

1 USV position

1.1 Uncontrolled

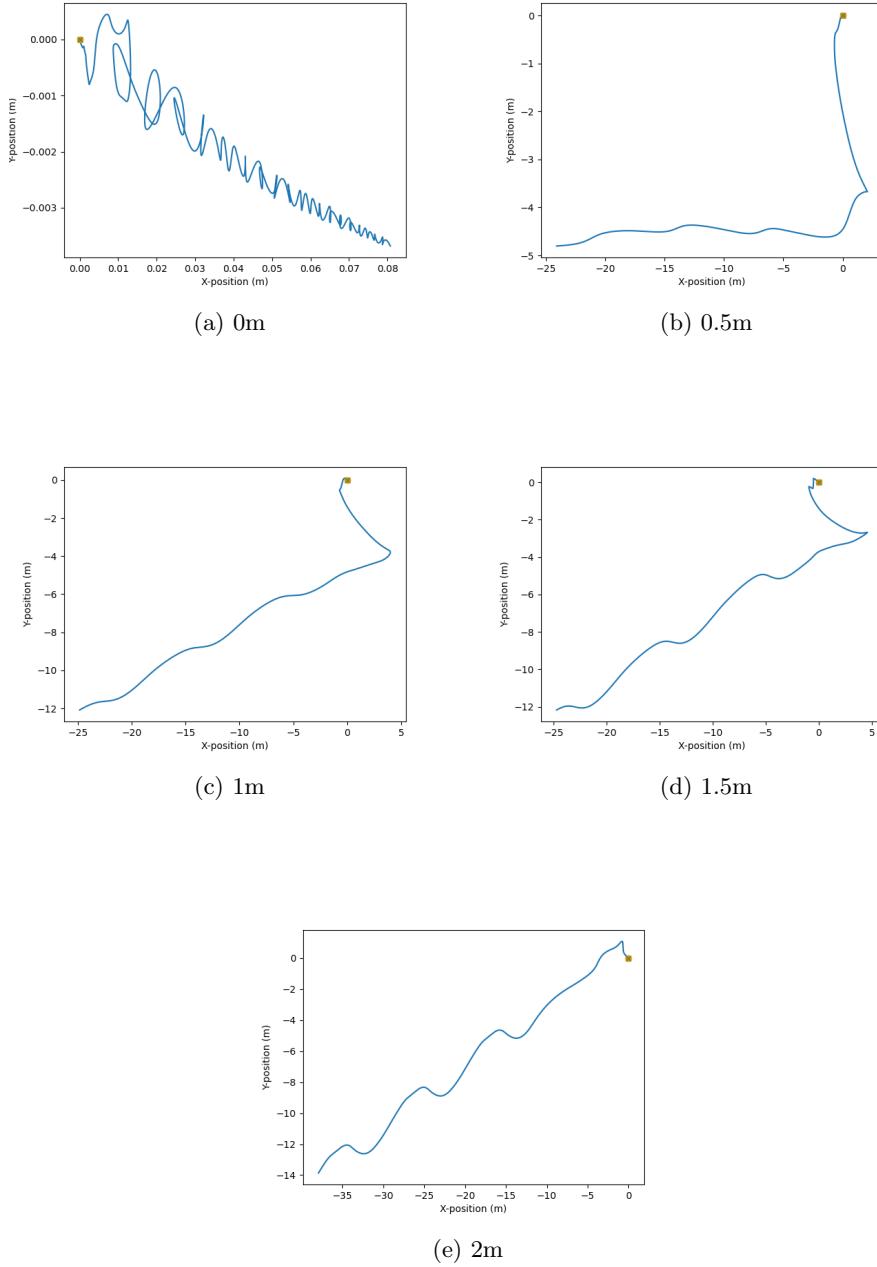


Figure 1: USV position over time

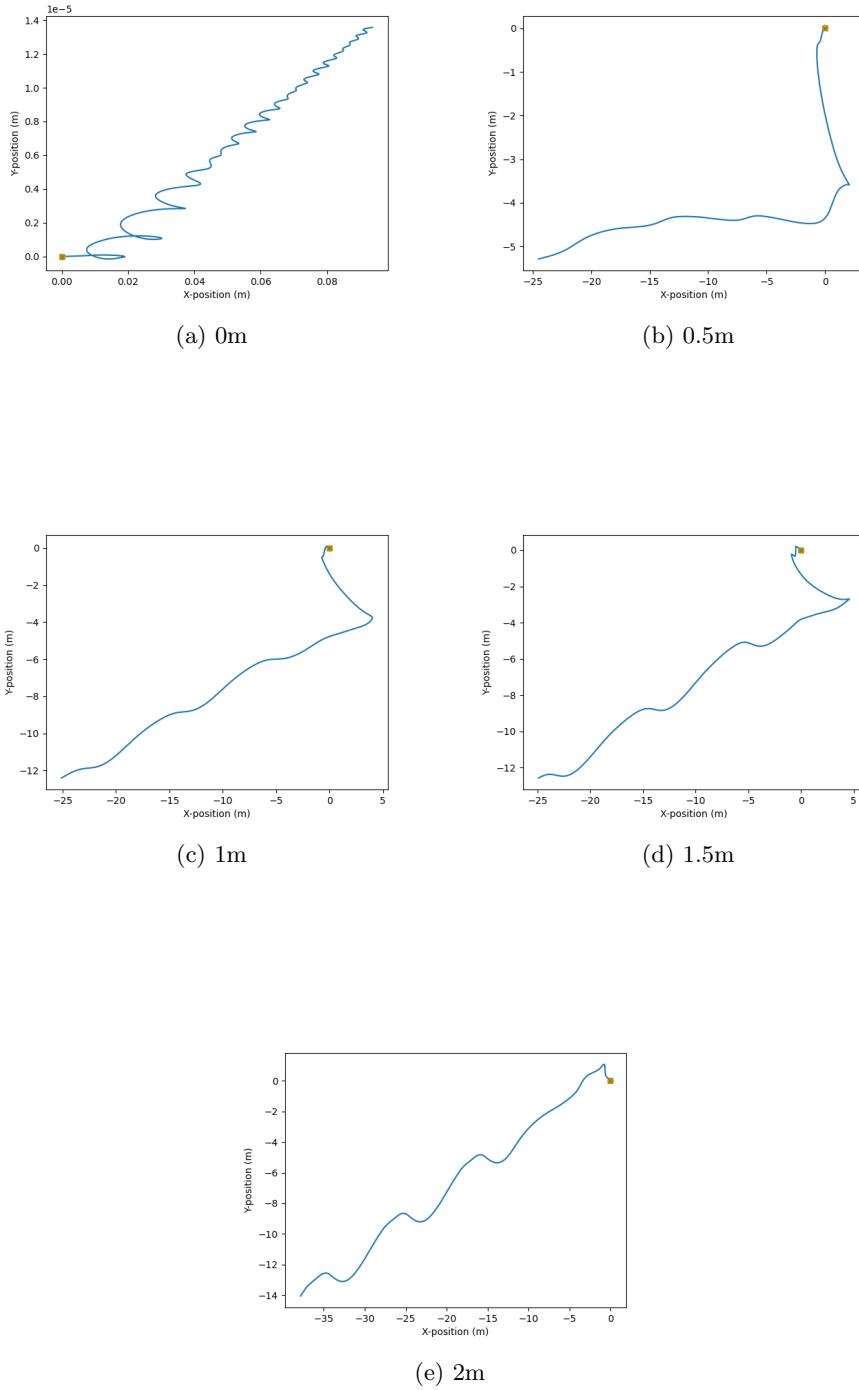


Figure 2: USV position over time

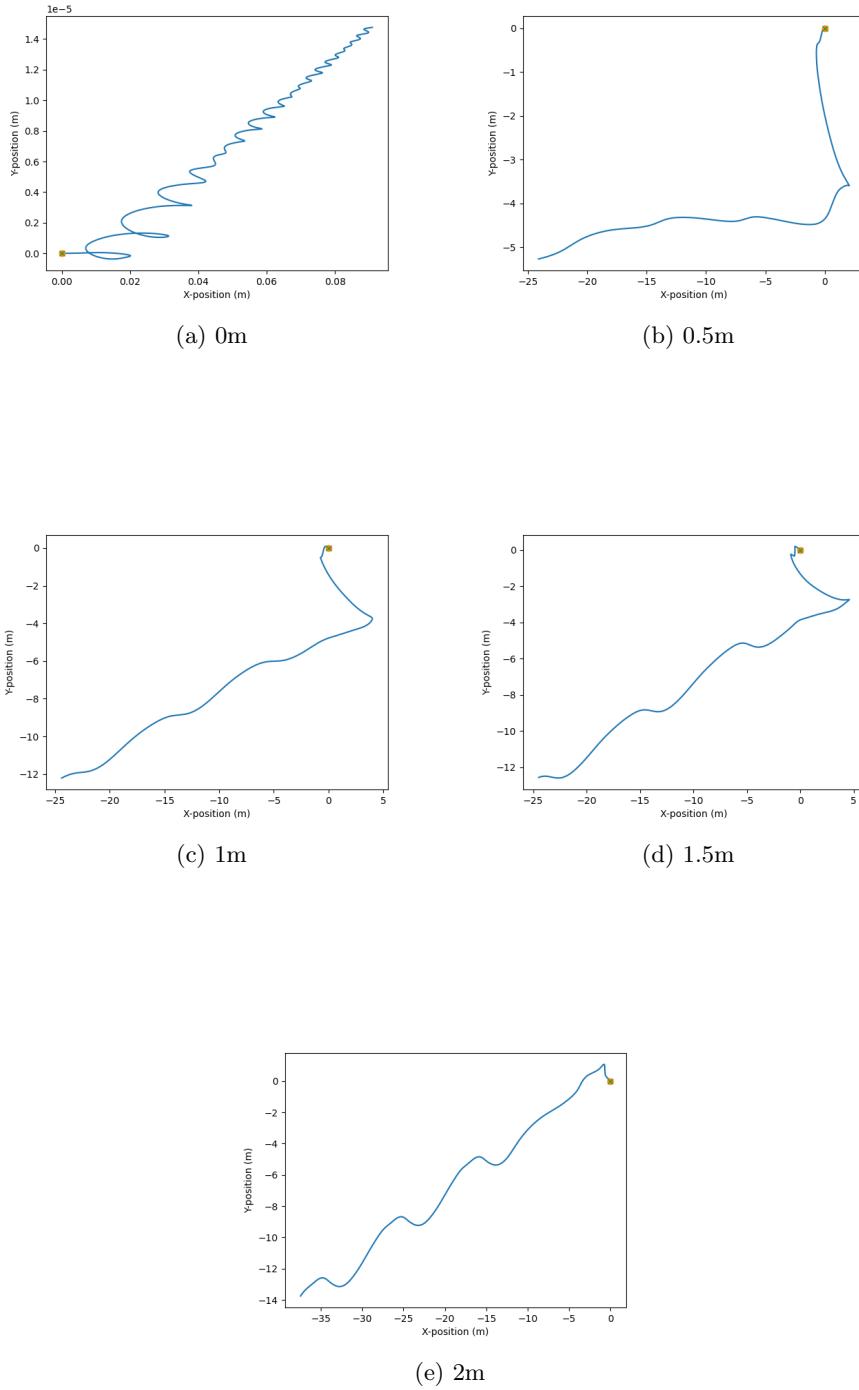


Figure 3: USV position over time

1.2 Controlled

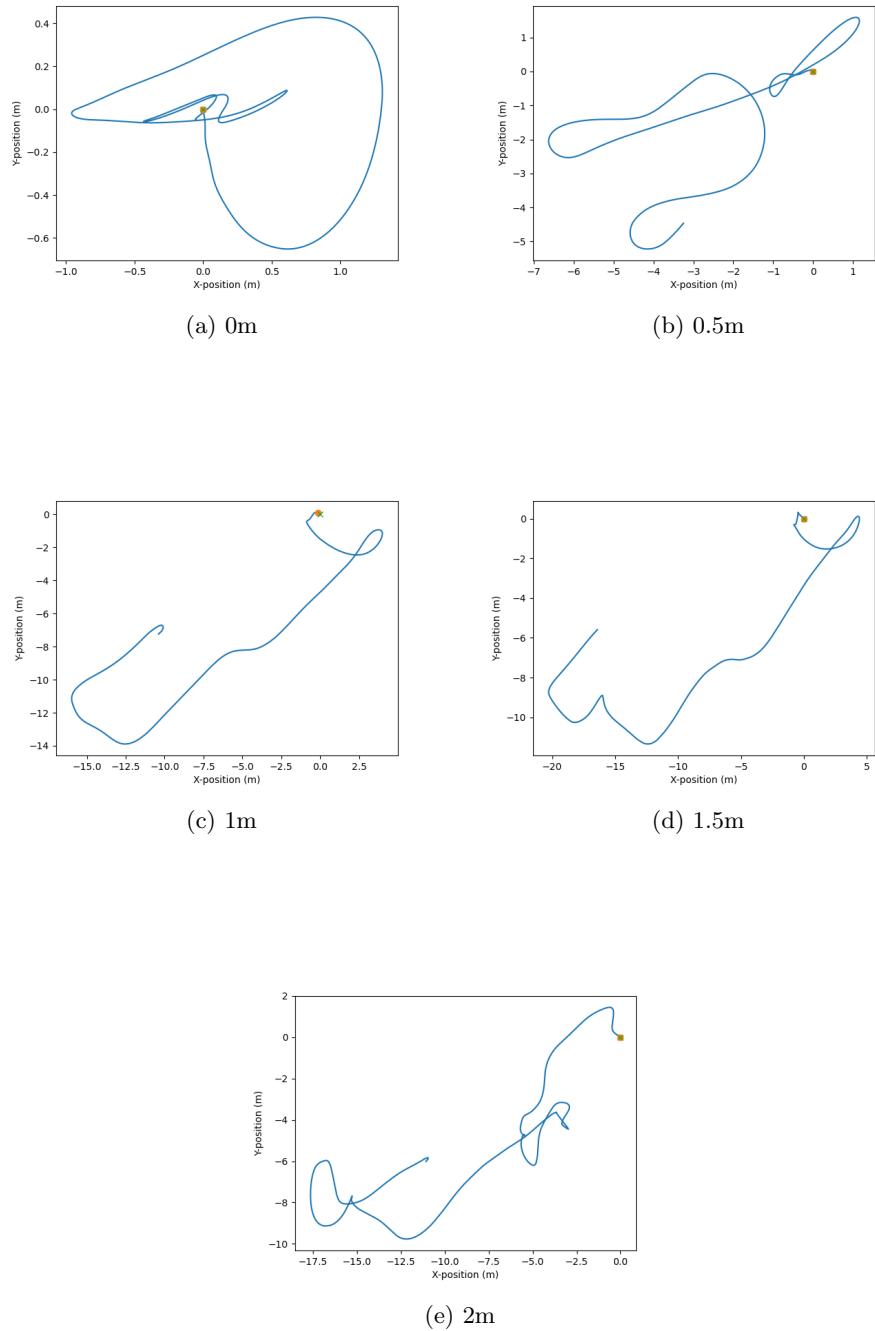
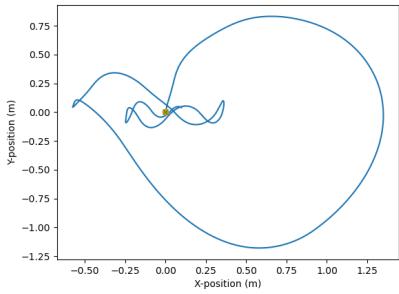
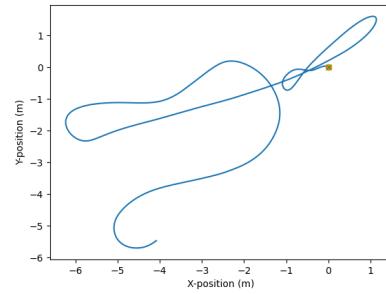


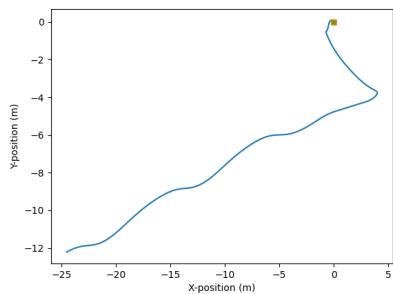
Figure 4: ROV position error over time



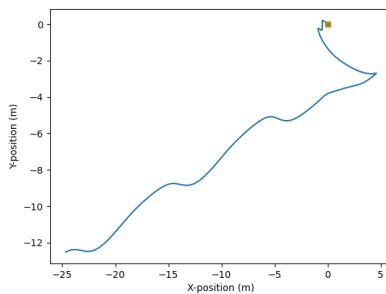
(a) 0m



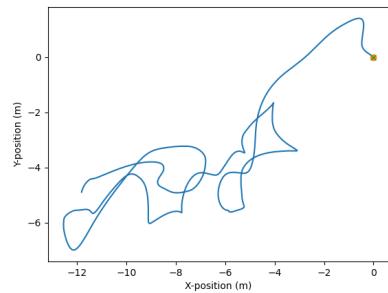
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 5: ROV position error over time

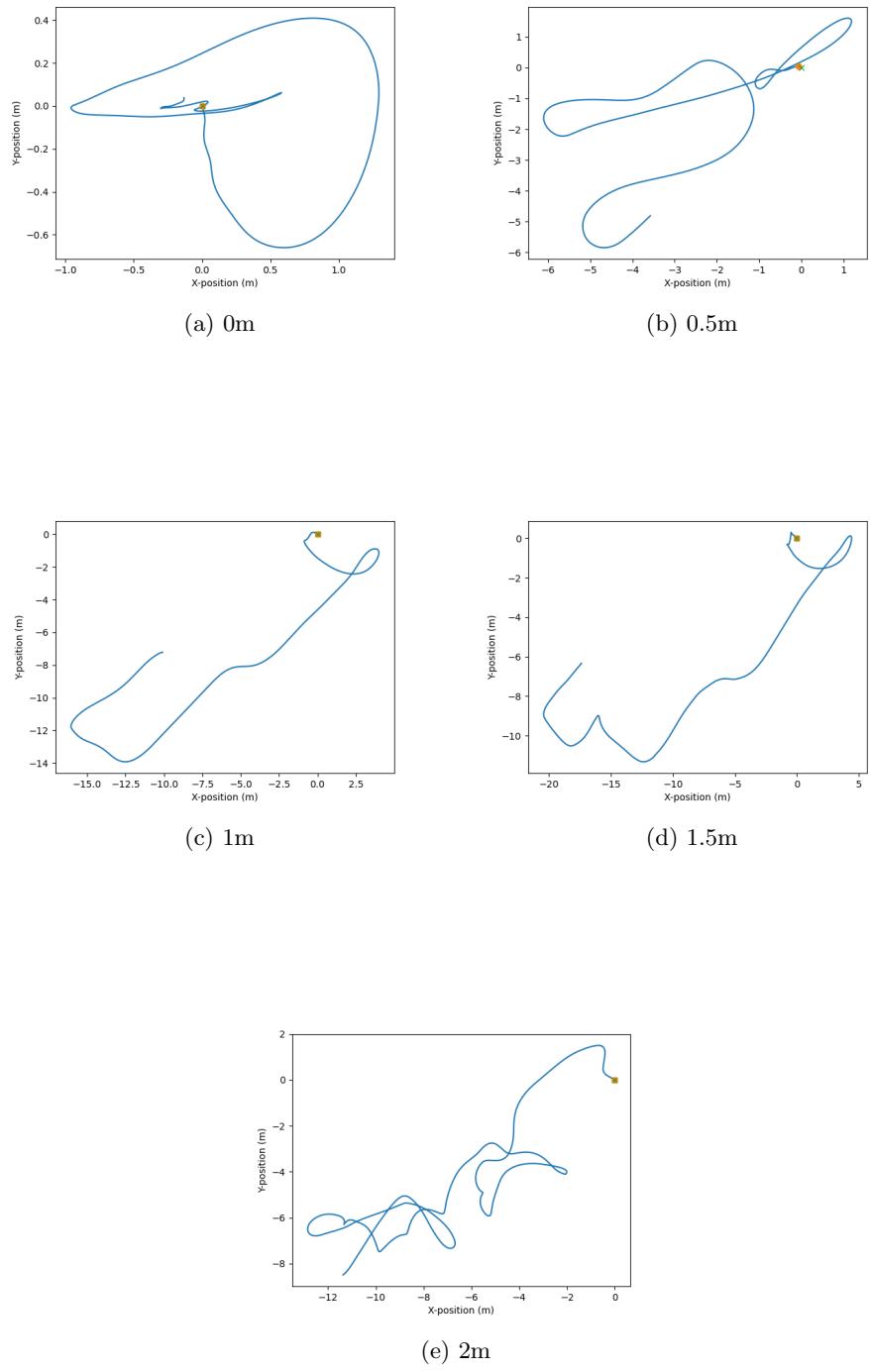


Figure 6: ROV position error over time

2 USV position errors over time

2.1 Uncontrolled

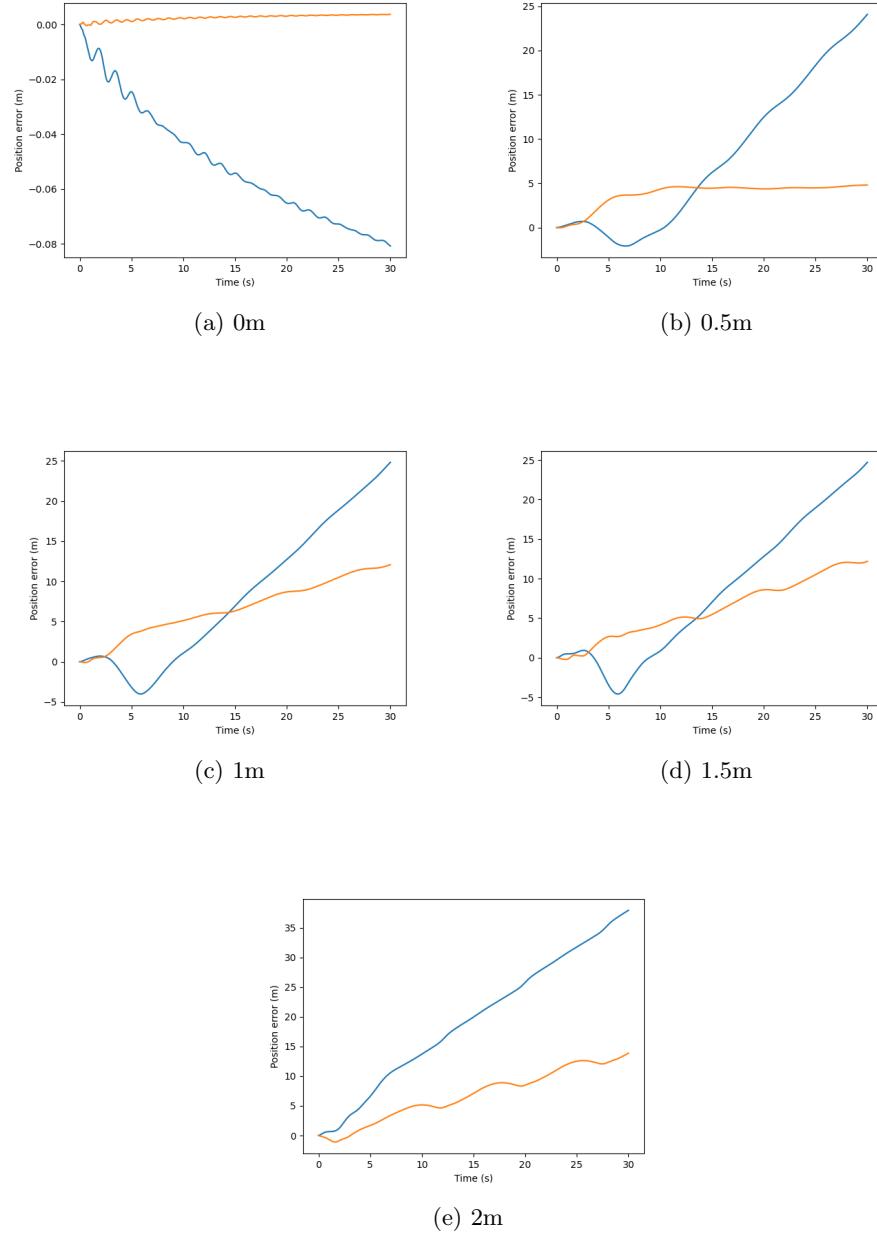
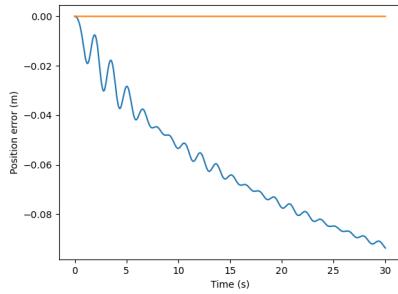
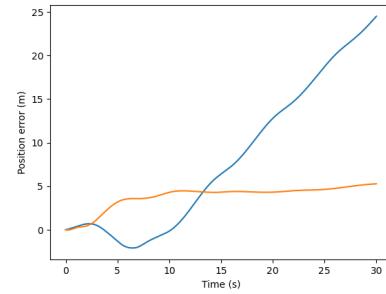


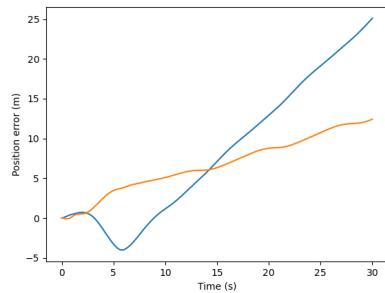
Figure 7: USV movement over time in varying wave heights, origin shown by the circle and the ideal end location shown as a cross



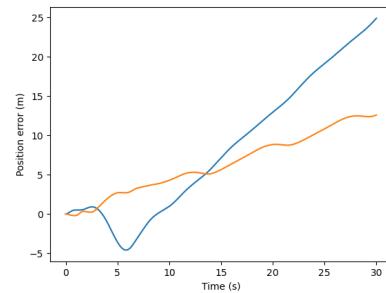
(a) 0m



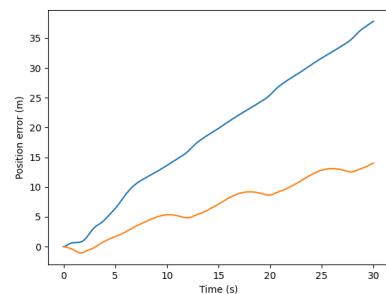
(b) 0.5m



(c) 1m

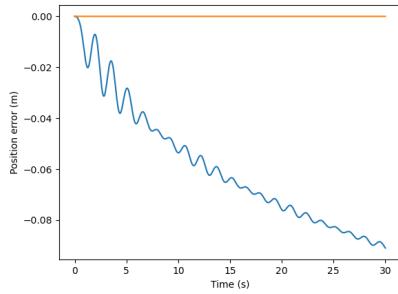


(d) 1.5m

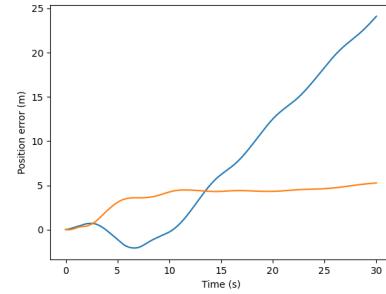


(e) 2m

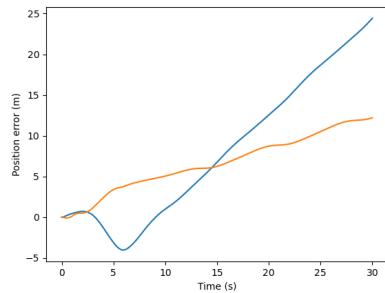
Figure 8: USV movement over time in varying wave heights, origin shown by the circle and the ideal end location shown as a cross



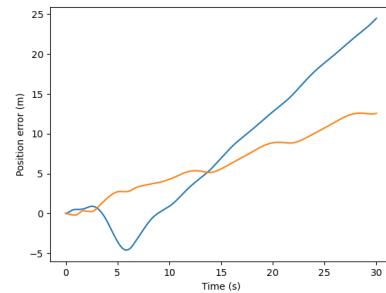
(a) 0m



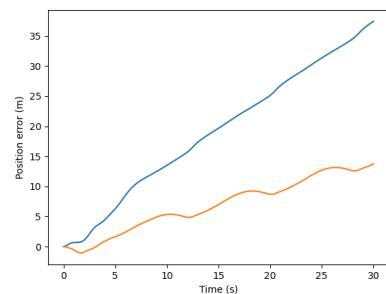
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 9: USV movement over time in varying wave heights, origin shown by the circle and the ideal end location shown as a cross

2.2 Controlled

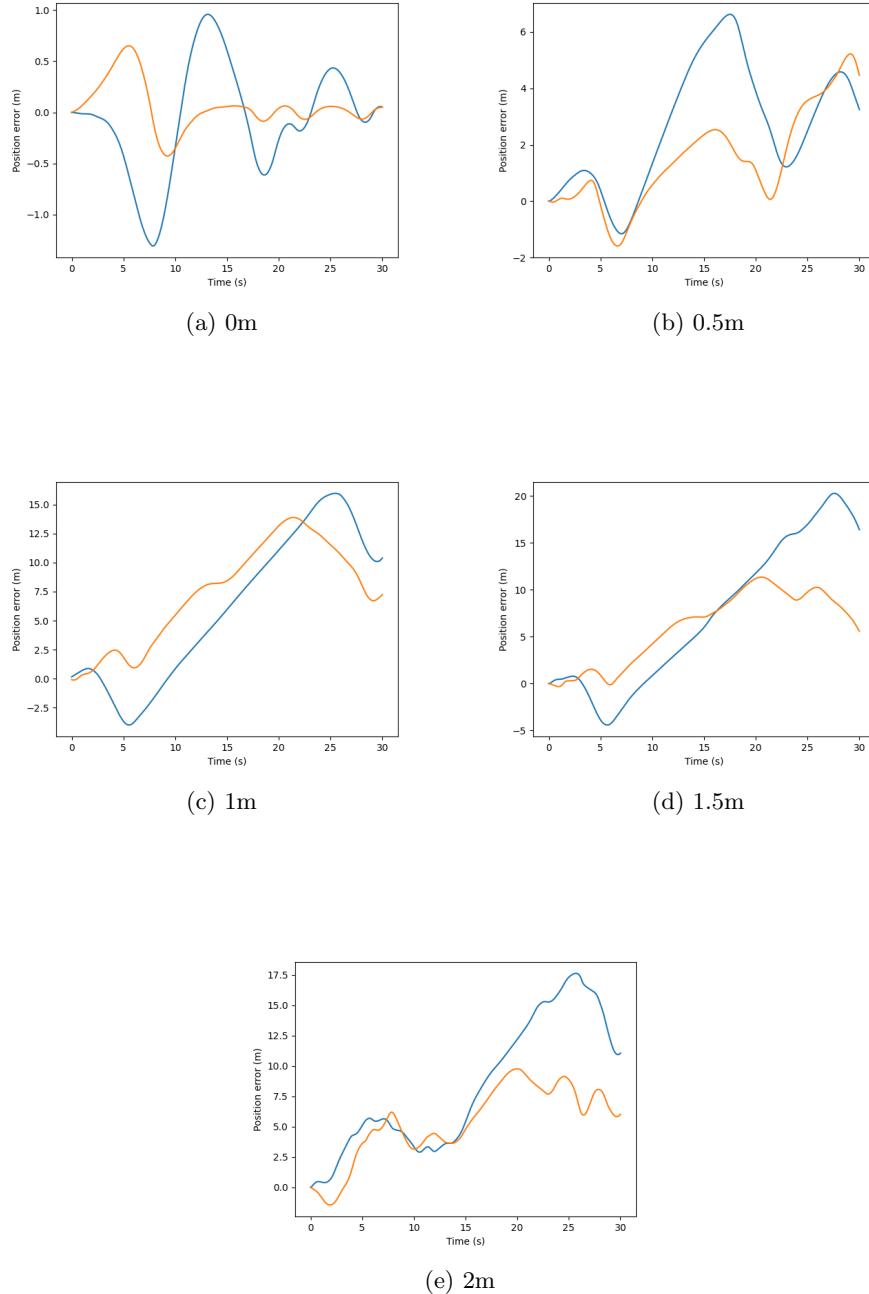
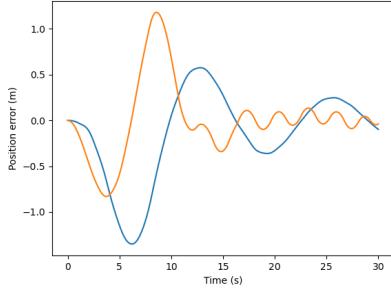
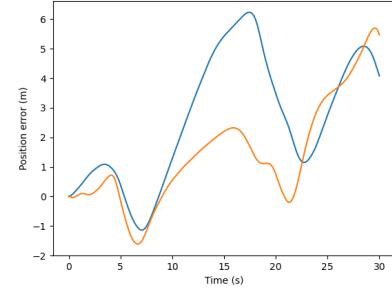


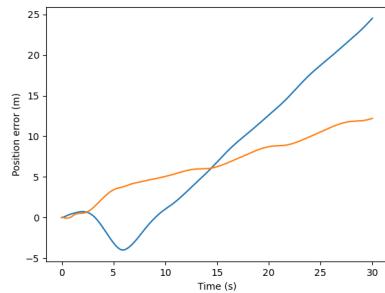
Figure 10: USV movement over time in varying wave heights, origin shown by the circle and the ideal end location shown as a cross



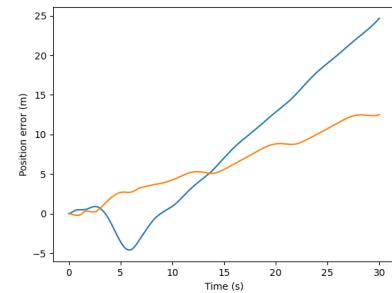
(a) 0m



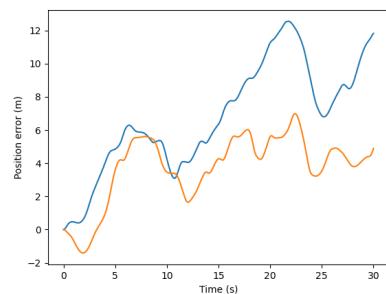
(b) 0.5m



(c) 1m

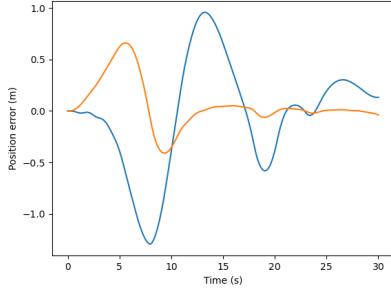


(d) 1.5m

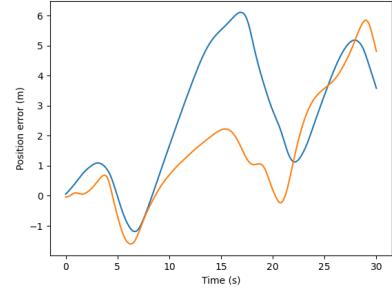


(e) 2m

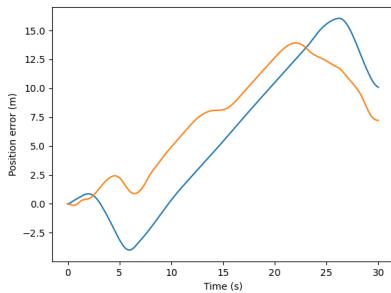
Figure 11: USV movement over time in varying wave heights, origin shown by the circle and the ideal end location shown as a cross



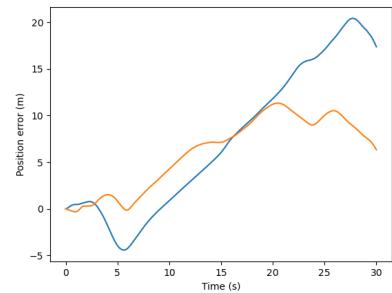
(a) 0m



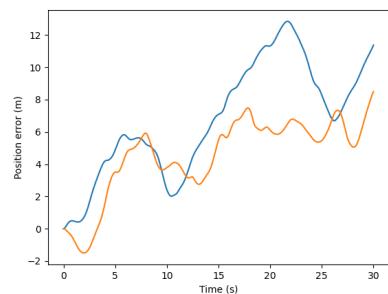
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 12: USV movement over time in varying wave heights, origin shown by the circle and the ideal end location shown as a cross

3 USV heading error

3.1 Uncontrolled

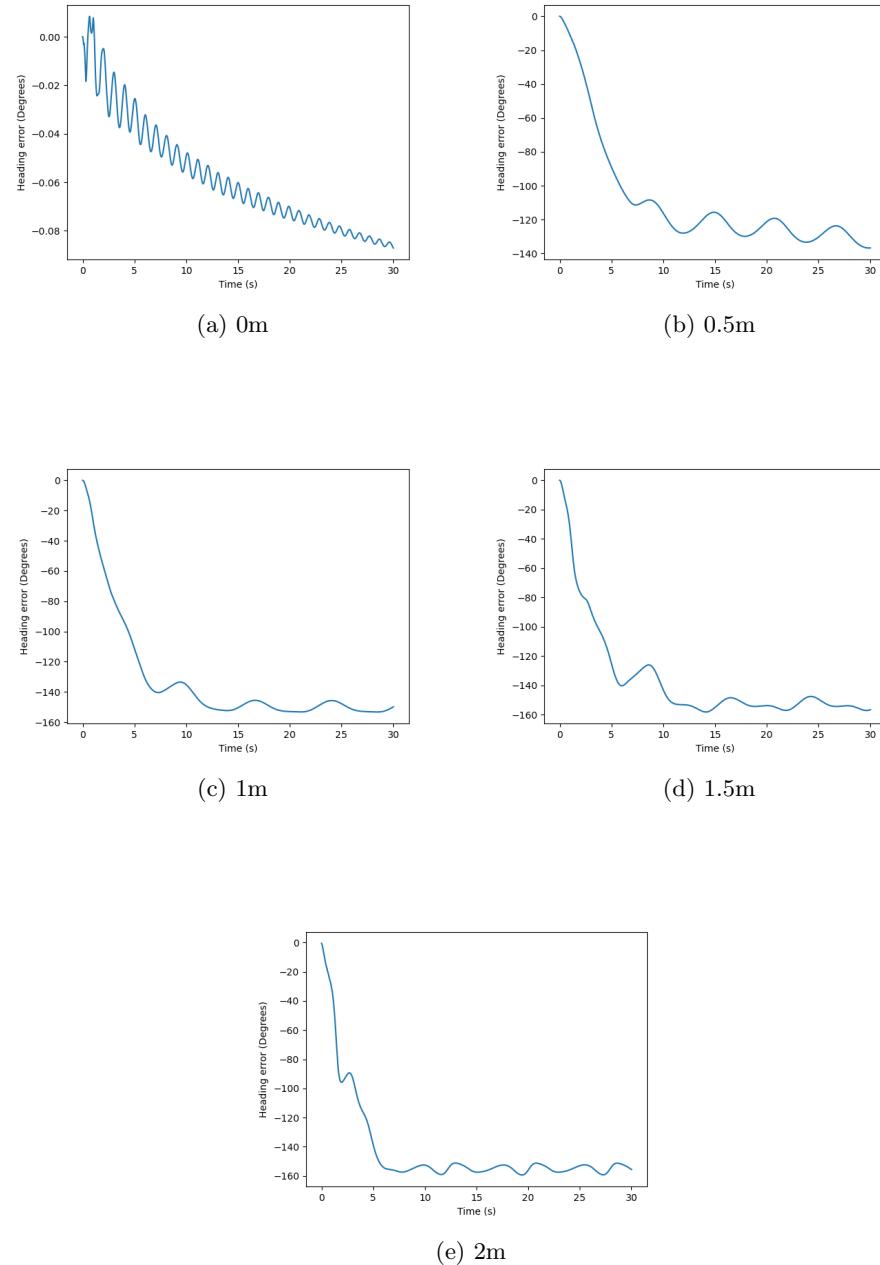


Figure 13: ROV position error over time

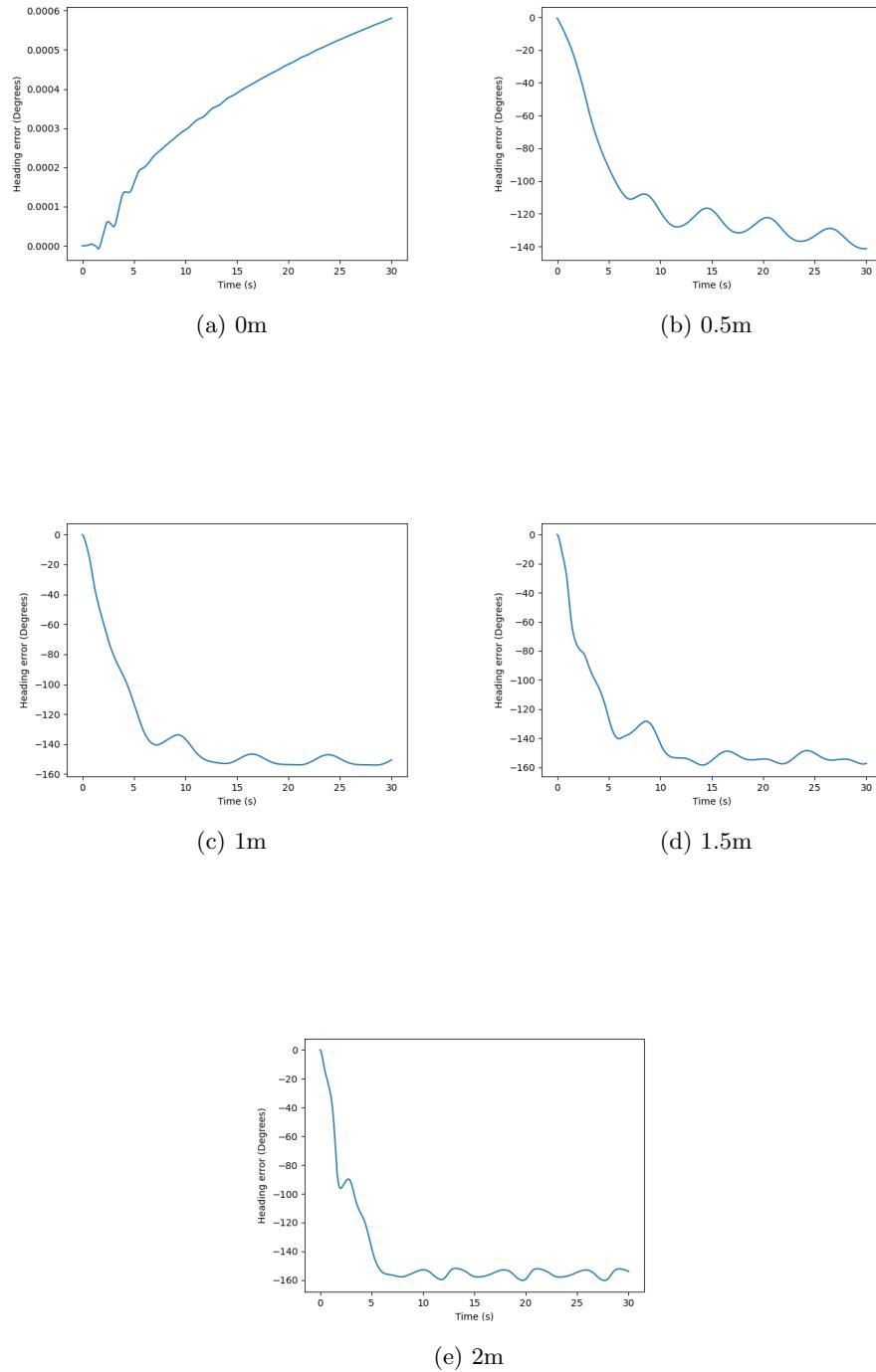
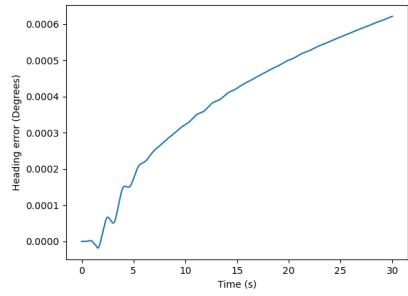
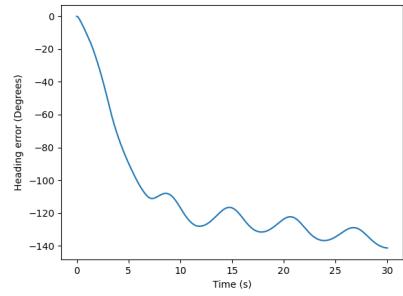


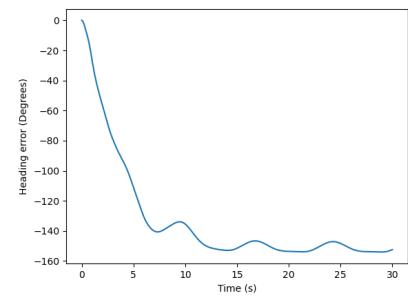
Figure 14: ROV position error over time



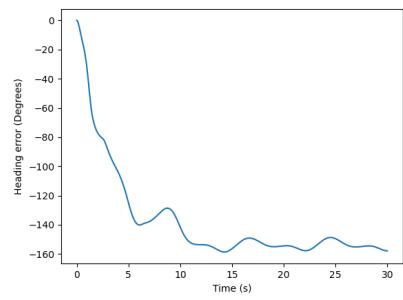
(a) 0m



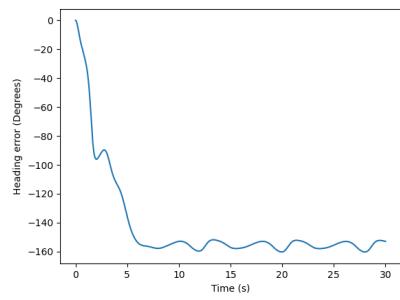
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 15: ROV position error over time

3.2 Controlled

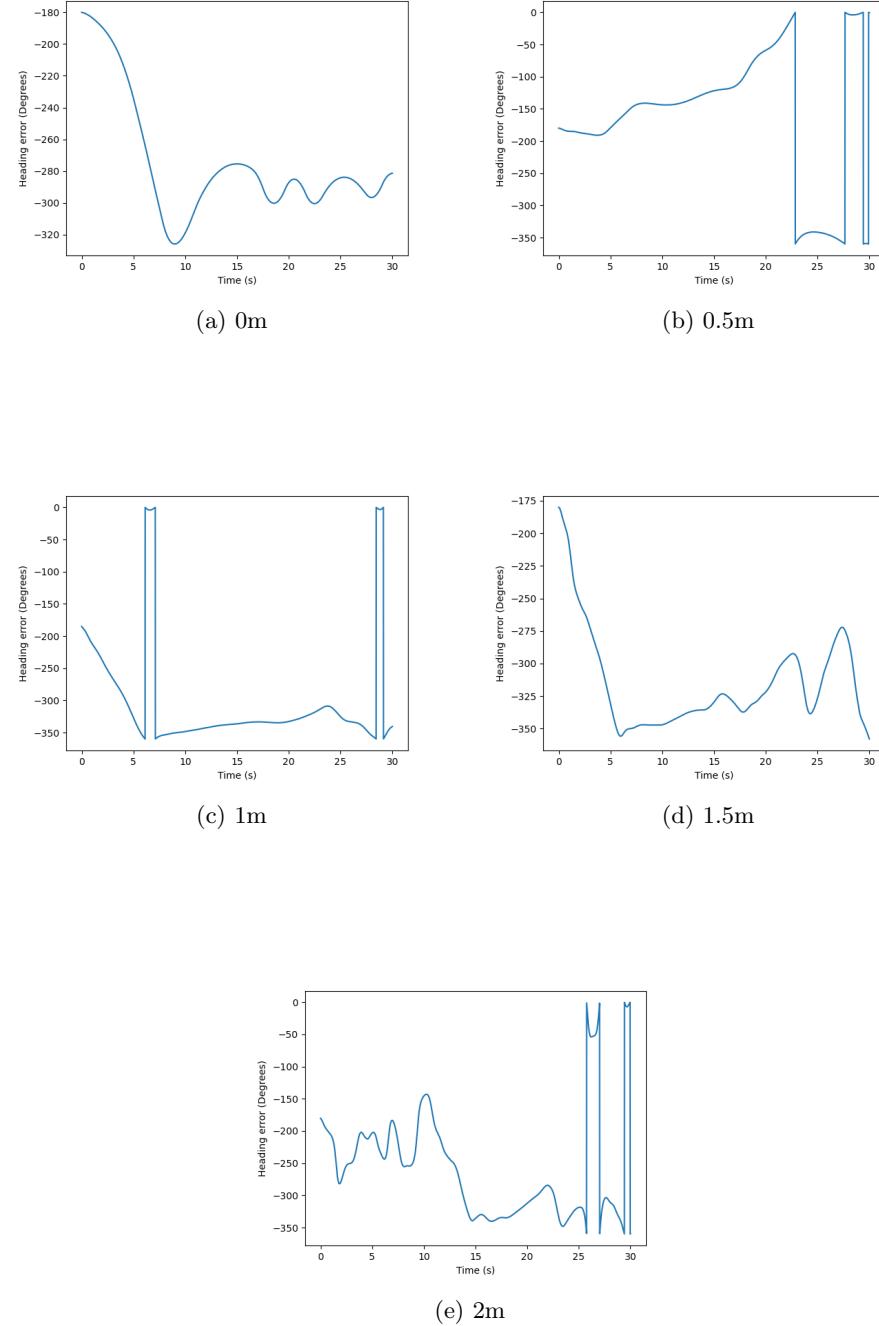
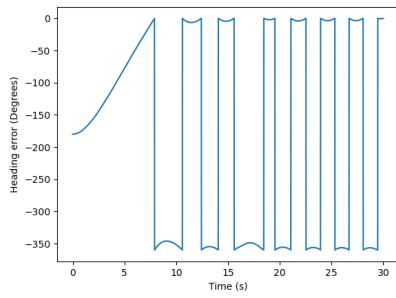
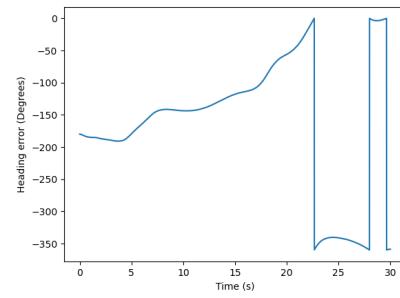


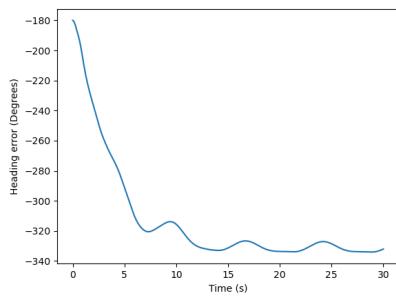
Figure 16: ROV position error over time



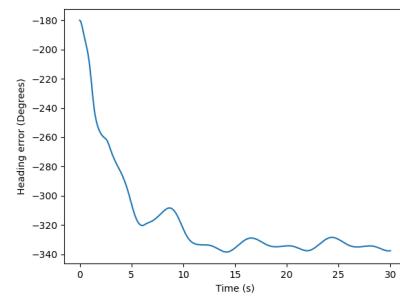
(a) 0m



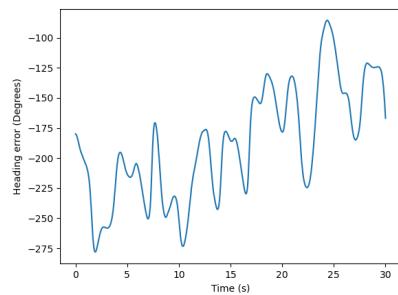
(b) 0.5m



(c) 1m

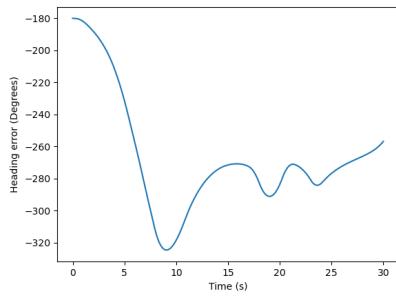


(d) 1.5m

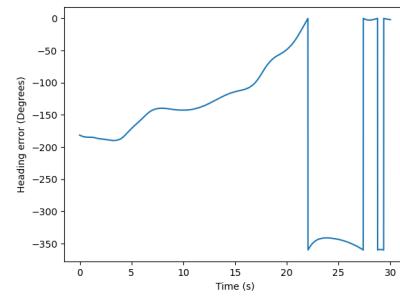


(e) 2m

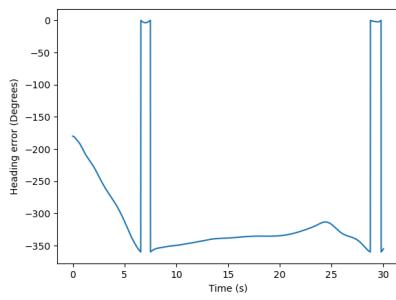
Figure 17: ROV position error over time



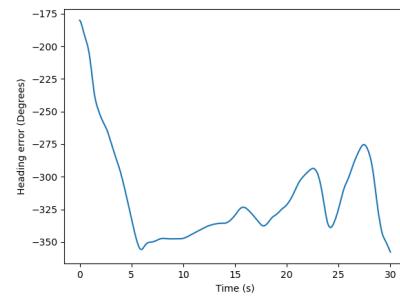
(a) 0m



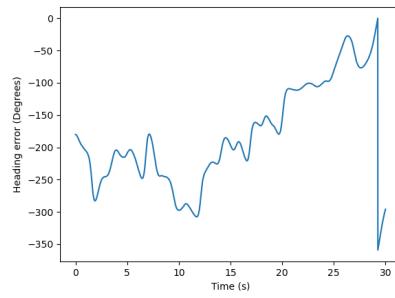
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 18: ROV position error over time

4 USV applied forces

4.1 Lateral forces

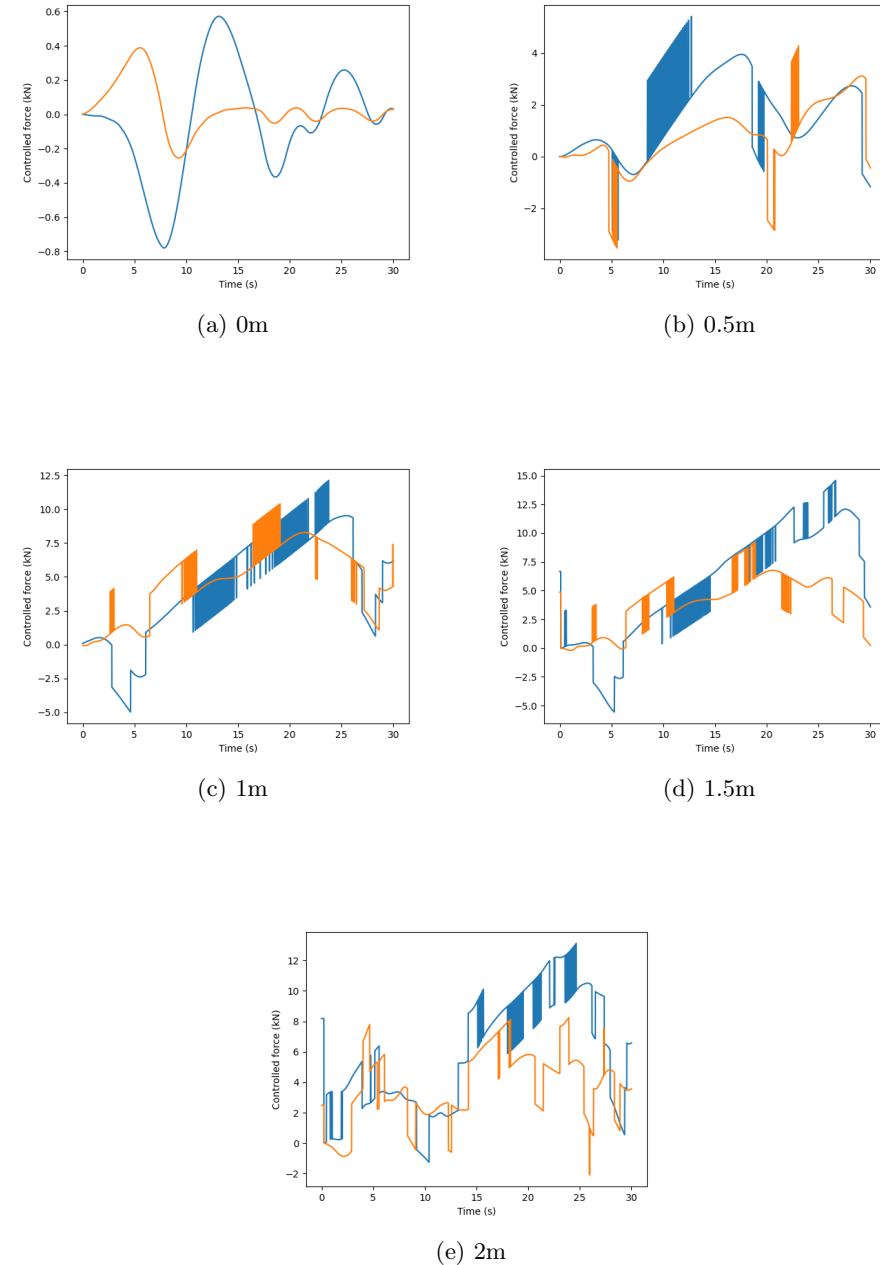


Figure 19: ROV position error over time

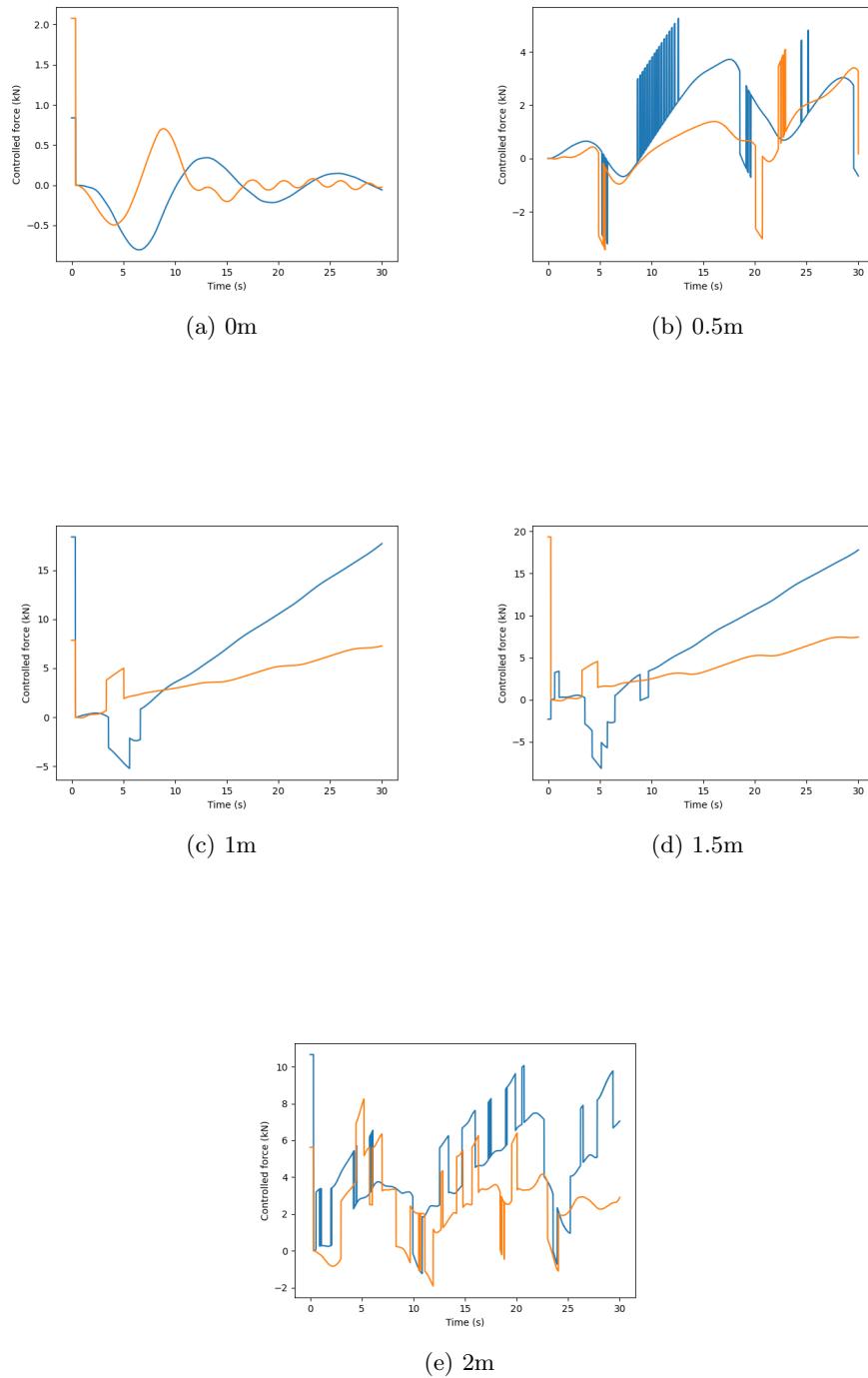


Figure 20: ROV position error over time

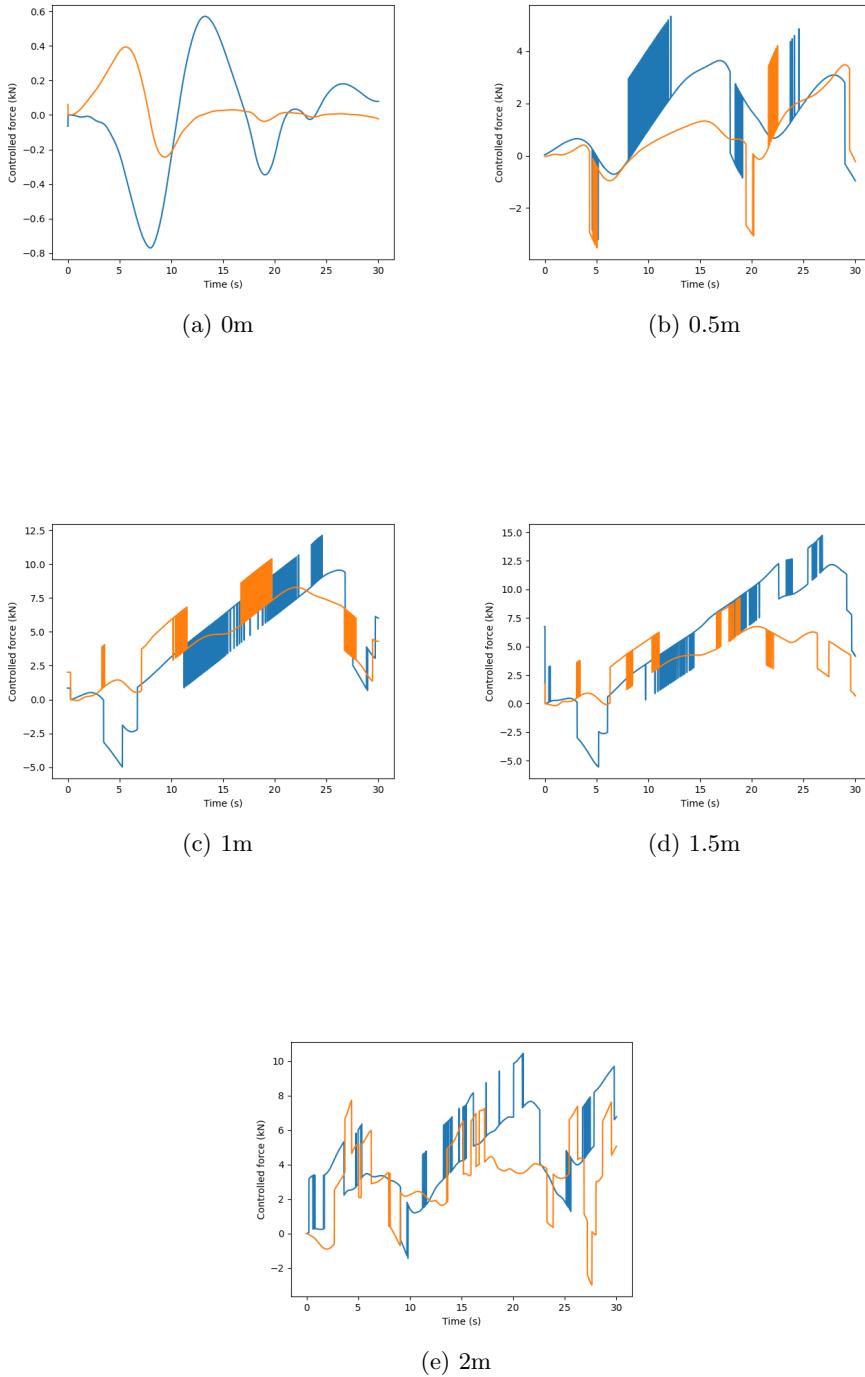


Figure 21: ROV position error over time

4.2 Torque

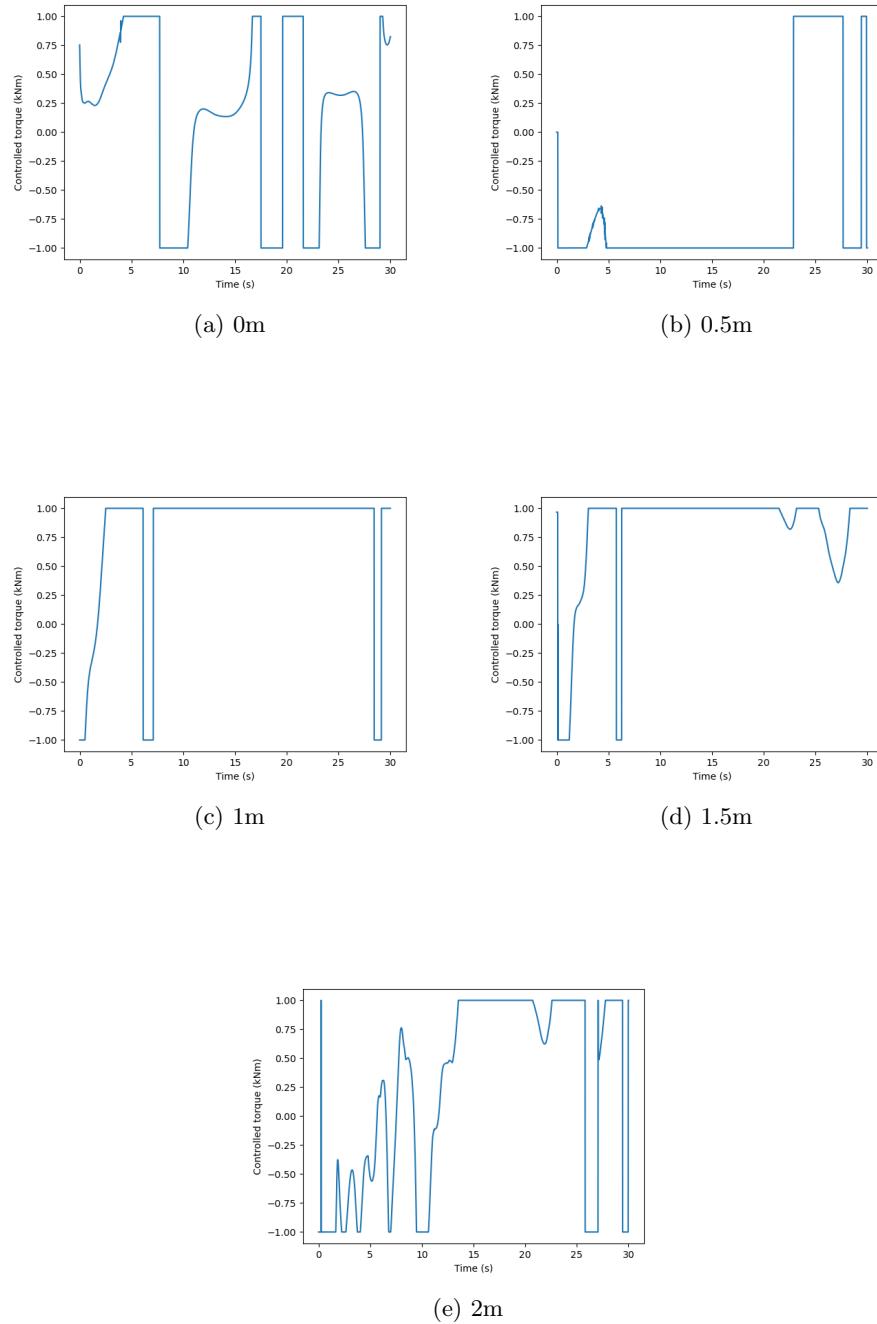
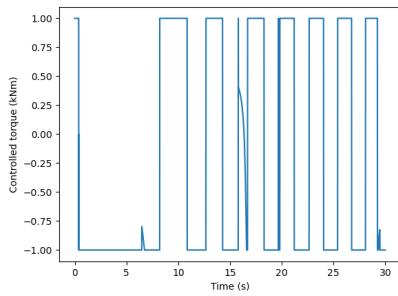
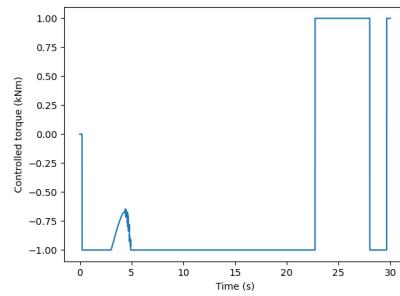


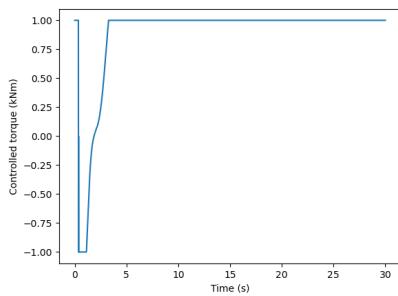
Figure 22: ROV position error over time



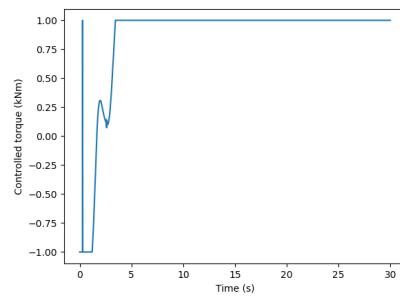
(a) 0m



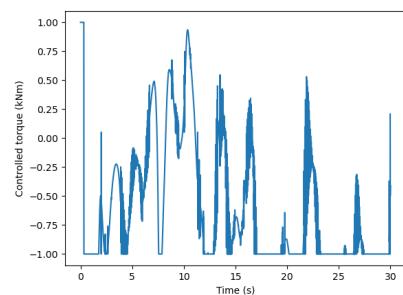
(b) 0.5m



(c) 1m

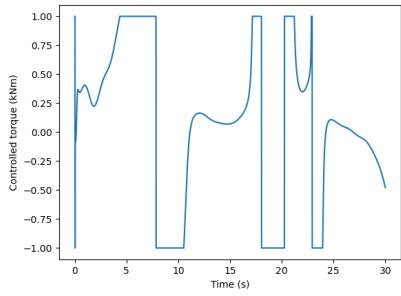


(d) 1.5m

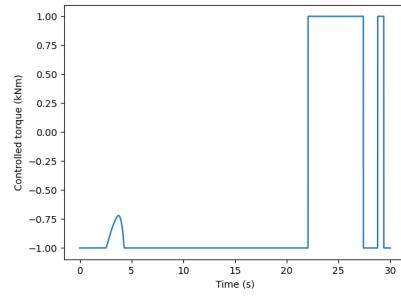


(e) 2m

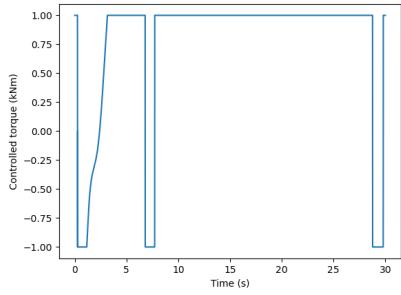
Figure 23: ROV position error over time



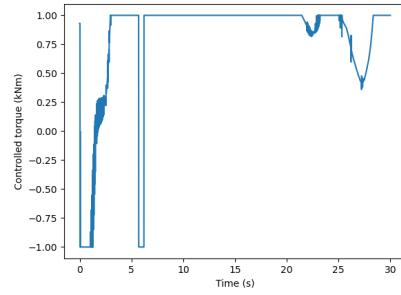
(a) 0m



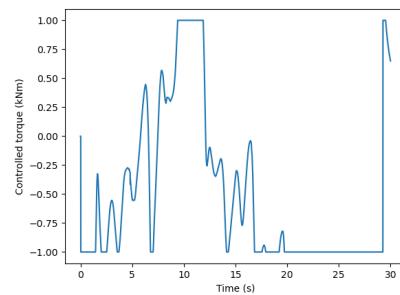
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 24: ROV position error over time

5 ROV position error over time

5.1 Uncontrolled

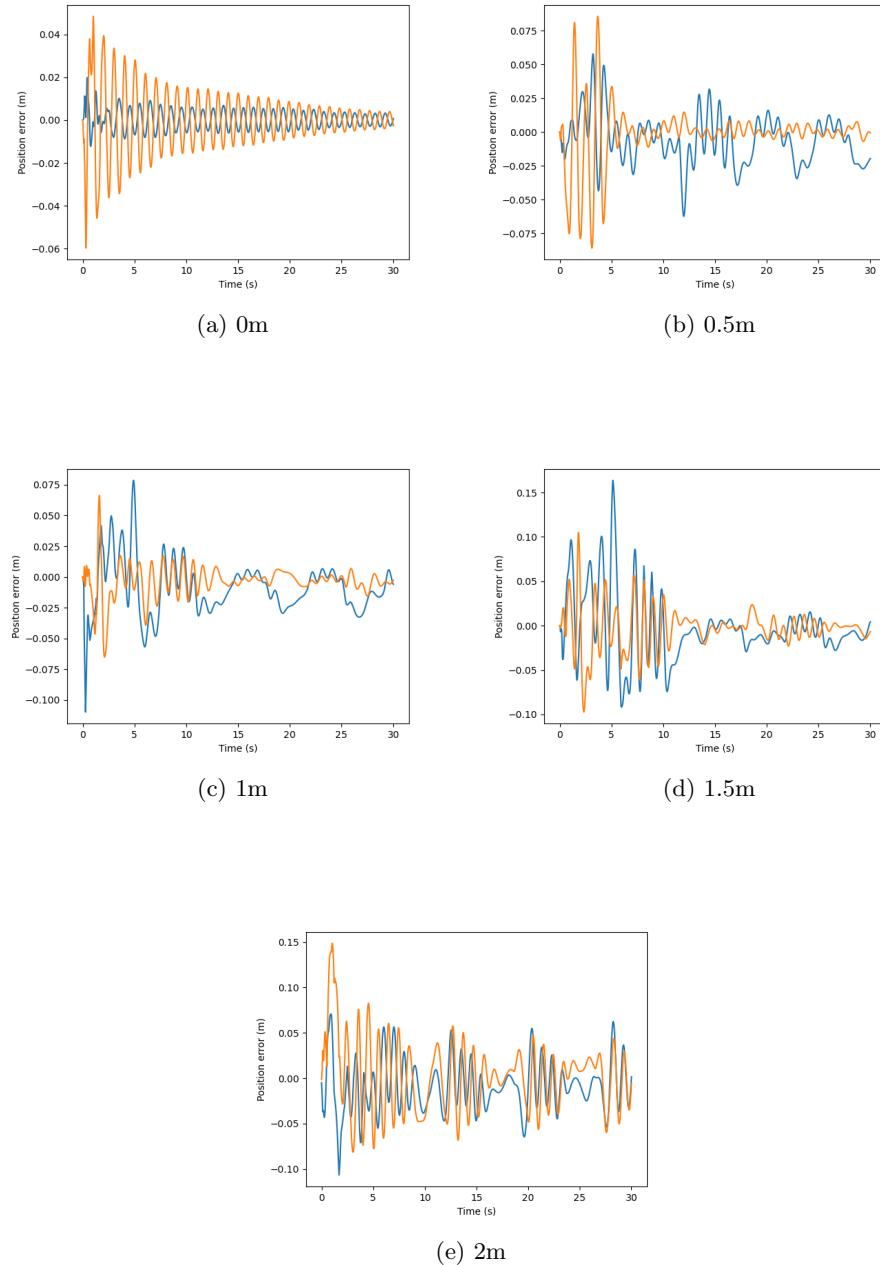
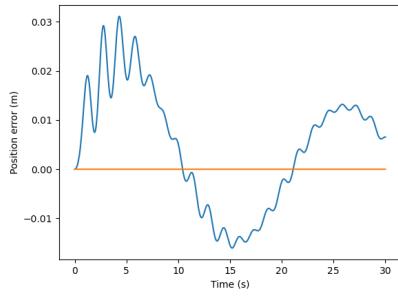
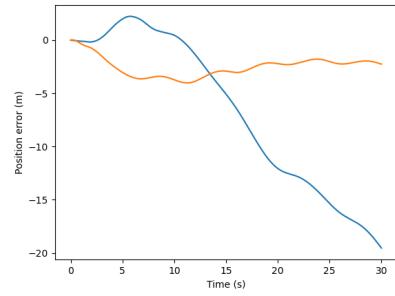


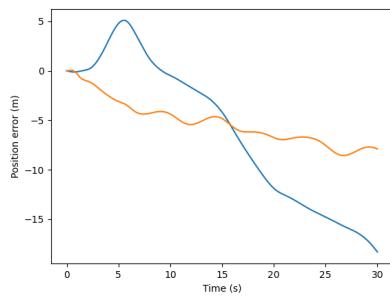
Figure 25: ROV position error over time



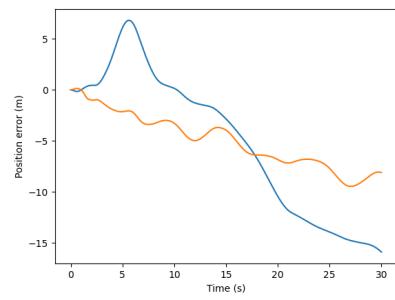
(a) 0m



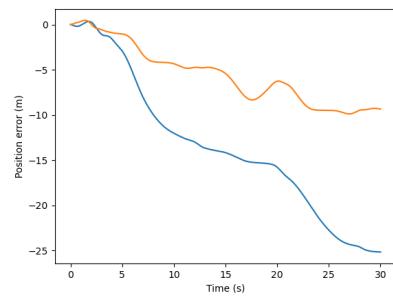
(b) 0.5m



(c) 1m

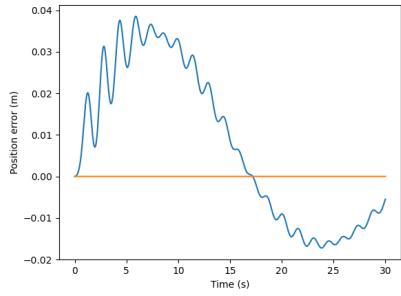


(d) 1.5m

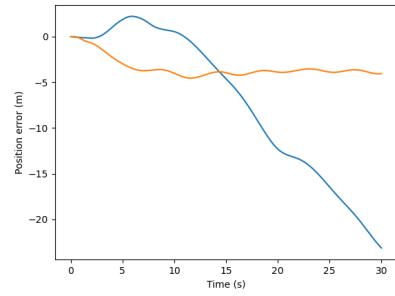


(e) 2m

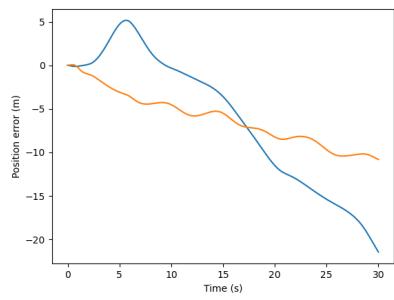
Figure 26: ROV position error over time



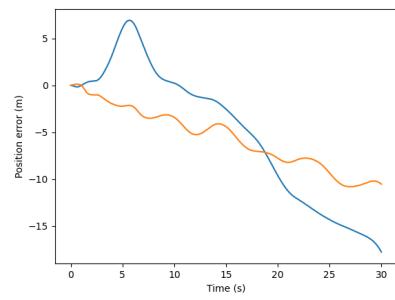
(a) 0m



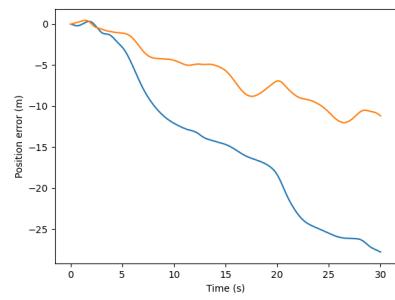
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 27: ROV position error over time

5.2 Controlled

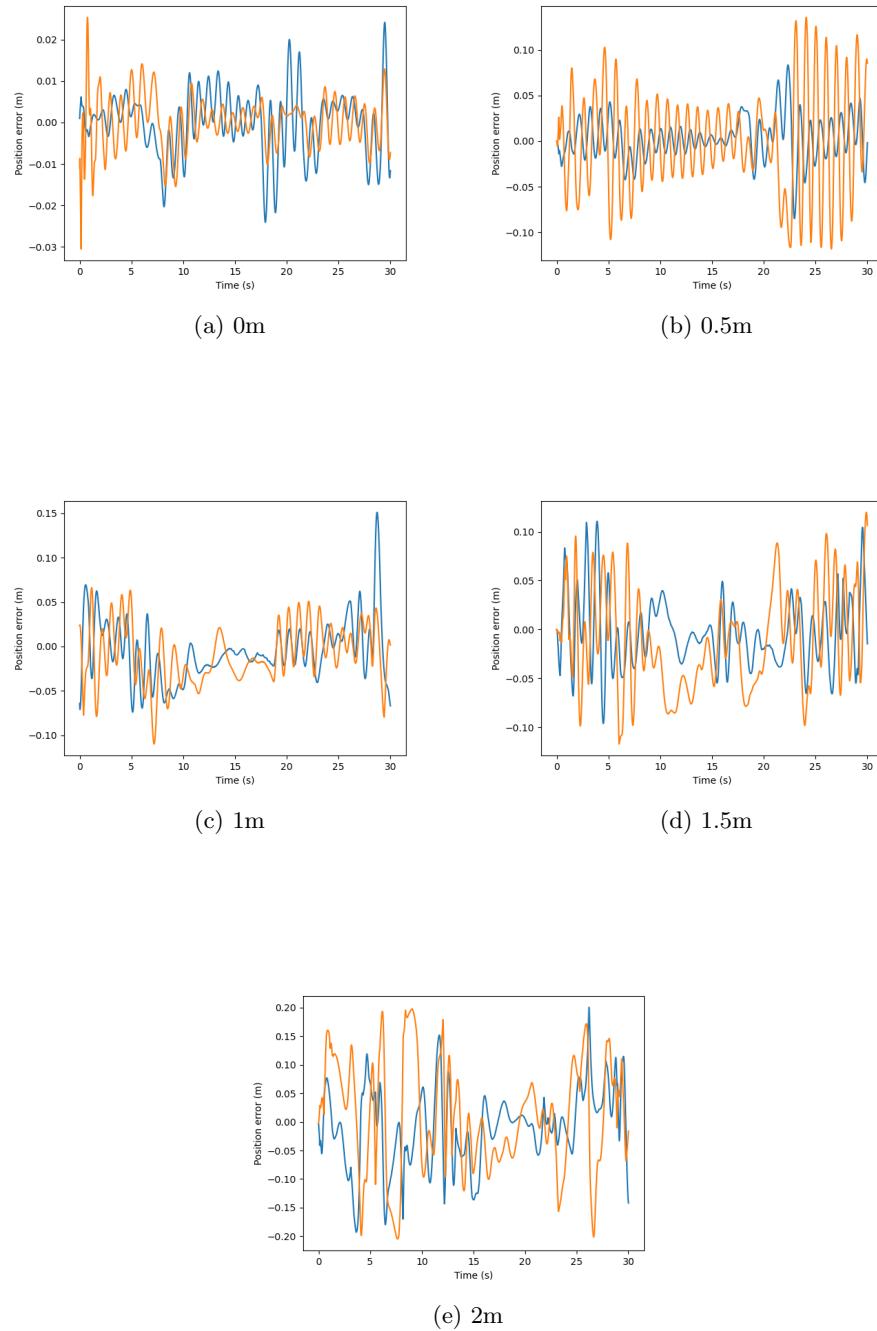


Figure 28: ROV position error over time

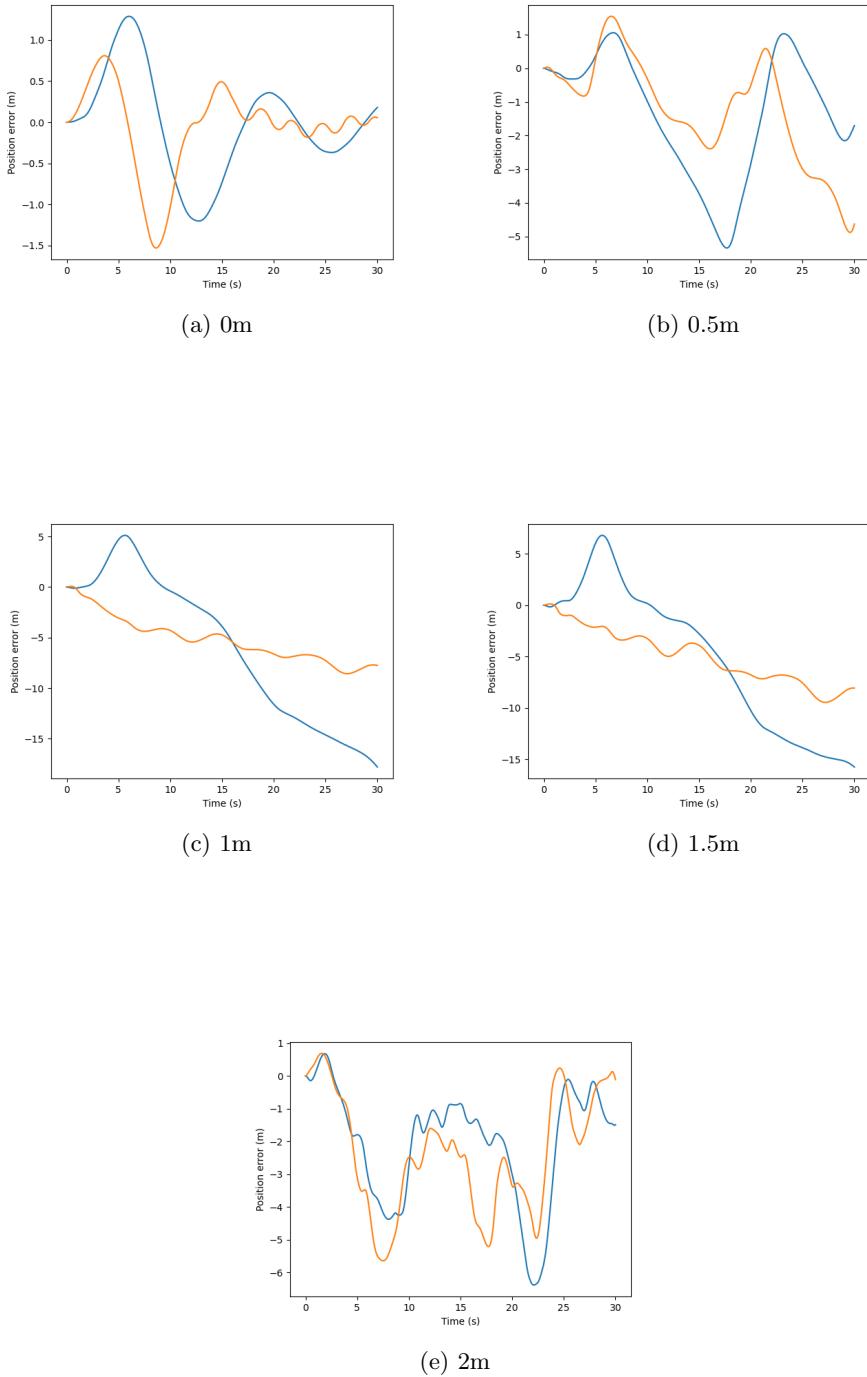


Figure 29: ROV position error over time

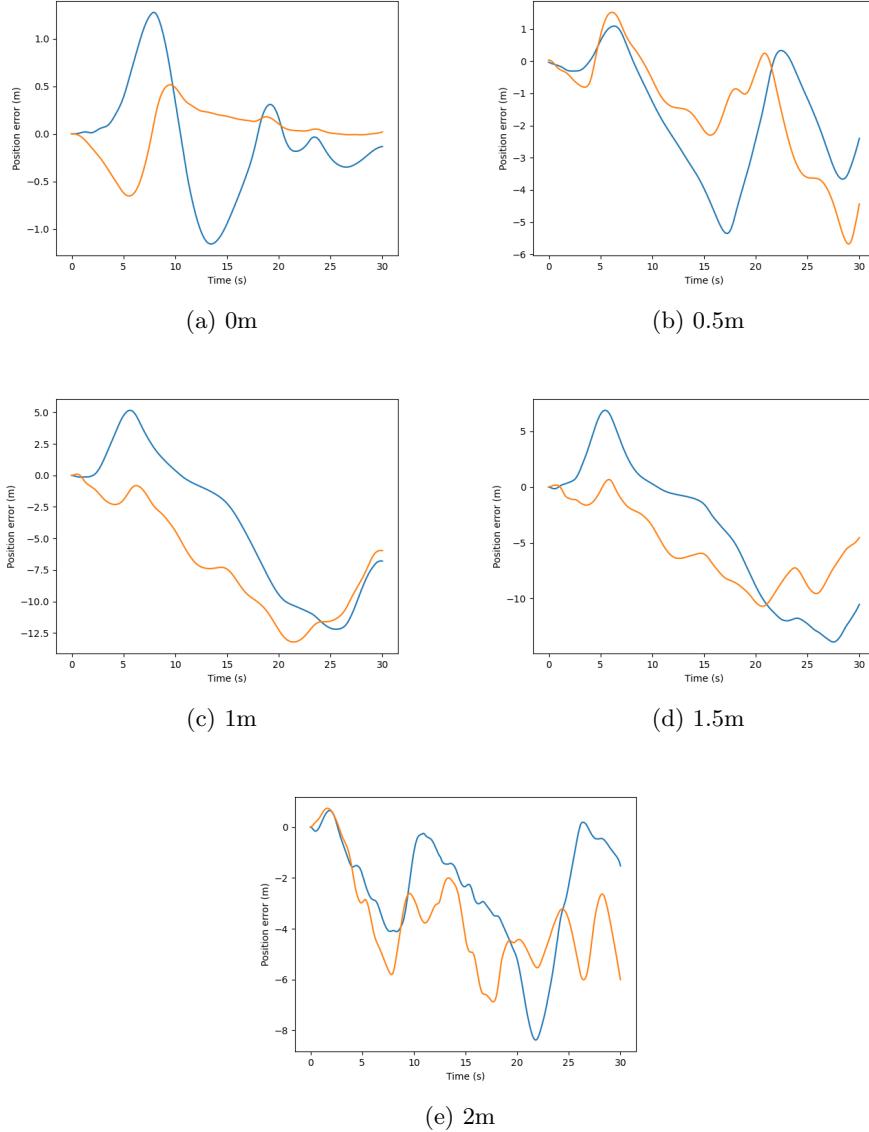


Figure 30: ROV position error over time

6 ROV depth error over time

Note that it seems the depth calculations for the plotting have gone wrong. They ended up being relative to 100m depth. It was not possible to fix this, so please simply imagine that the depths are correct. For the retracted ROV, the goal height is -100m, while for the fully extended one it is 0m.

6.1 Uncontrolled

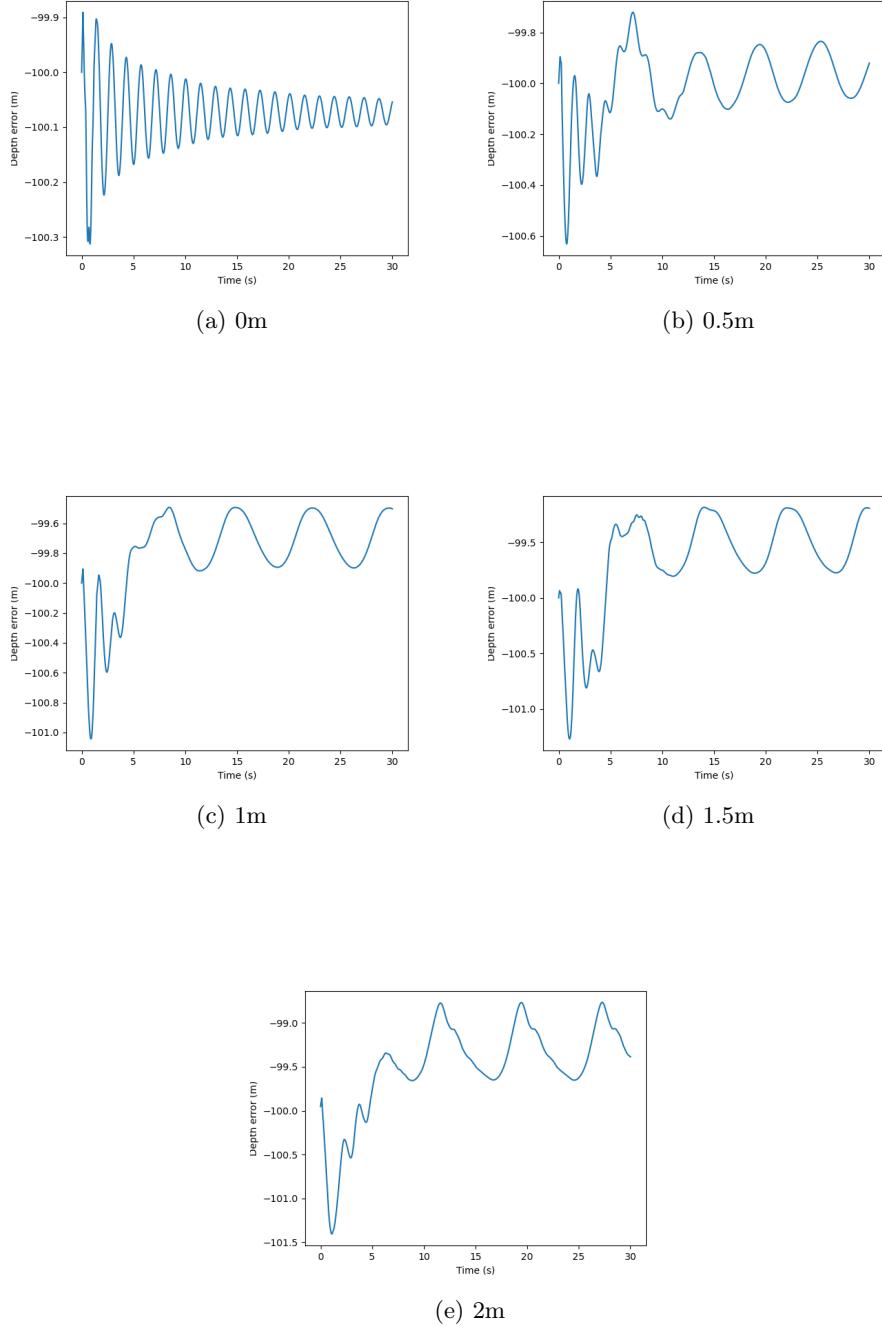
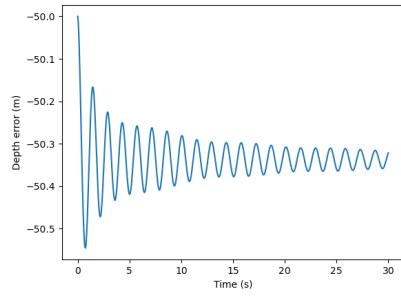
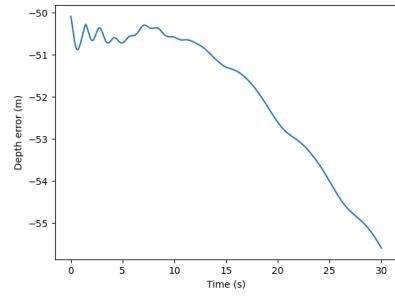


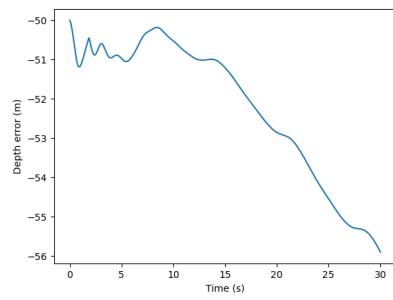
Figure 31: ROV position error over time



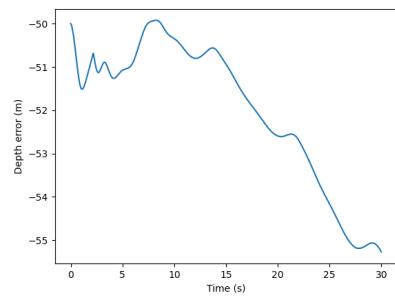
(a) 0m



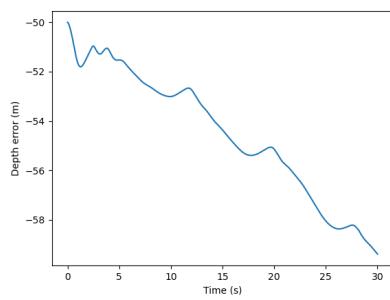
(b) 0.5m



(c) 1m

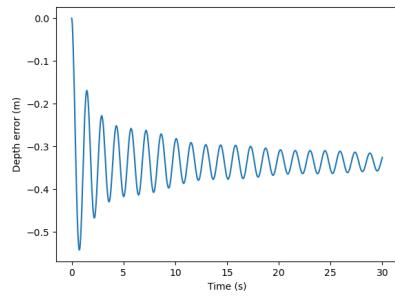


(d) 1.5m

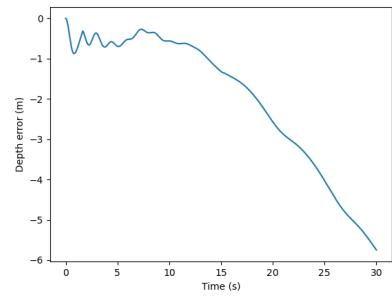


(e) 2m

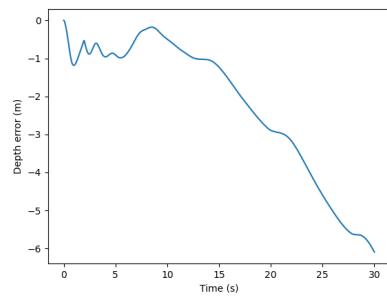
Figure 32: ROV position error over time



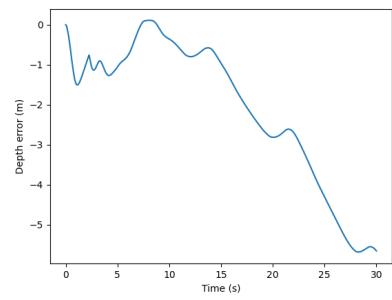
(a) 0m



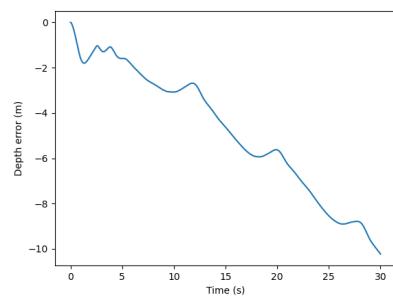
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 33: ROV position error over time

6.2 Controlled

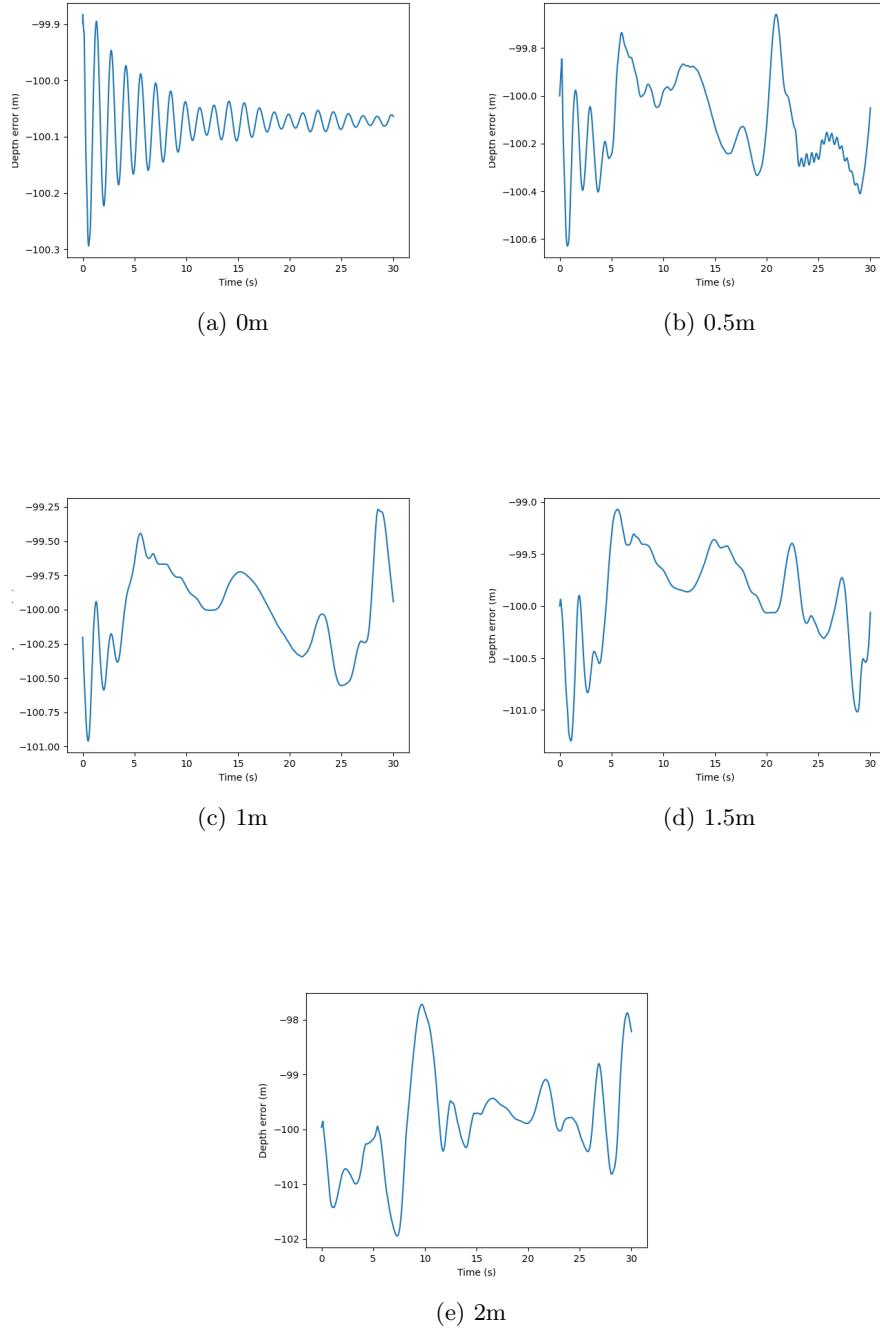
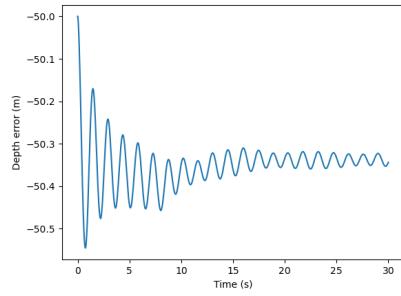
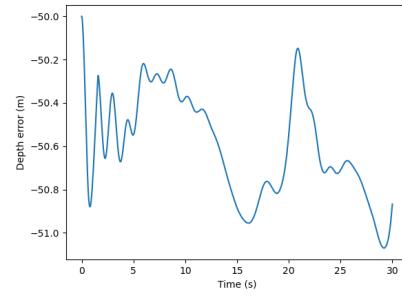


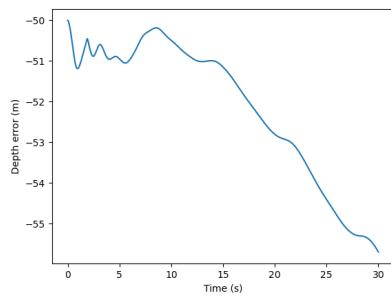
Figure 34: ROV position error over time



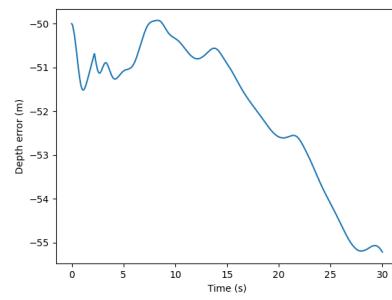
(a) 0m



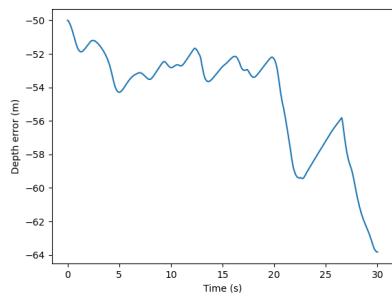
(b) 0.5m



(c) 1m

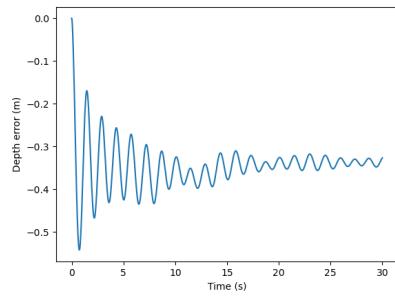


(d) 1.5m

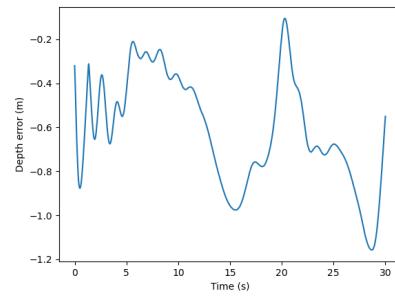


(e) 2m

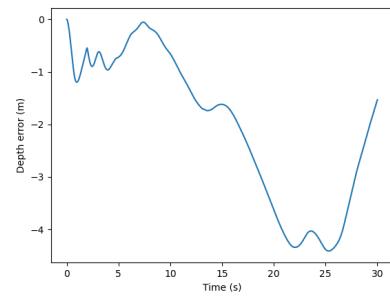
Figure 35: ROV position error over time



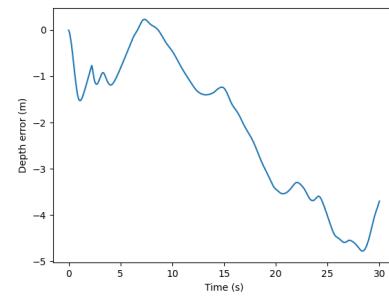
(a) 0m



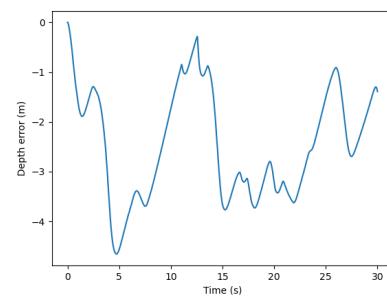
(b) 0.5m



(c) 1m



(d) 1.5m



(e) 2m

Figure 36: ROV position error over time