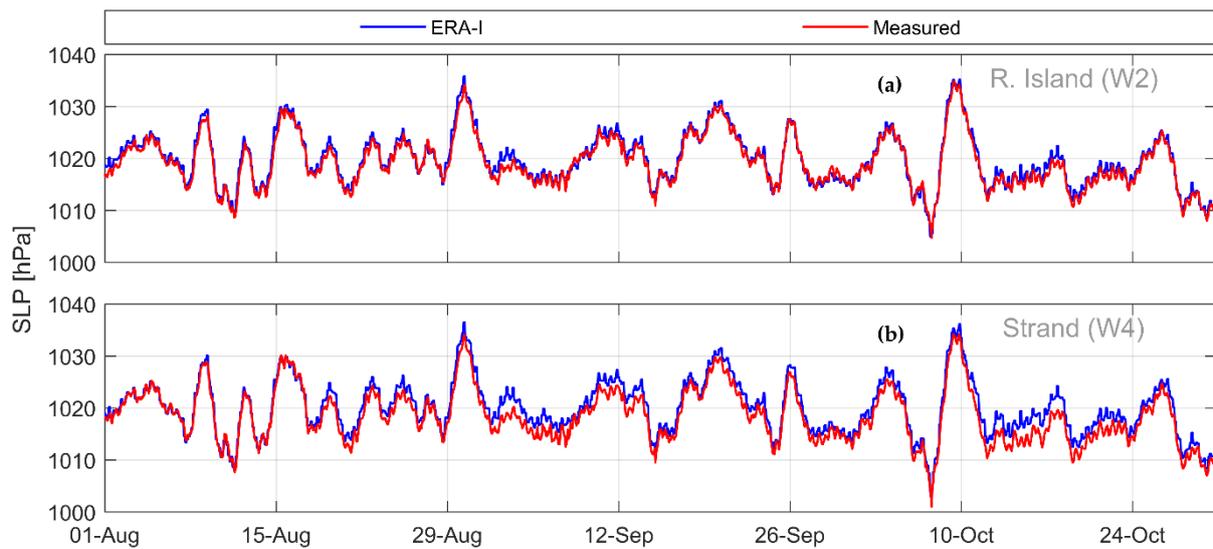
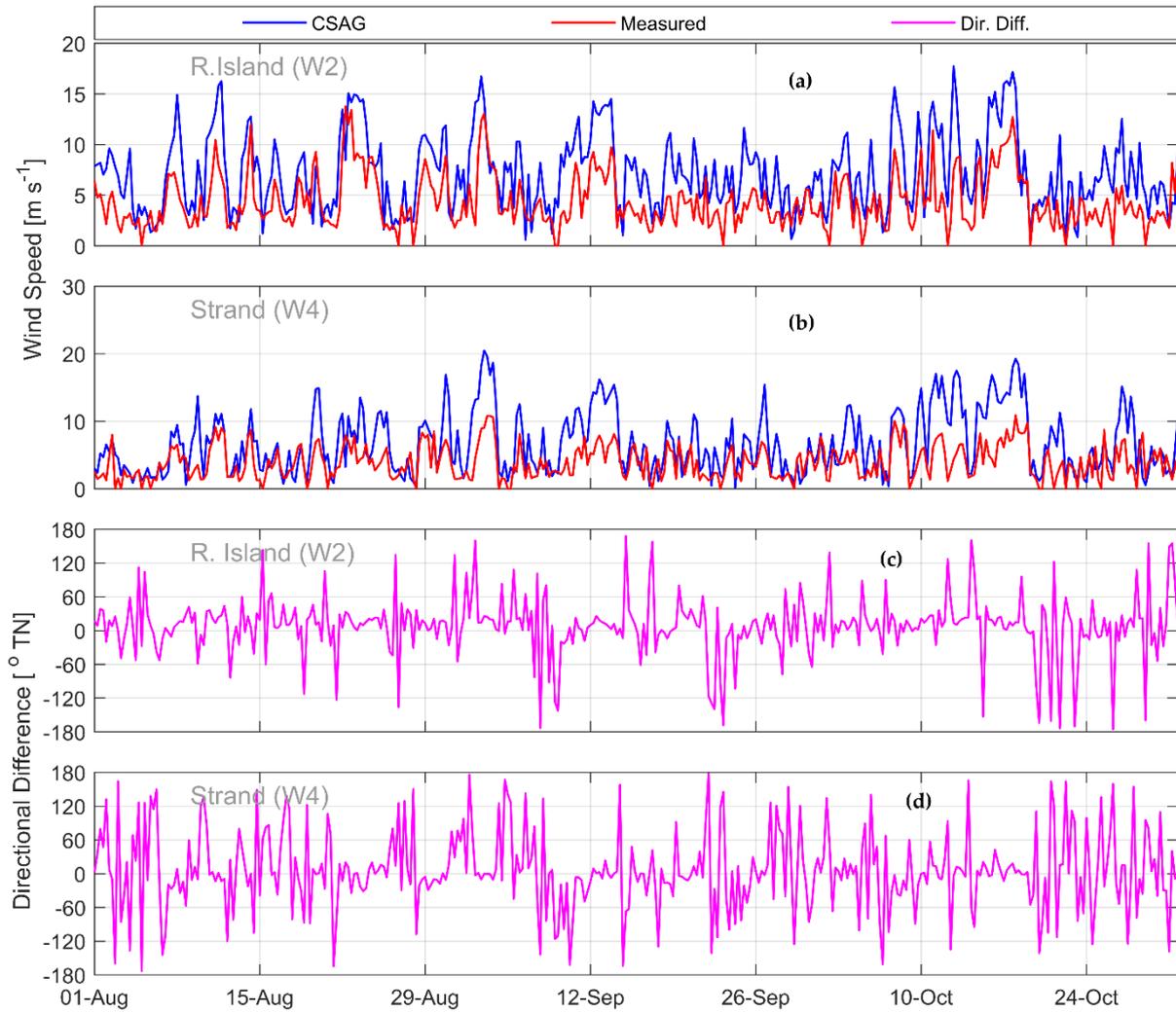


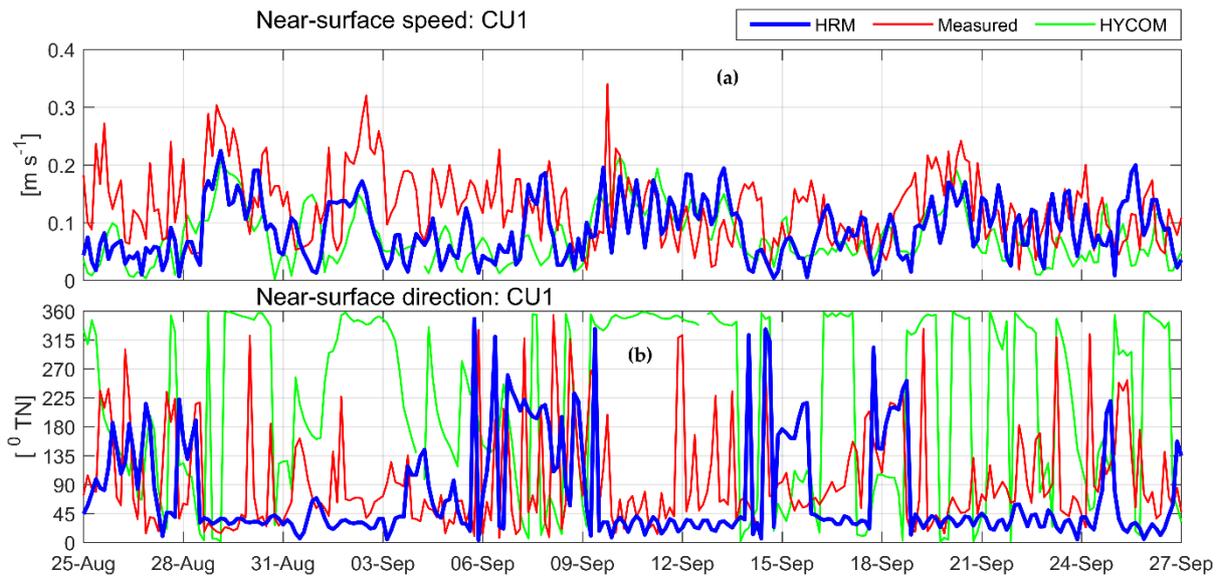
## Supplementary Materials



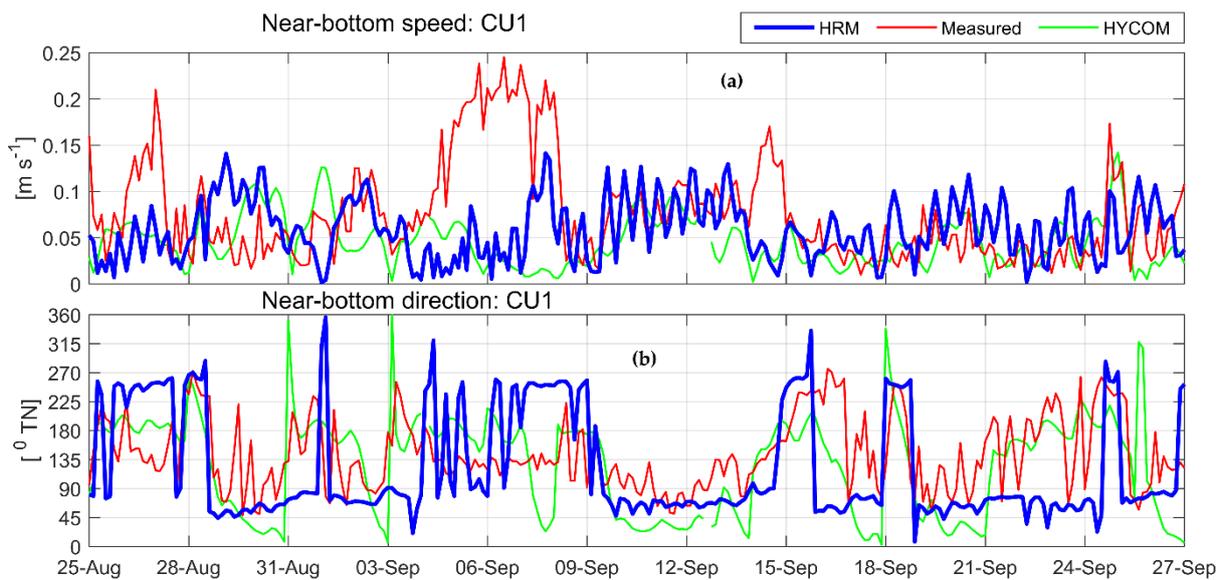
**Figure S1.** Comparison between sea level pressure from the ERA-I atmospheric forcing and available measurements. A point in each of the two bays is shown, namely (a) Robben Island (W2) and (b) Strand (W3). Performance is presented for the period between August and October 2006 at these two sites but is very similar to the other two measurement sites and for the corresponding period in 2010. Performance metrics for the other sites and period can be found in Table A1.



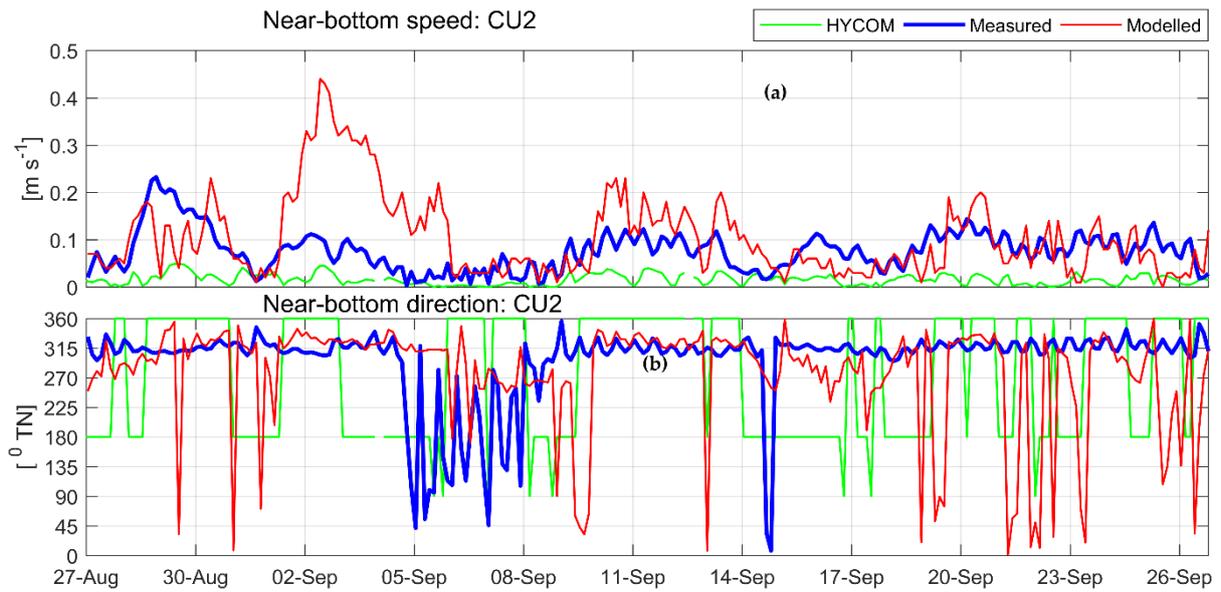
**Figure S2.** Comparison between wind speed and direction from the WASA wind forcing and available measurements from **(a, c)** Robben Island (W2) and **(b, d)** Strand (W4). Three other sites around the Peninsula are not shown here, but their validation metrics are available in Table A1. Performance is presented for the period between August and October 2006, with the same comparison having been made for the corresponding 2010 period. In **c** and **d**, a positive (negative) value indicates an easterly (westerly) error.



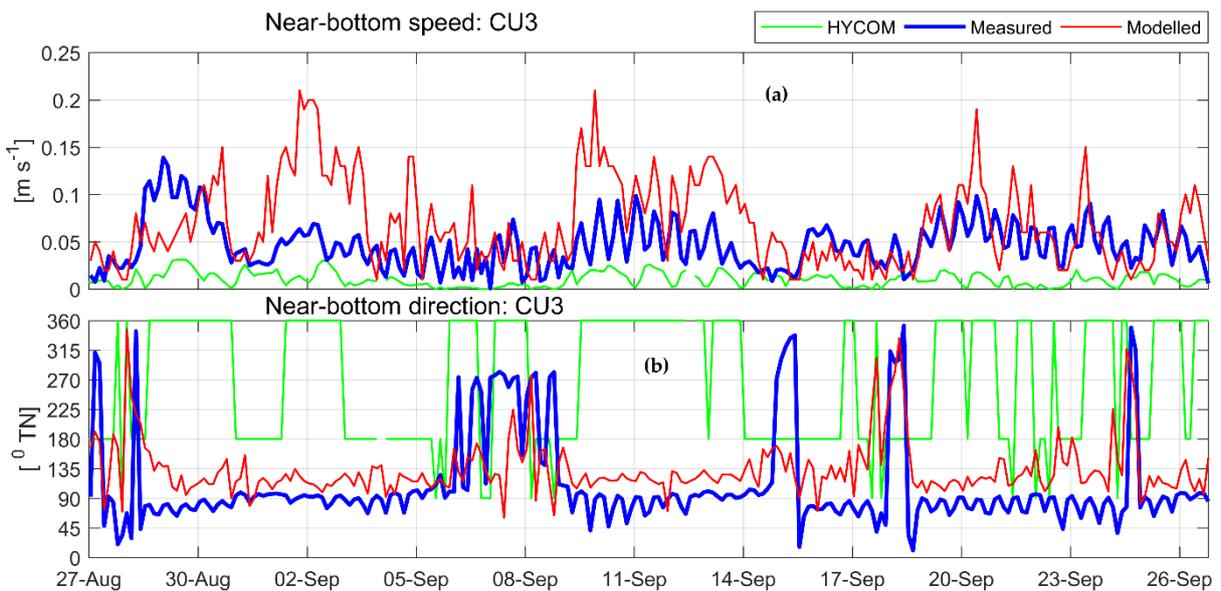
**Figure S3.** Timeseries comparison of modelled and measured near-surface current speeds (a) and directions (b) at the calibration site CU1 north-west of Green Point. The global HYCOM solution is shown for reference.



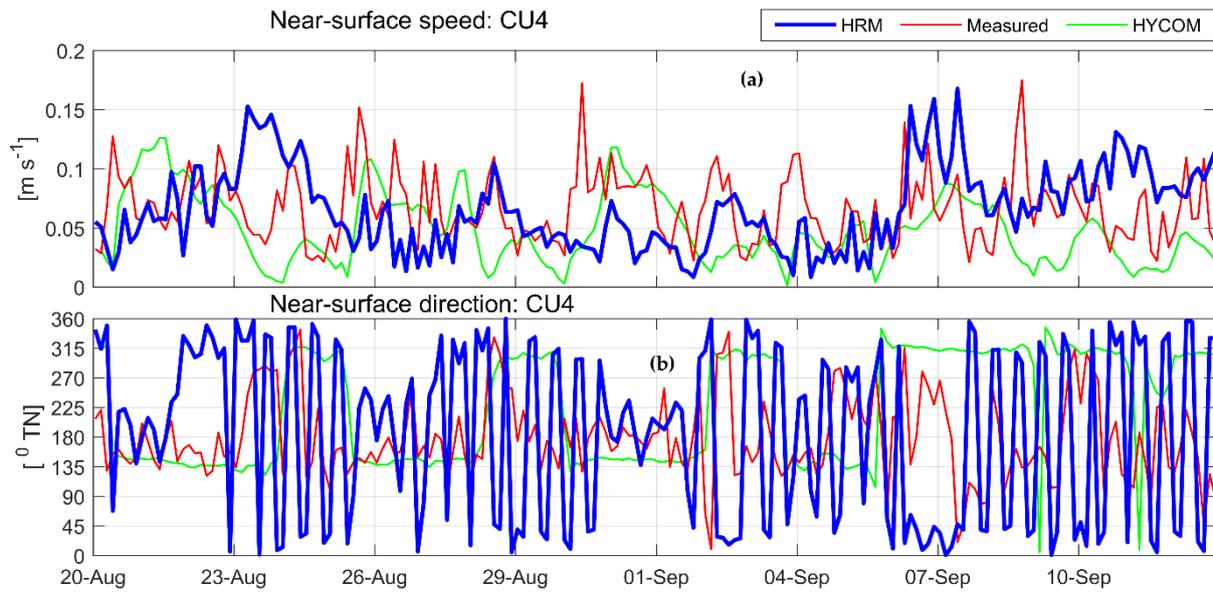
**Figure S4.** Timeseries comparison of modelled and measured near-bottom current speeds (a) and directions (b) at the calibration site CU1 north-west of Green Point. The global HYCOM solution is shown for reference.



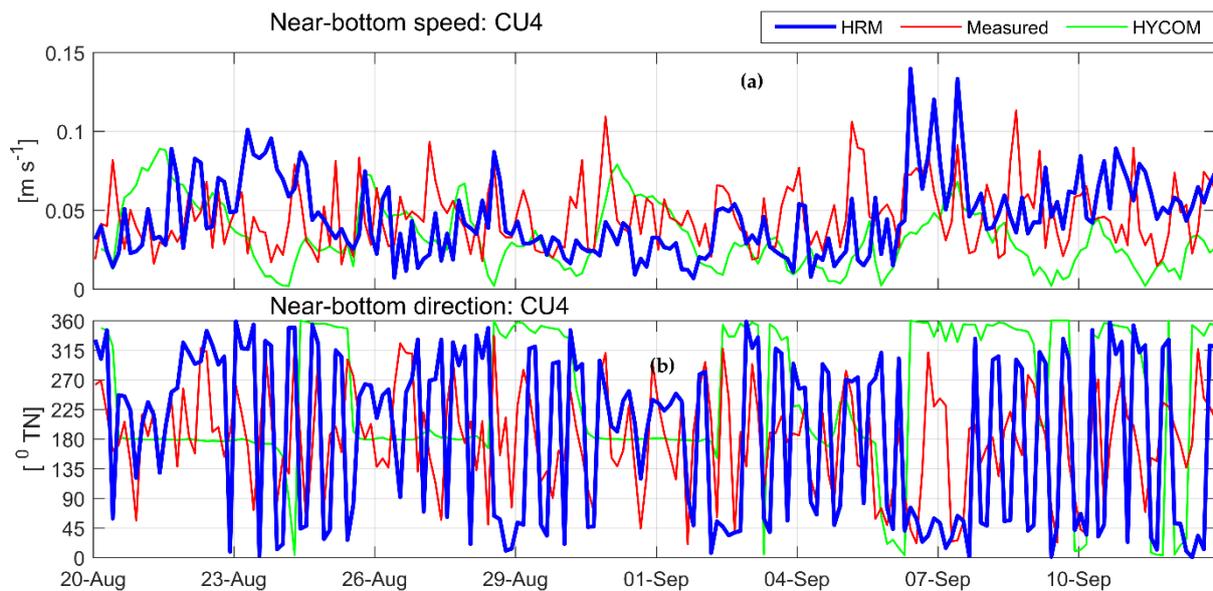
**Figure S5.** Timeseries comparison of modelled and measured near-bottom current speeds (a) and directions (b) at the calibration site CU2, in between Robben Island and the mainland. The global HYCOM solution is shown for reference.



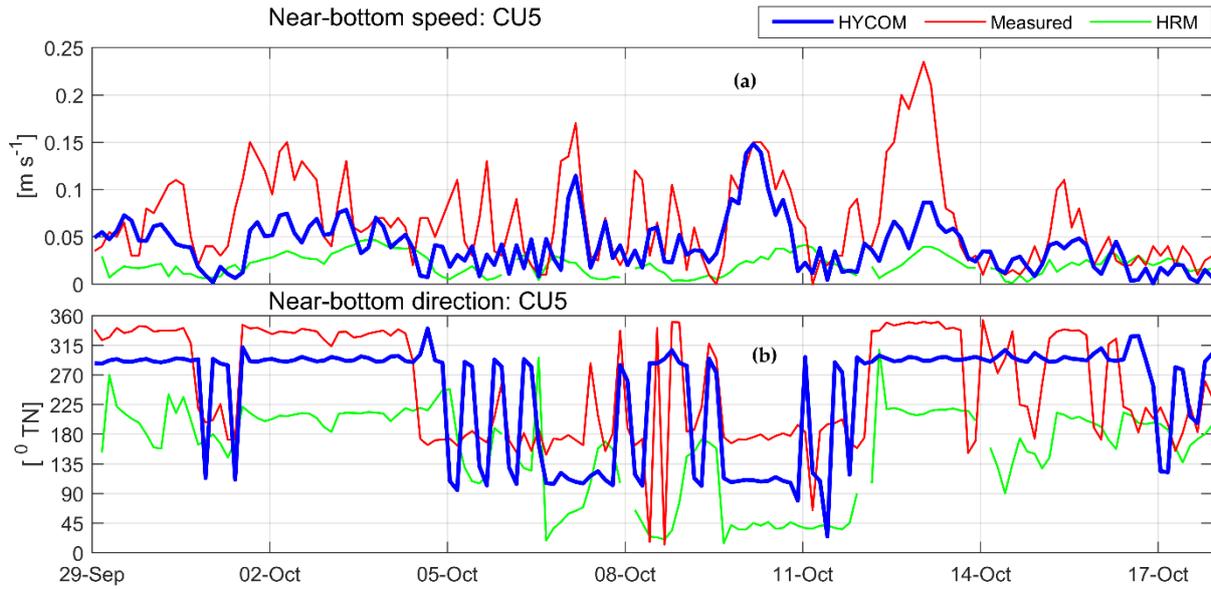
**Figure S6.** Timeseries comparison of modelled and measured near-bottom current speeds (a) and directions (b) at the calibration site CU3, just north of the Port of Cape Town. The global HYCOM solution is shown for reference.



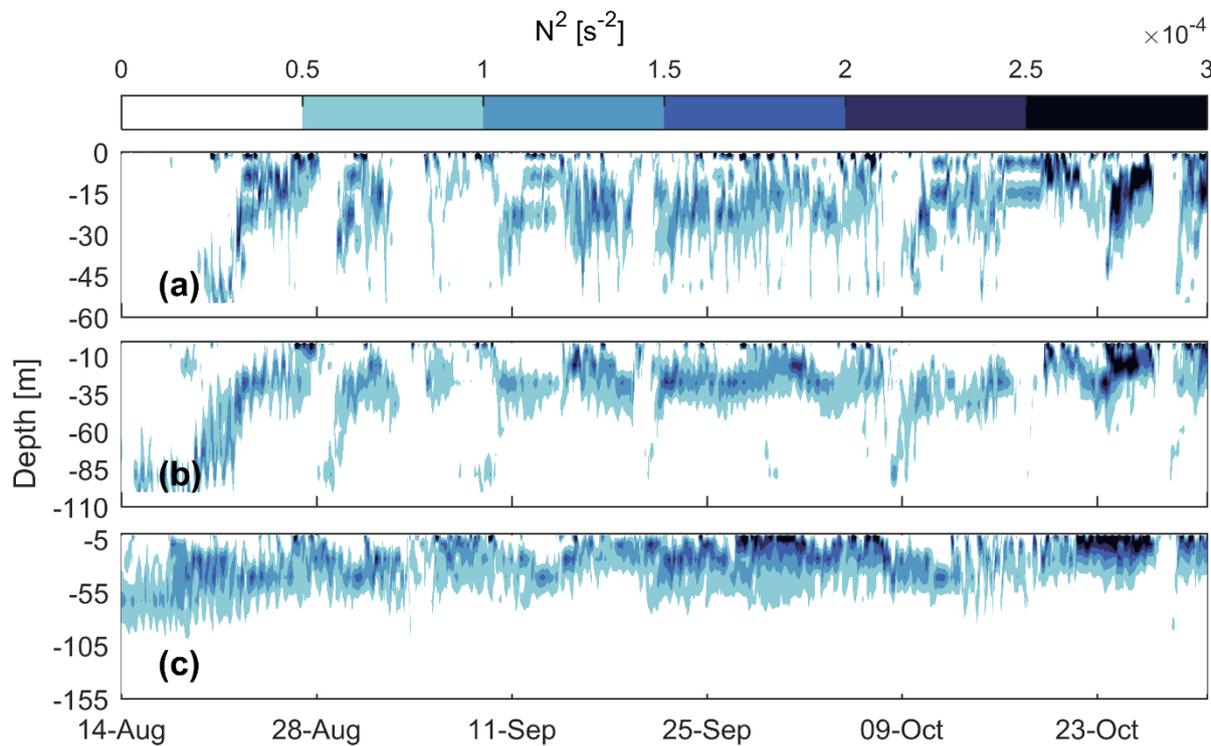
**Figure S7.** Timeseries comparison of modelled and measured near-surface current speeds (a) and directions (b) at the calibration site CU4, near Gordon's Bay. The global HYCOM solution is shown for reference.



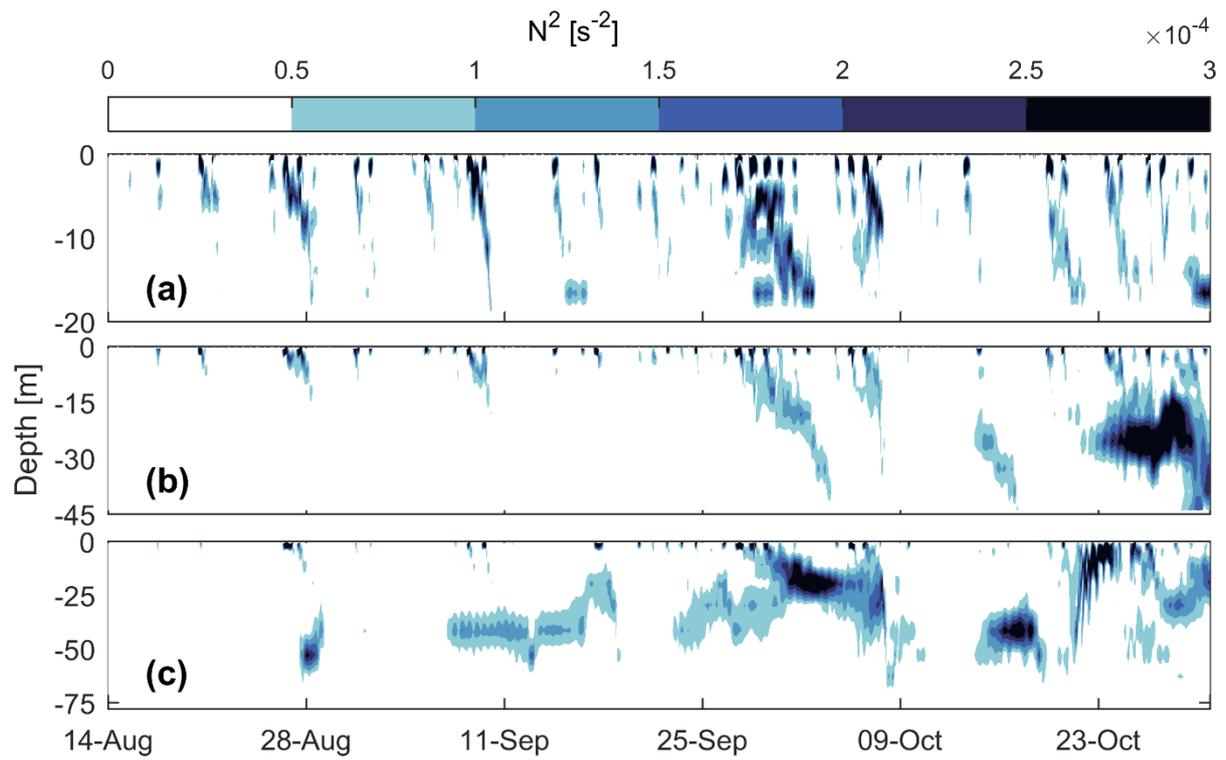
**Figure S8.** Timeseries comparison of modelled and measured near-bottom current speeds (a) and directions (b) at the calibration site CU4, near Gordon's Bay. The global HYCOM solution is shown for reference.



**Figure S9.** Timeseries comparison of modelled and measured near-bottom current speeds (a) and directions (b) at the calibration site CU5, near Simon's Town. The global HYCOM solution is shown for reference.



**Figure S10.** Hovmöller diagrams showing Brunt-Väisälä frequency ( $s^{-2}$ ) calculated for vertical profiles at the eastern (a), mid (b) and western (c) margins of the zonal transect at Slangkop. The locations of the profiles from which (a-c) are constructed are shown by grey dashed lines in Figure 17.



**Figure S11.** Hovmöller diagrams showing Brunt-Väisälä frequency ( $\text{s}^{-2}$ ) for vertical profiles at the northern (a), mid (b) and southern (c) margins of the meridional transect in False Bay. The locations of the profiles from which (a-c) are constructed are shown by grey dashed lines in Figure 19.