



The Use of Autonomous Underwater Vehicle for Quantification of Velocity

Fields in Severn River/College Creek, MD

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Introduction

Autonomous Underwater Vehicles are increasingly used by the U.S. Navy for operational mission planning. Each AUV is lightweight, man portable, and has a sensor suite comparable to a research vessel. These vehicles are highly mobile making them ideal platforms for measuring spatial quantities. Although these vehicles are widely used for measuring variables that change slowly over time, such as temperature, salinity, and bathymetry. The interest of this study was to understand the vehicle's ability to measure dynamic fields, specifically velocity.

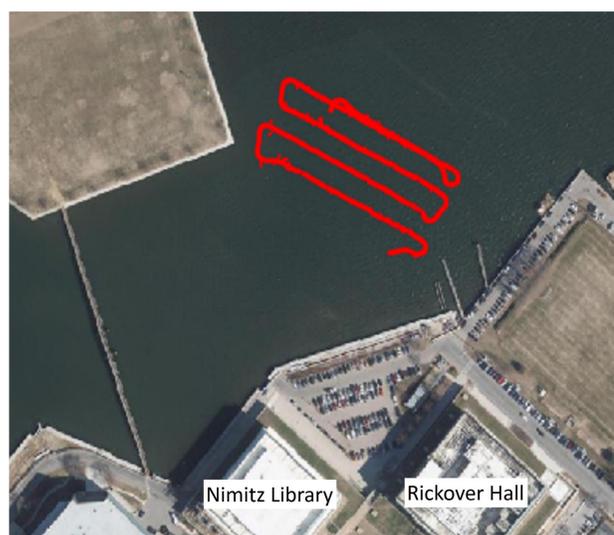
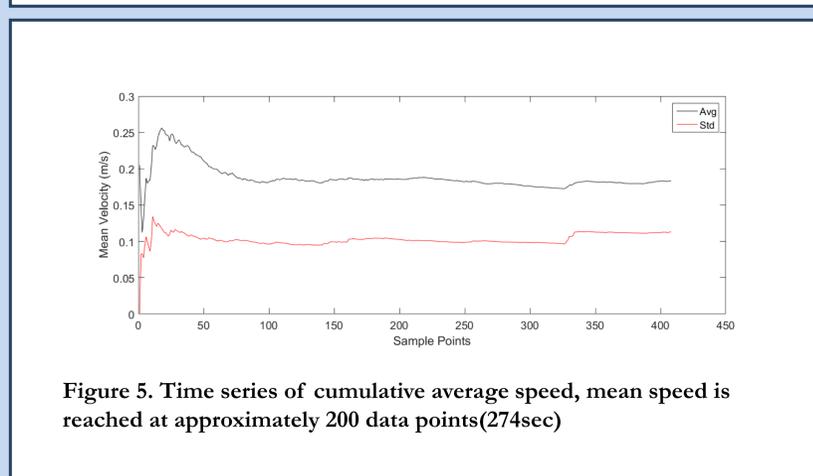
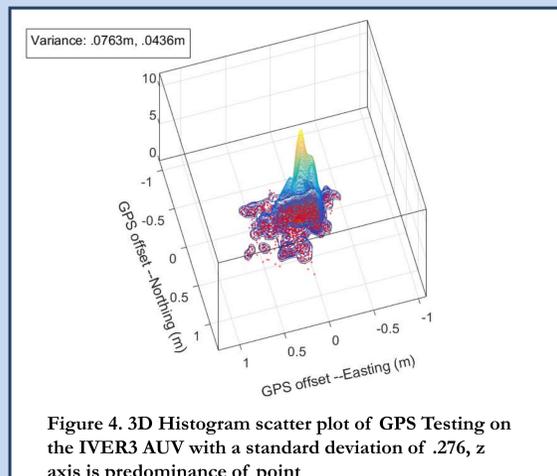
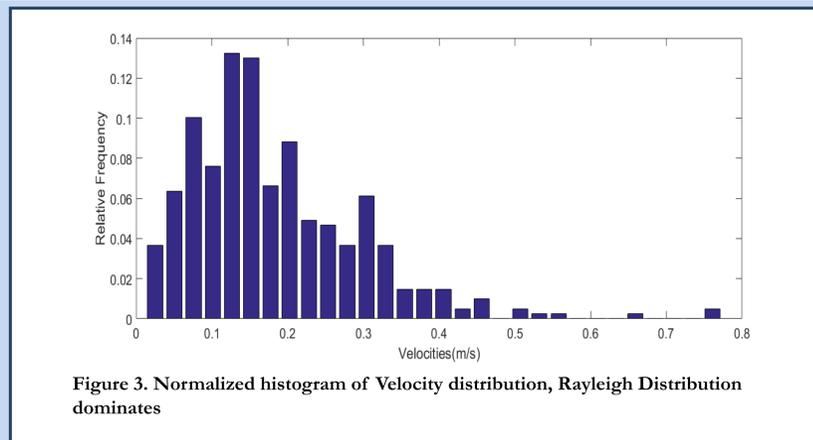
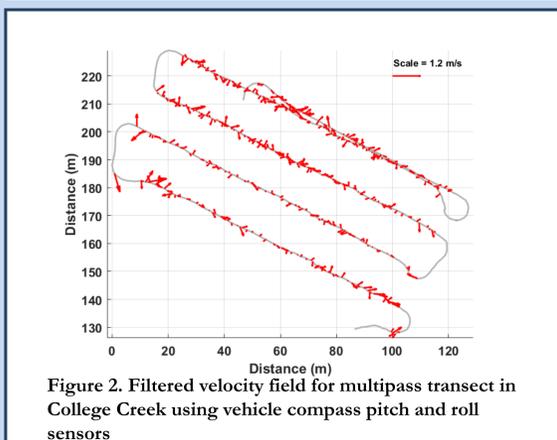


Figure 1. College Creek mission area with multiple pass transect overlaid

Physical Characteristics	Communication	Sensors	Onboard Electronics
Dimensions: 60-85 in. long, 5.8 in. diameter, 59-85 lbs	Navigation: Surface GPS(WAAS corrected), Subsurface: RDI DVL with 81m range, depth sensor, and corrected compass	Sonar Side Scan: Tritech Starfish 450 kHz single frequency	Intel Dual Core 1.6 GHz N2600 processor with MS Windows, 512 GB solid state drive for data storage
Speed/Range: 1-4 kts(.5-2.0 m/s), 8-14 hrs at 2.5 kts	Computer: Wireless 802.11n Ethernet standard	CT Sensor	
Propulsion: 48V Servo Controlled DC Motor, 3-blade cast bronze propeller	Handheld Remote: 2.4 GHz telemetry radio, touchscreen with joystick, 300m range	SVP Sensor	
		RDI Explorer ADCP: Single frequency 614.4 kHz, 4-beam phased array, 81m depth range	

Results

After running four missions the best data was collected in the College Creek multipass transect. Transects in Severn River had large time gaps in the data. Primary flow in College Creek is East-Southeast at approximately $.1834 \text{ ms}^{-1}$. Error is induced in vehicle movement and time gaps in sensors.



Conclusion

Significant progress was made into the understanding and operation of the U.S. Naval Academy's IVER3 AUV. Properly creating missions, setting ADCP sensor settings, and operating the vehicle are crucial to collecting usable data. Improving the AUV configuration and running an increased amount of missions better enables quantification of velocity fields. Larger bodies such as the entire Severn River can be measured with increased confidence.

References

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Future Work

- Run Severn River missions and calculate residuals
- Run more IVER missions with different configuration, input better data into WinRiver with more bins
- Further WinRiver work to display moving platform data with greater clarity