a small fraction of the total observed surge, and only centimetres at the other locations. Note that this wind-induced surge occurs well after the peak surge occurred in both the observations and simulations with full forcing.

A simple steady state argument balancing the wind stress with the pressure gradient can be used to calculate the slope of the sea surface in a body of water with a constant depth $D$ (Pugh, 2004):

$$\text{slope} = \frac{C\rho_{air}U^2}{g\rho D}, \tag{4}$$

where $C$ is the coefficient of friction, $\rho_{air}$ is the density of air, $g$ is the acceleration due to gravity, $U$ is the wind speed, and $\rho$ is the density of water. Given $C = 10^{-3}$, $\rho_{air} = 1.23$ kg m$^{-3}$, $\rho = 1035$ kg m$^{-3}$, wind speed $U = 20$ m s$^{-1}$, and depth $D = 100$ m, the slope of the sea surface is approximately $5 \times 10^{-7}$. At Point Atkinson, a westerly wind can act over a small distance of approximately 50 km, giving a sea surface elevation on the order of centimetres in agreement with the model findings. Since the Strait of Georgia is not a constant depth and is up to 400 m deep, this calculation is only an approximation. Choosing a larger depth would result in an even smaller estimate for the sea surface elevation caused by wind stresses. Further, northwesterly winds would induce the largest elevations at Point Atkinson due to the large distance over which the winds can act.

Next, the surge amplitude decreases by a few centimetres at all four locations if local atmospheric pressure is not included in the surface forcing. This drop is smaller than the IB sea level change calculated by equation (1), approximately 1 cm rise in sea level associated with 1 hPa drop in atmospheric pressure. In this event, the pressure at the Vancouver International Airport dropped to about 99 000 Pa (Environment Canada, 2014a), corresponding to a 20 cm rise in sea level. This magnitude is ~~more~~ in line with the findings of (Murty et al., 1995) that the IB contributes up to $^1/_3$ of the total surge amplitude. In our model,
including ~~or excluding~~
~~because~~ the influence of remote
~~where~~ including
atmospheric pressure forcing i~~s included~~ in the sea level at the open boundary, ~~the above tests simply~~ suggest that the local atmopsheric pressure generates a sea level change that is smaller

Our results

~~the simulations~~ produces realistic surge amplitudes compared with the runs ~~excluding~~ only including local atmospheric pressure forcing.