IT'S ALIVE! : Automated Glider Data Processing

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Introduction

- Velocity calculations are a physical oceanographic essential ocean variable
- Real-time onboard sensor processing is necessary to efficiently provide critical data for scientific discovery [1]
- Caribbean Sea plays a large role in the Atlantic Meridional Overturning Circulation (AMOC)
- Accurate numeric modeling is needed to address environmental concerns

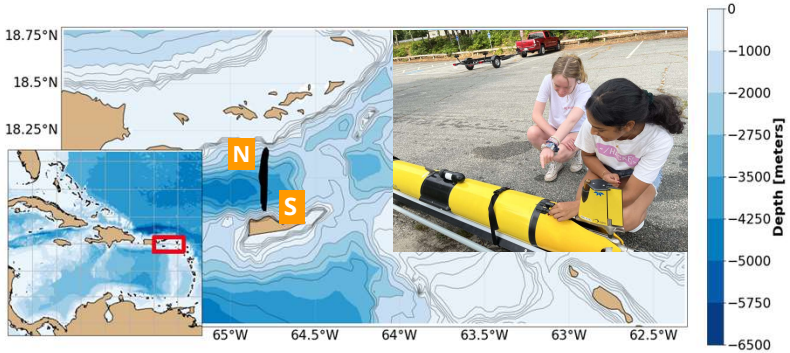


Figure 1: Map of glider dive area in the Virgin Islands

Research Questions:

1. How efficiently can an adjunct processor execute an onboard processing algorithm?
2. How can processing efficiency be maximized?
3. How does transport from the RTOFS model compare to transport calculated from glider data?

Methodology

Computers Used:

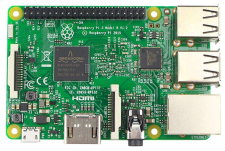


Figure 2: Raspberry Pi Model 3+

Figure 3: Raspberry Pi Model 4

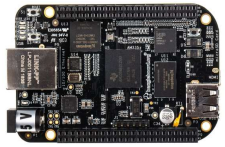


Figure 4: BeagleBone Black, did not enough memory

$$U_{ADCP}=U_{ocean}+U_{CTD}+U_{noise}$$ [2]

Results

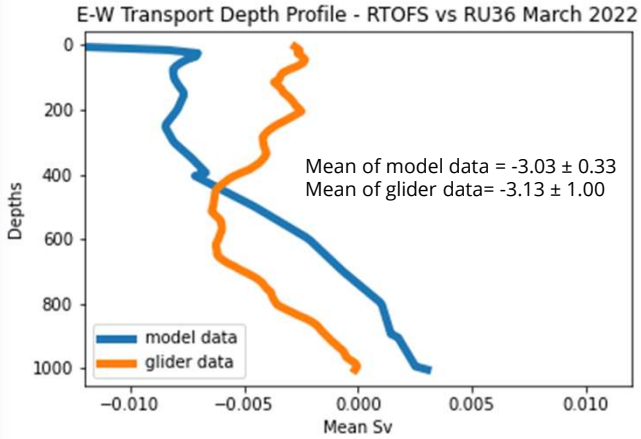


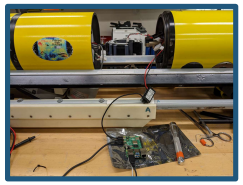
Figure 5: Transport depth profile structure is different but mean transport values are similar.

	Laptop	Raspberry Pi 3	Raspberry Pi 4
Standard Time	22 s	125 s	48.48 s
Averaging Time	20.25 s	98.82 s	40.35 s
Skipping Time	18.67 s	89.66 s	36.44 s

Figure 8: 1000-meter test profiles

Pi 3 Spike	.65 Amps
Pi 4 Spike	.75 Amps

Figure 9&10 Only used 2% of glider's total battery power.



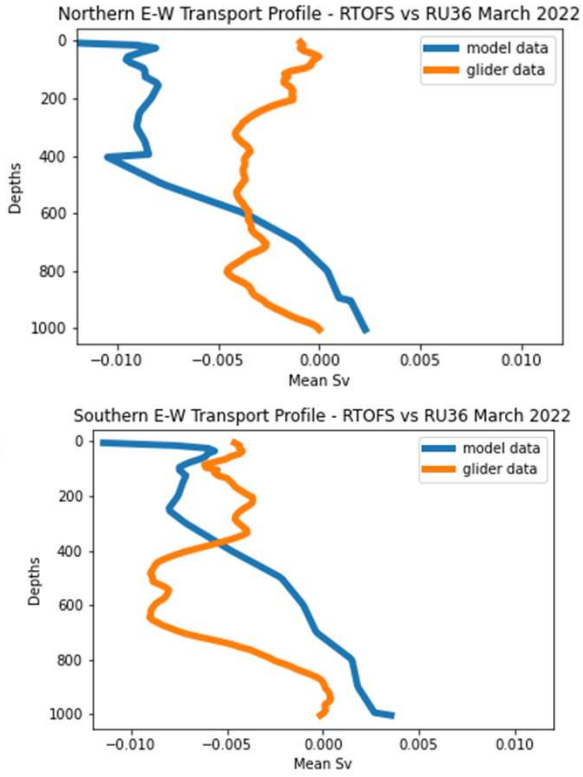


Figure 6&7: The southern transport showed more similarities than the northern.

Conclusion

- **Raspberry Pi 4** is the most efficient computer
- Overall **mean** transport is similar between model and glider data
- **However**, there are significant differences in transport depth profile
- Southern vs northern transport highlight discrepancies and model uncertainty

Future Work

- Implement software and hardware to assist with Pi to glider configuration
- Deploy glider to test real-time processing method
- Address possible miscalculations with RTOFS model

References

[1] J. C. Gradone, E. J. Hunter, J. Mullison and T. N. Miles, "Development of Onboard Processing Capabilities for a Slocum Glider Acoustic Doppler Current Profiler," OCEANS 2021: San Diego – Porto, 2021, pp. 1-5, doi: 10.23919/OCEANS44145.2021.9705895.
[2] M. Visbeck, "Deep Velocity Profiling Using Lowered Acoustic Doppler Current Profilers: Bottom Track and Inverse Solutions*," Journal of Atmospheric and Oceanic Technology, vol. 19, no. 5, pp. 794-807, 2002-05-01 2002, doi: 10.1175/1520-0426(2002)019<0794:dvpula>2.0.co;2.