

Cruise Plan

KNORR 200-6

15 May – 14 June 2011

Pointe-a-Pitre, Guadeloupe to St. Georges, Bermuda

Cruise Participants

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Description of Project

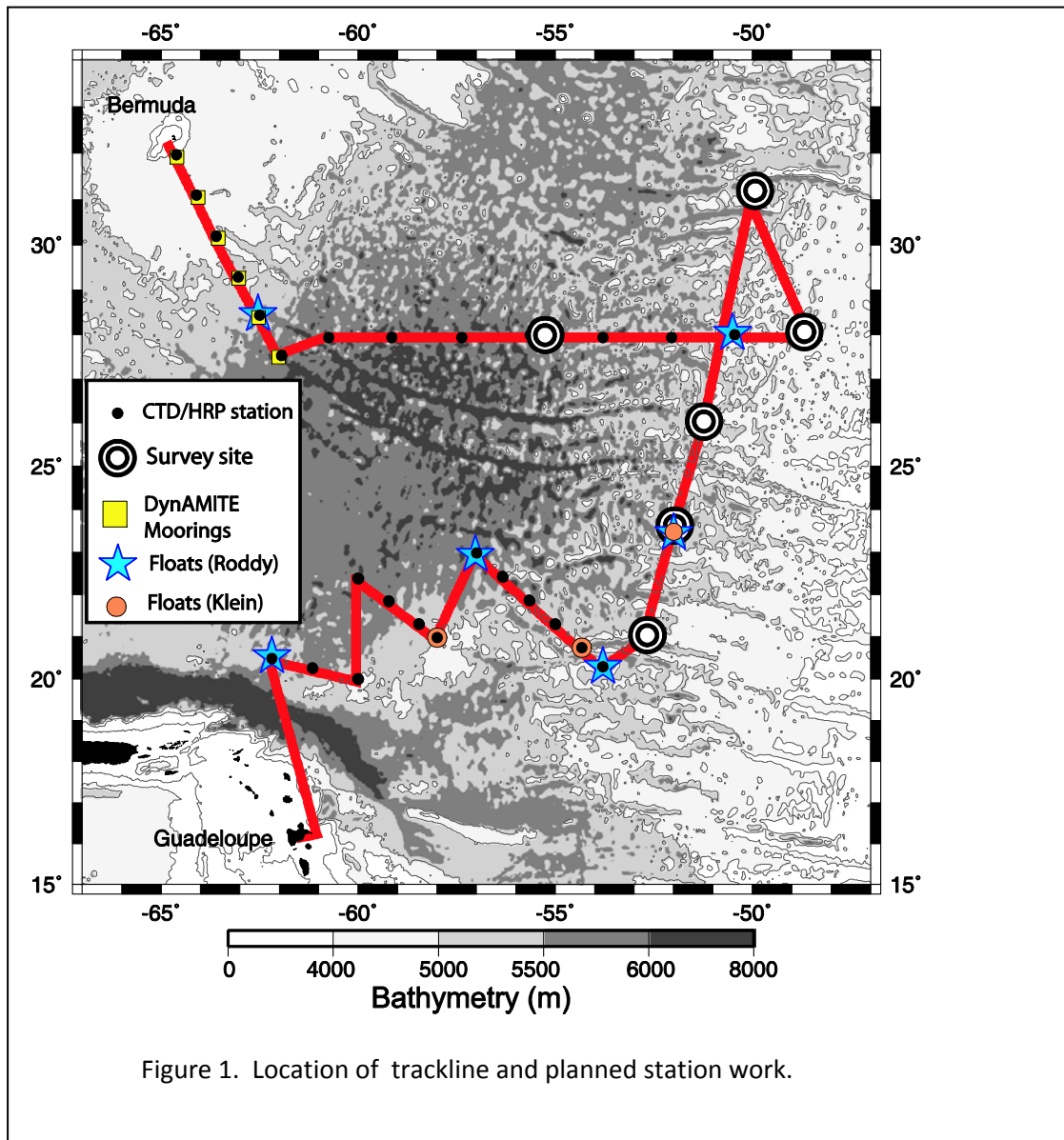
DynAMITE (**D**ynamics of **A**byssal **M**ixing and **I**nterior **T**ransports **E**xperiment) is a program funded by NSF to investigate the processes by which the coldest, densest waters in the Atlantic Ocean are transformed into warmer, lighter water masses by turbulent mixing and recirculation. The waters enter the North Atlantic from the south as Antarctic Bottom Water (AABW) and from the north as Denmark Strait Overflow Water (DSOW) flowing along the seafloor at temperatures colder than 1.5°C. They are exported back to the South Atlantic as Lower North Atlantic Deep Water (LNADW) at temperatures > 2°C and depths shallower than 4000 meters. Most of the water mass transformation takes place in the basin interior between 20-40°N, 65-50°W, where mixing is enhanced over the rugged topography of the Mid Atlantic Ridge and Bermuda Rise. This process strongly affects the density structure and circulation of the abyssal basins (> 4000 m). In Sept 2010, an array of 6 moorings was installed down the southeast flank of Bermuda Rise using *R/V Atlantic Explorer*. Those moorings are measuring the currents that flow along Bermuda Rise in the depth range 1200-6000 meters. This cruise will undertake a survey of the region south and east of the array to directly measure the mixing that drives these flows: where is it occurring? how much? and why?

Science Objectives

Knorr 200-6 will conduct a survey along the trackline shown in Figure 1 using SeaBeam to map seafloor topography, CTD casts to capture water samples, and the High Resolution Profiler (HRP) to measure water column properties and velocity at very small vertical scales. HRP is an untethered instrument that descends to the seafloor, drops its weights at a preprogrammed height above the bottom and ascends buoyantly to the surface. Recovery involves maneuvering the ship alongside the instrument in order to hook a line onto it, and then using a specially designed winch and lifting rig system to hoist the package

back onto deck at the stern. A system of tracks is used to move the package from the stern to a protected area near the aft hangar. A typical dive takes about the same time as a shipboard CTD cast. We will conduct CTD casts simultaneously with HRP operations, but not on every HRP dive. The plan is for ~125 HRP dives and 60 CTD casts. We will also deploy 10 profiling floats along the ship's track. At 6 sites, intensive multi-beam and HRP surveys will be carried out over a time period of ~2.5 days each. The specific goals are to be able to determine: 1) where and how much turbulent mixing occurs in the study region in relation to varying bathymetric characteristics, 2) the sources of energy driving that mixing, 3) how the dense waters navigate past a topographic ridge at 20°N, and 4) to acquire a detailed bathymetric survey and water samples along the moored array deployed last September.

For further details about the HRP, see: <http://hrp.whoi.edu/hrpgrp/new/newhrp.html>



Waypoints and estimated timeline:

Estimated using speed = 10 knots

WP#	lat		lon		depth(m)	(nm)	hours		cumulative days
	distance	steam	cast						
	16	12.0 N	61	30.0 W		Depart Guadeloupe	~0900	15May	
1	20	30.0 N	62	12.0 W	5128	261.1	26.1	2.9	1.8
2	20	15.6 N	61	9.6 W	5474	60.2	6.0	3.1	2.1
3	20	0.0 N	60	0.0 W	4848	67.2	6.7	2.7	2.5
4	22	24.0 N	60	0.0 W	5886	144.0	14.4	3.3	3.3
5	21	51.6 N	59	13.2 W	5596	54.1	5.4	3.1	3.6
6	21	19.2 N	58	27.0 W	5398	53.8	5.4	3.0	4.0
7	21	0.0 N	58	0.0 W	4879	31.7	3.2	2.7	4.2
8	23	0.0 N	57	0.0 W	5735	132.3	13.2	3.2	4.9
9	22	26.4 N	56	19.8 W	5230	50.0	5.0	2.9	5.2
10	21	52.8 N	55	39.6 W	4869	50.1	5.0	2.7	5.6
11	21	19.2 N	55	0.0 W	5338	49.9	5.0	3.0	5.9
12	20	45.6 N	54	19.8 W	5670	50.4	5.0	3.2	6.2
13	20	18.0 N	53	48.0 W	4946	40.6	4.1	2.8	6.5
14	21	0.0 N	52	42.0 W	4646	74.7	7.5	2.6	6.9
15	23	30.0 N	52	0.0 W	5330	155.0	15.5	3.0	9.7 SURVEY
16	26	0.0 N	51	12.0 W	5076	156.2	15.6	2.9	12.5 SURVEY
17	31	0.0 N	50	0.0 W	4808	306.6	30.7	2.7	15.9 SURVEY
18	28	0.0 N	48	30.0 W	4988	196.3	19.6	2.8	18.8 SURVEY
19	28	0.0 N	50	16.8 W	5788	94.0	9.4	3.2	21.3 SURVEY
20	28	0.0 N	52	6.0 W	5430	96.0	9.6	3.0	21.9
21	28	0.0 N	53	51.0 W	5731	92.0	9.2	3.2	22.4
22	28	0.0 N	55	37.8 W	5701	94.0	9.4	3.2	22.9
23	28	0.0 N	57	25.2 W	5774	94.0	9.4	3.2	25.4 SURVEY
24	28	0.0 N	59	12.0 W	6326	94.0	9.4	3.5	26.0
25	28	0.0 N	60	48.0 W	5928	84.0	8.4	3.3	26.5
26	27	36.0 N	62	0.0 W	5978	68.1	6.8	3.3	26.9
27	28	27.0 N	62	30.0 W	5541	57.5	5.7	3.1	27.3
28	29	18.0 N	63	3.0 W	5036	58.6	5.9	2.8	27.6
29	30	12.0 N	63	36.0 W	4667	61.1	6.1	2.6	28.0
30	31	6.0 N	64	6.0 W	4475	59.9	6.0	2.5	28.3
31	31	58.8 N	64	36.6 W	4041	58.9	5.9	2.3	28.7
Bmuda	32	18.0 N	64	48.0 W	0	21.5	2.1	0.0	28.8