Currents in the First Zone of the Nantucket Shelf

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Introduction

- Ocean currents are continuous and directed movements of ocean water. [2]
- Currents are important for understanding how organisms, nutrients and other constituents of the ocean are moved around. [2]
- There are two different types of currents: coastal and surface ocean currents. [2]
- The main factors that influence ocean currents include winds, water density, temperature, floor features and Coriolis effect. [2]
- Martha's Vineyard and the islands of Buzzards Bay make up the first zone of the Nantucket Shelf which is a transition point between the colder waters of the Gulf of Maine Region and the warm waters of the Middle Atlantic region.[3]
- This area is rich in biodiversity, the transition between warm and cold waters allows species from each extreme to mingle together.[3]
- This study will observe the currents by collecting data at different points during the cruise, and map out the locations with the greatest current strengths to identify what increases their strength.

Methods

During the three-day research cruise on the Cramer, an ADCP, Acoustic Doppler Current Profiler, was utilized to measure the speed and direction of ocean currents. The ADCP uses the Doppler Effect by producing a sequence of high frequency pulses of sound that bounce off of particles which move at the same speed as the current. Data was collected every 20 minutes for three days.[2]

Figure 1: Acoustic Doppler Current Profiler

References

[1]Acoustic Doppler Current Profiler. National Oceanic and Atmospheric Association.(2013). Available at: https://oceanexplorer.noaa.gov/technology/tools/acoust_doppler/acoust_doppler.html [Accessed 15 June 2018]

[2]Currents. (2007). [PDF] National Oceanic and Atmospheric Association. Available at: https://oceanservice.noaa.gov/education/kits/currents/05currents1.html [Accessed 15 June 2018]

[3]Toward an Ocean Vision for the Nantucket Shelf Region. (2005). [ebook] Provincetown Center for Coastal Studies. Available at: https://mail.google.com/mail/u/2/#inbox/163f4850c9e68326?projector=1&messagePartId=0.1 [Accessed 15 June 2018].

Results

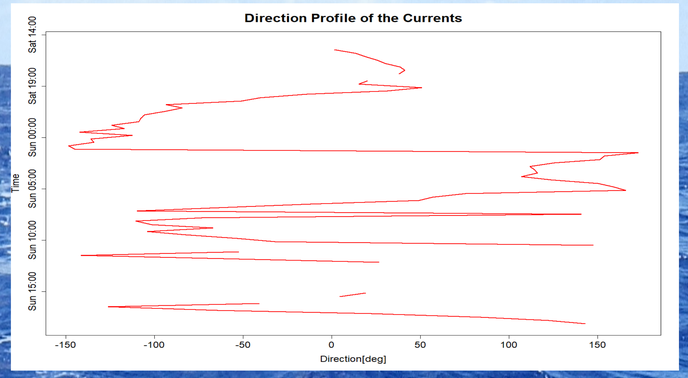

Figure 2: Direction of the currents throughout the cruise

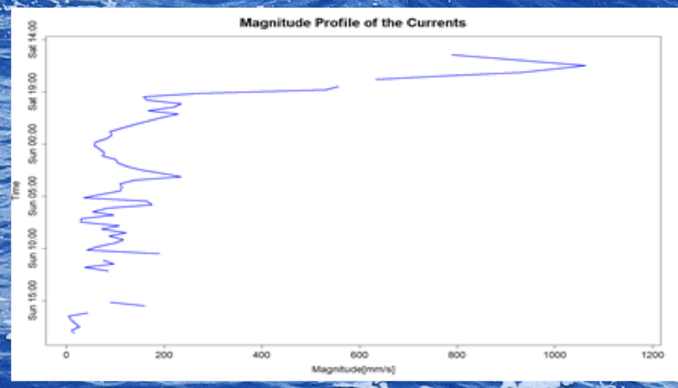

Figure 3: Current strength throughout the cruise

DATE		HIGH				LOW					
		AM	ft	PM	ft	AM	ft	PM	ft	RISE	SET
8	Fri	4:09	1.6	4:46	1.8	10:50	0.3	11:39	0.4	5:06	8:16
9	Sat	5:03	1.6	5:37	2.1	11:32	0.3			5:06	8:17
10	Sun	5:55	1.7	6:26	2.4	12:36	0.2	12:17	0.2	5:06	8:17

Table 1: Dates and times of the high and low tides

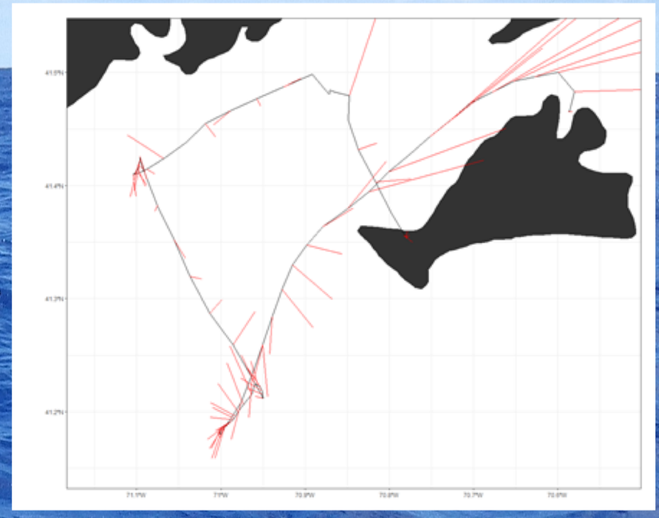

Figure 4: Map of the cruise path illustrating the magnitude and direction at different points

- On Saturday, the currents were heading in the North East direction, steadily shifting towards the South West.
- Soon after midnight, the currents shifted in the opposite direction, and oscillated in direction for the remainder of the trip.
- The beginning of the trip had the strongest currents, at a maximum of a little over 1 meter per second and weakened down to a range between 0 and .2 meters per second over the remainder of the trip.
- There were a few spikes in strength : around two in the morning (low to high), seven in the morning(high to low), eleven (high to low) and three in the afternoon on Sunday(low to high).

Conclusions

- Spikes in current strength occurred when the direction of the currents shifted to the opposite direction.
- The strongest currents took place in Vineyard Sound, when they were heading in the North East direction.

Acknowledgements

We would like to thank the crew of the Corwith Cramer for helping us gather the data, Ben Harden for guiding us through out the analysis of the data, and the Woods Hole PEP for allowing us to participate in this opportunity.