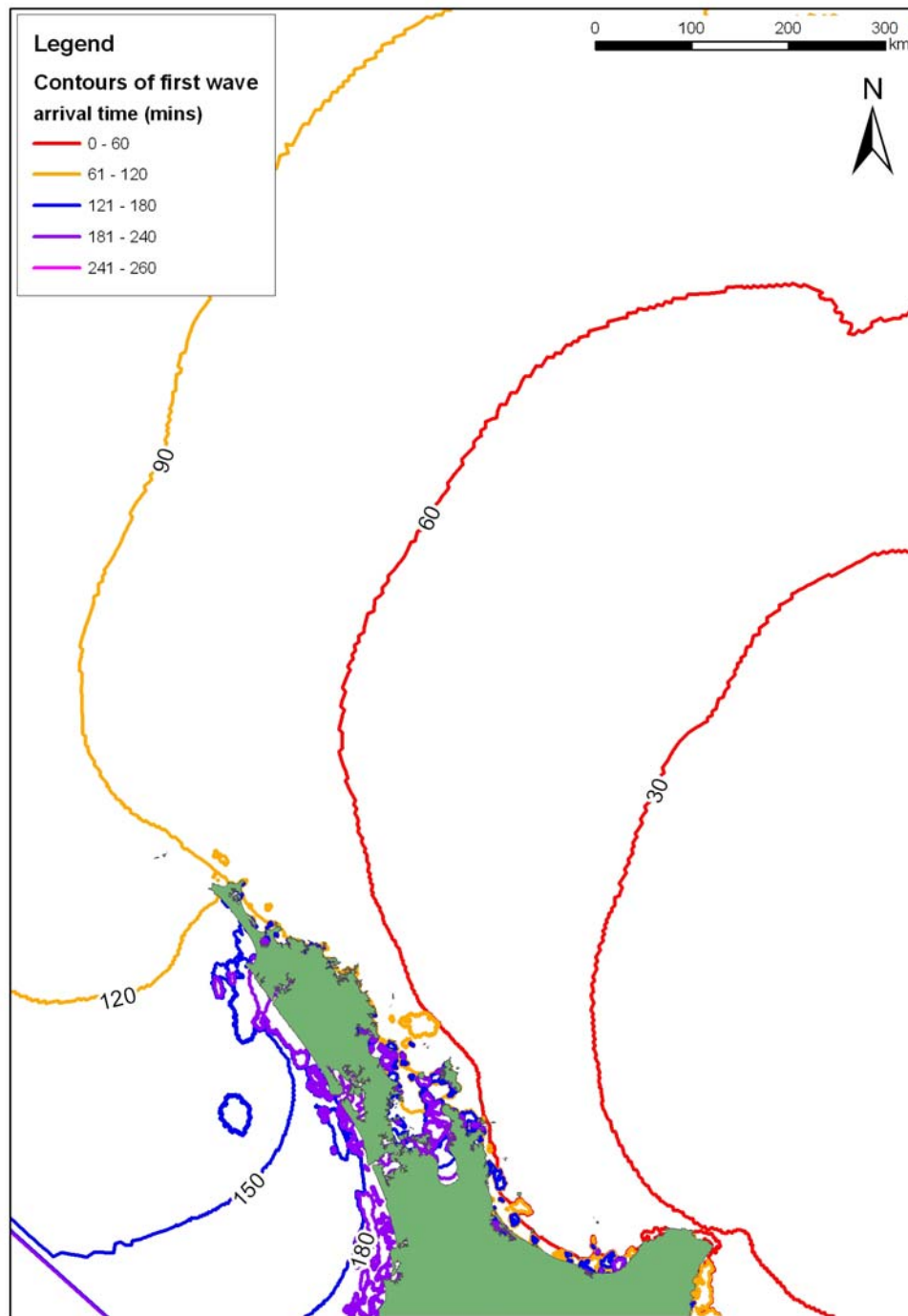


Figure 16: Full domain: 30 minutes interval arrival times for the maximum wave for the $M_w 8.5$ Tonga-Kermadec subduction zone scenario.

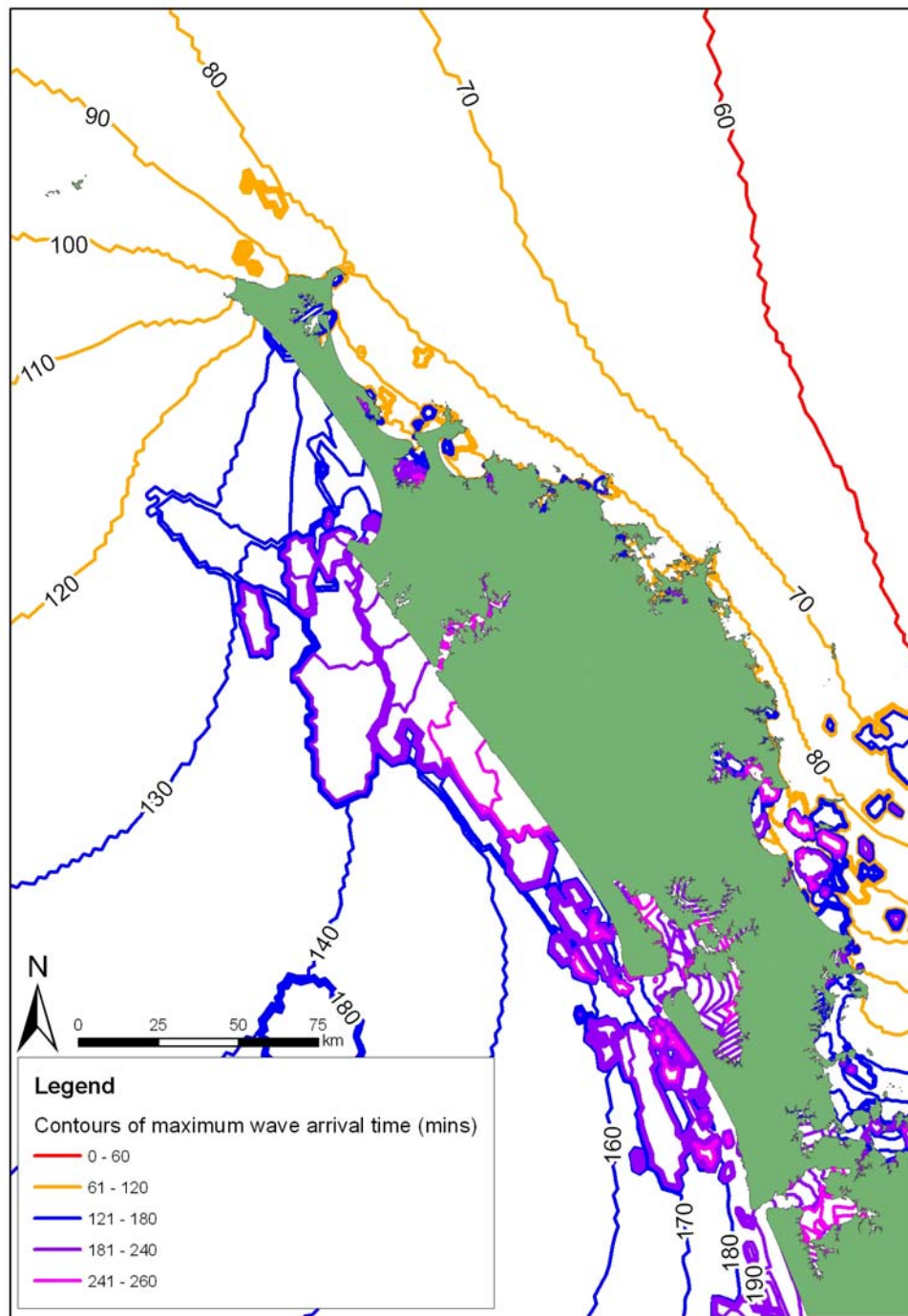


Figure 17: Northland: 10 minutes interval arrival times for the maximum wave for the $M_w 8.5$ Tonga-Kermadec subduction zone scenario.

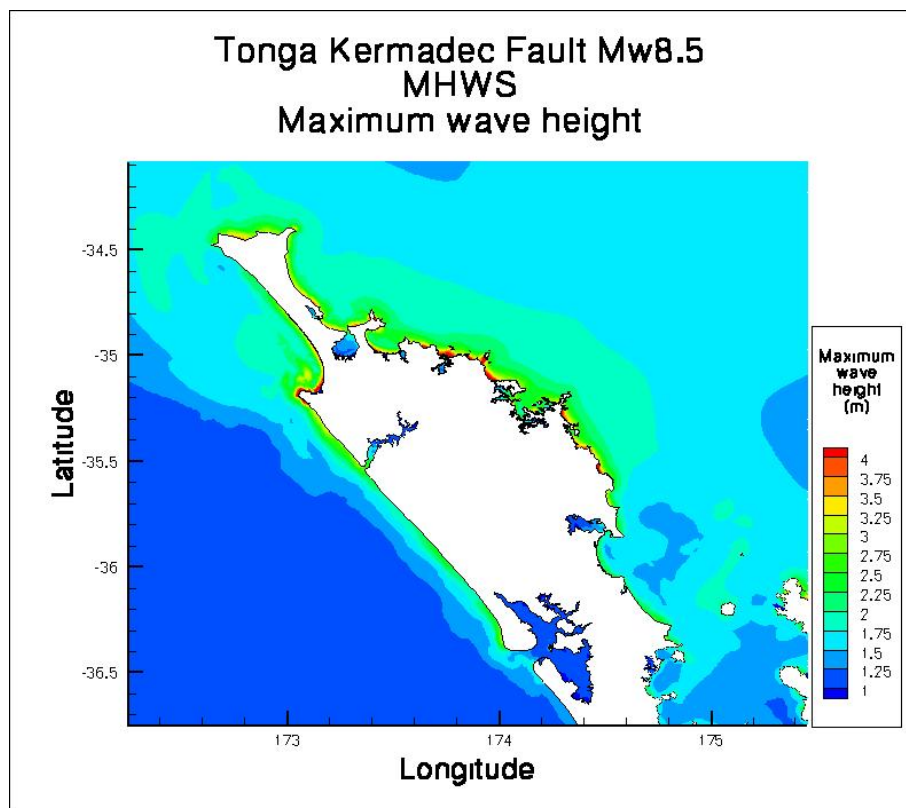
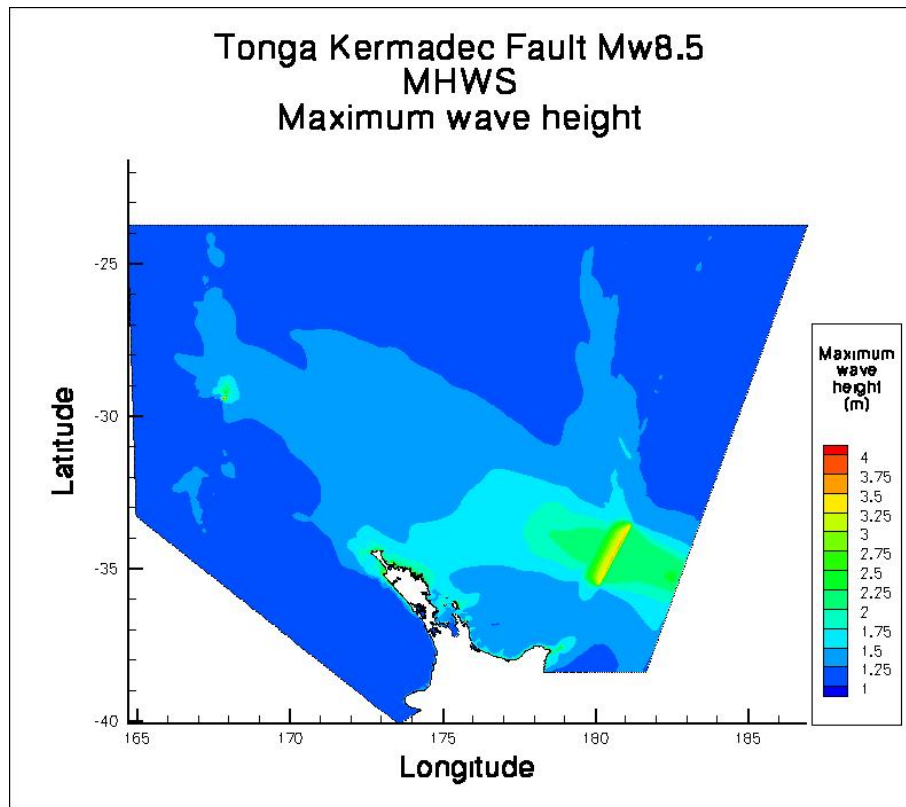


Figure18: Maximum water surface elevations for the $M_w8.5$ Tonga-Kermadec subduction zone scenario at MHWS - New Zealand (upper) and Northland (lower).

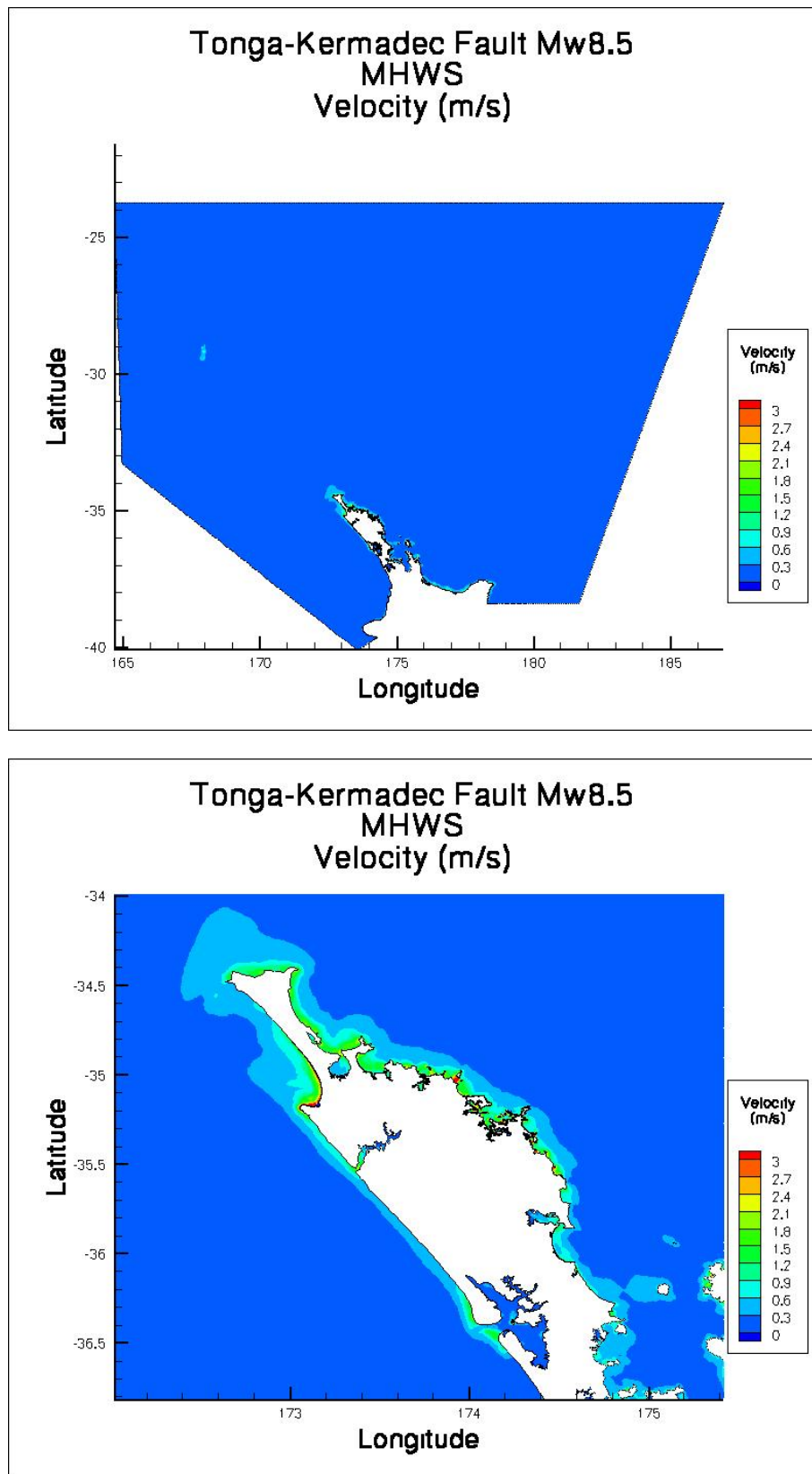


Figure 19: Maximum water velocities for the $M_w8.5$ Tonga-Kermadec subduction zone scenario at MHWS - New Zealand (upper) and Northland (lower).

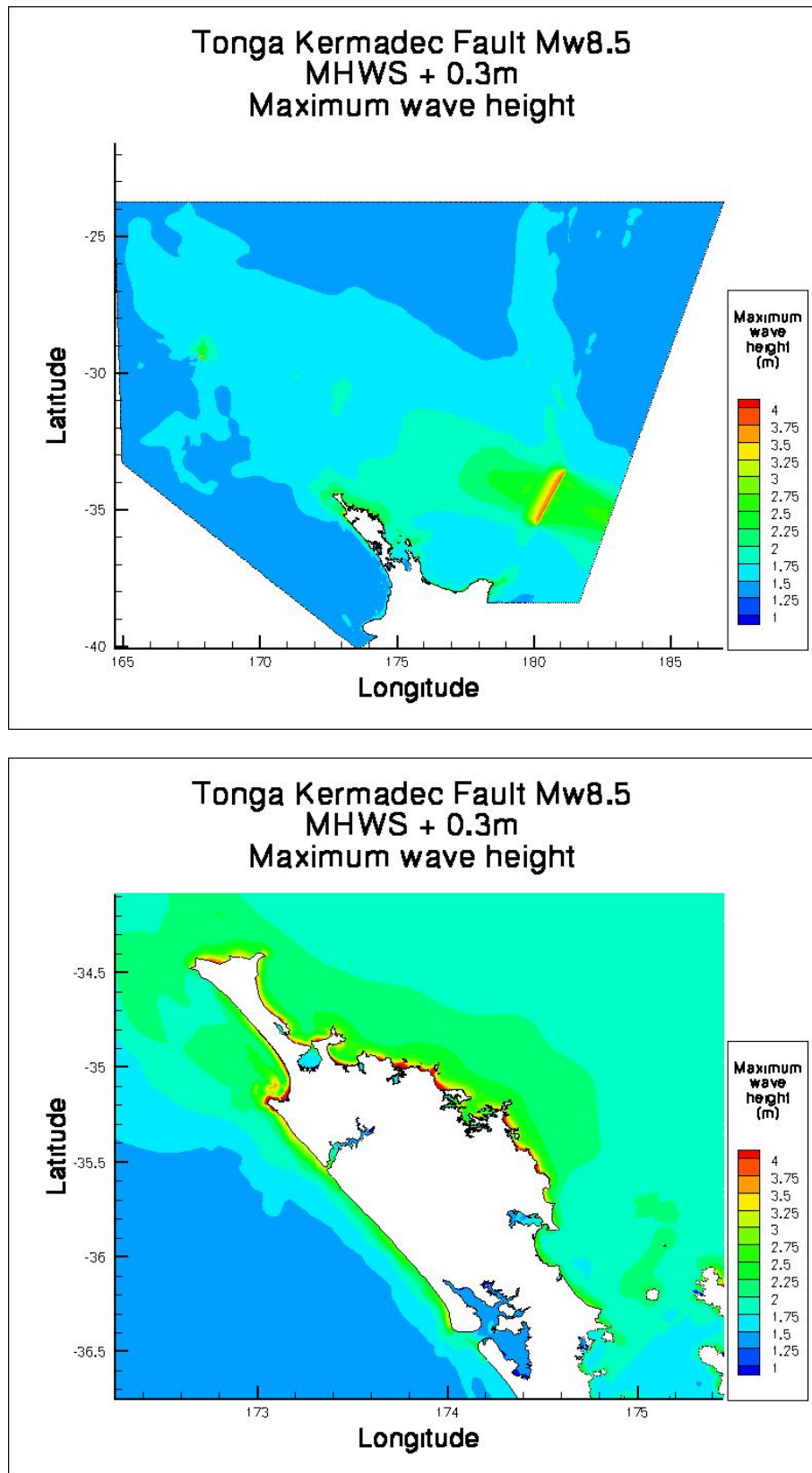


Figure 20: Maximum water surface elevations for the $M_w8.5$ Tonga-Kermadec subduction zone scenario at MHWS + 30cm – New Zealand (upper) and Northland (lower). Note change in scale.

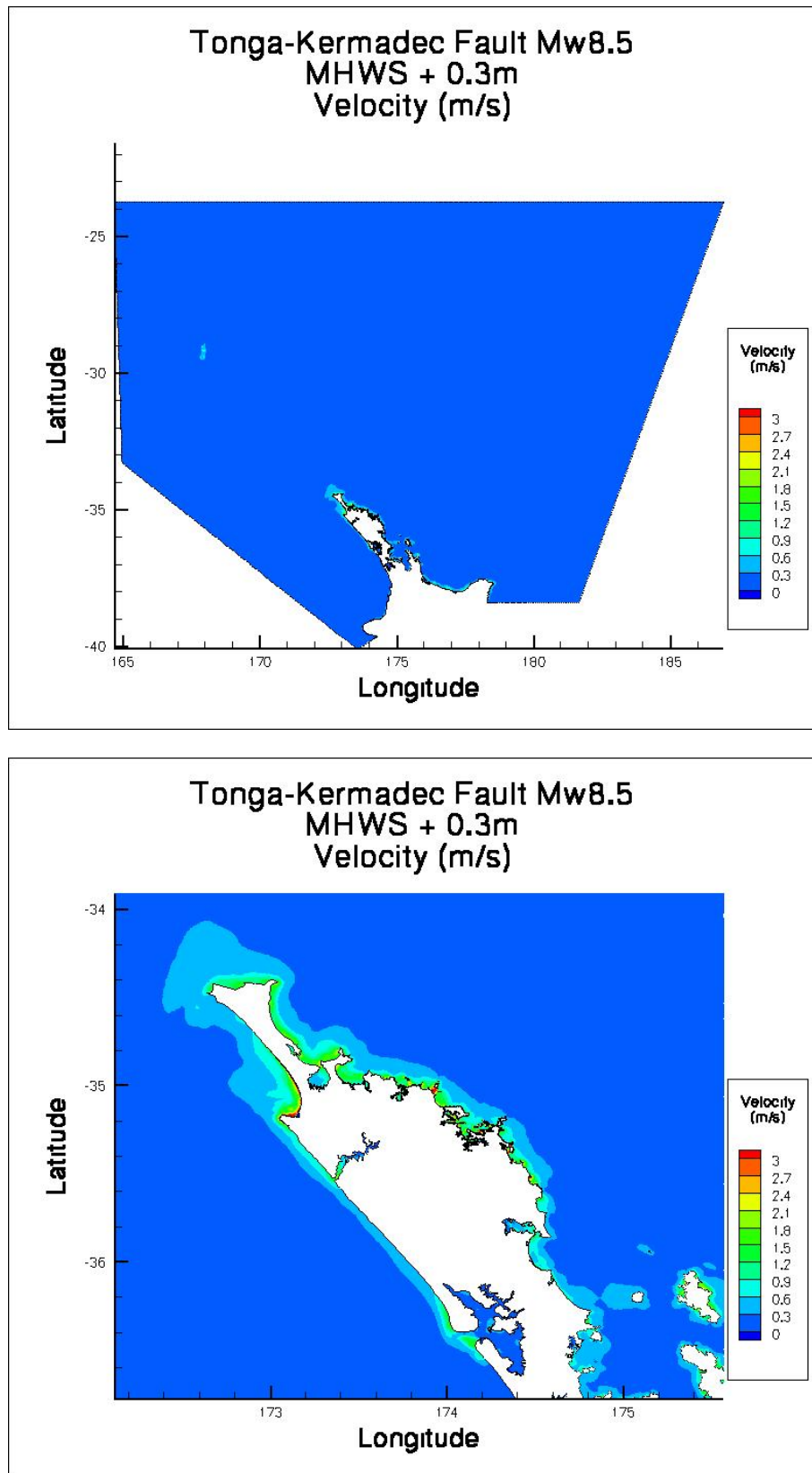


Figure 21: Maximum water velocities for the $M_w8.5$ Tonga-Kermadec subduction zone scenario at MHWS + 30cm – New Zealand (upper) and Northland (lower).

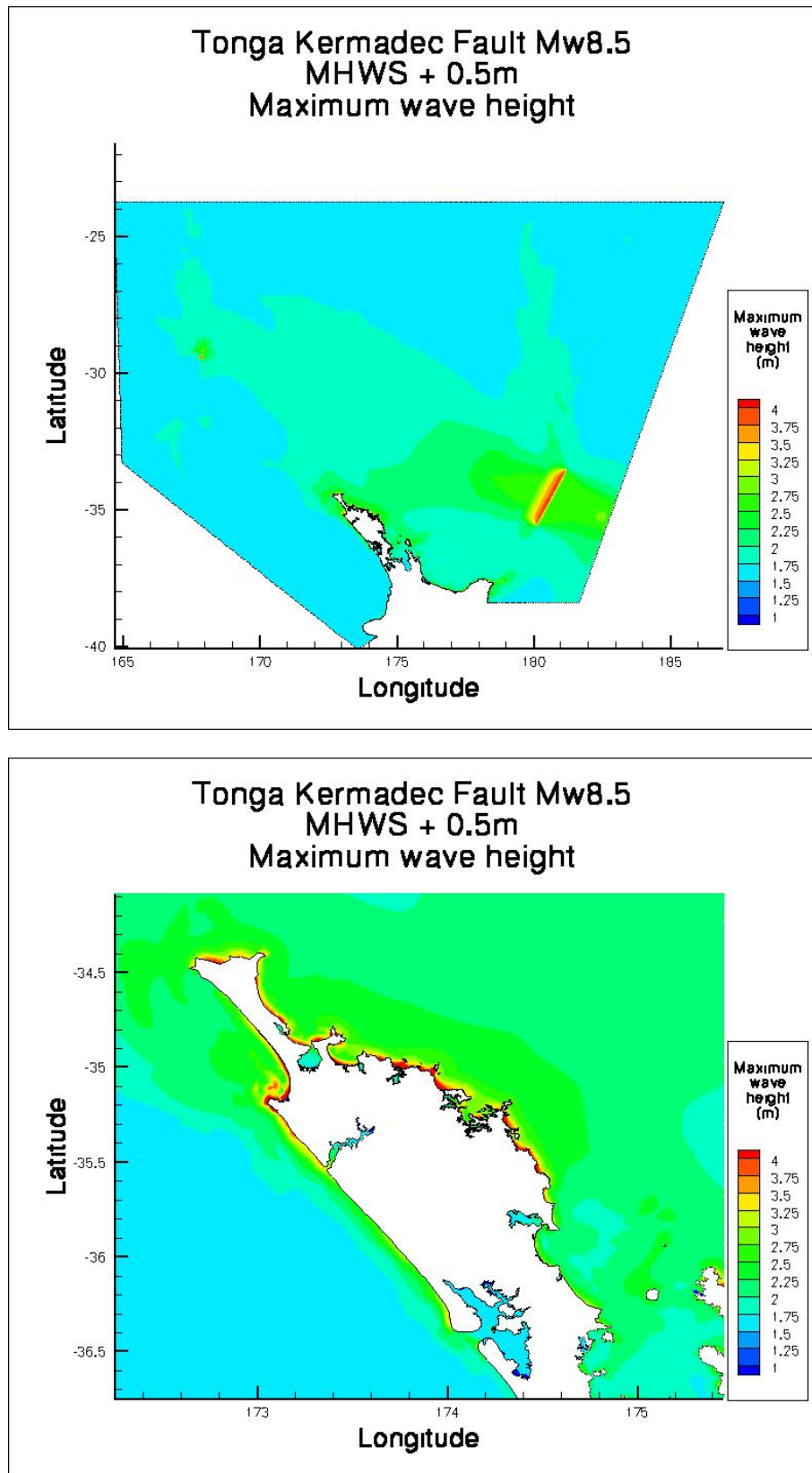


Figure 22: Maximum water surface elevations for the $M_w8.5$ Tonga-Kermadec subduction zone scenario at MHWS + 50cm – New Zealand (upper) and Northland (lower).

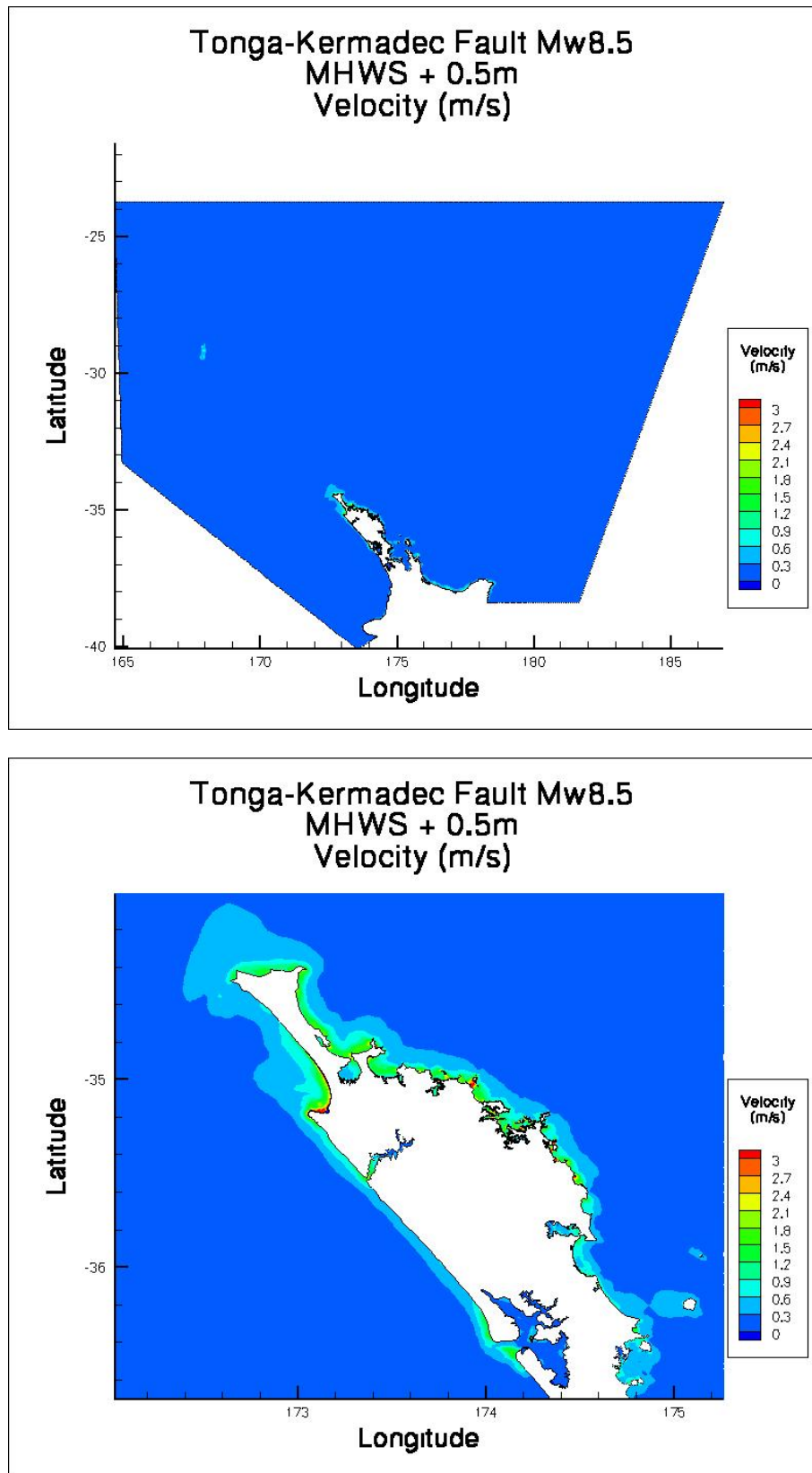


Figure 23: Maximum water velocities for the $M_w8.5$ Tonga-Kermadec subduction zone scenario at MHWS + 50cm – New Zealand (upper) and Northland (lower).