Draft Cruise Plan
Ocean Researcher 1
QPE Program
Leg 1- August 23-September 1, 2009 (Kaohsiung-Keelung)
Leg 2- September 4- September 12, 2009 (Keelung-Keelung)

Chief Scientist- Jan Sen Leg 1, YJ Yang Leg 2

US Participants

Leg 1
Jan Sen, NTU
ADD OTHER TAIWANESE SCIENCE PARTY
Jim Lynch, WHOI
Neil McPhee, WHOI
Will Ostrom, WHOI
Frank Bahr, WHOI
Craig Marquette, WHOI
Jim Murray, OASIS Inc.
Dave Morton, OASIS Inc.
Ted Abbot, OASIS Inc.
Chris McCall, Scripps Inst. of Oceanography (Space Permitting)

Leg 2

YJ Yang, NTOU
ADD OTHER TAIWANESE SCIENCE PARTY
Tim Duda, WHOI
Neil McPhee, WHOI
Will Ostrom, WHOI
Glen Gawarkiewicz, WHOI
Frank Bahr, WHOI
Craig Marquette, WHOI
Dave Morton, OASIS Inc.
Chris Emerson, OASIS Inc.
Chris McCall, SIO (Space Permitting)

Overall Cruise Goals

Joint operations between Taiwanese and US physical oceanographers and acousticians in order to deploy and recover acoustic receivers, thermistor chains, and two bottom mounted ADCPs as well as deploy mobile acoustic sources and the National Taiwan University SeaSoar for high-resolution hydrographic mapping. We will be studying shelfbreak processes including onshore transport of Kuroshio water onto the outer shelf as well as Cold Dome structure over the shelf. For Leg 1, mobile acoustic source operations will be pre-planned to establish baseline conditions for oceanographic

conditions and acoustic propagation for low frequency. For Leg 2, both oceanographic data from the SeaSoar transects as well as regional model fields will be used to do adaptive sampling of the outer shelf and upper slope in order to quantify and exploit the uncertainty and ultimately to determine which processes contribute to uncertainty in the prediction of acoustic propagation.

Major Equipment to be deployed

Moorings

During Leg 1, two separate deployments and recoveries of equipment at Acoustics Sites A and B respectively will be done. Site B is at the 125 m isobath near the shelfbreak at the position 25.7139 N, 122.6130 E. Three thermistor chains will be deployed at each site along with one 300 kHz bottom-mounted ADCP and a horizontal line array (HLA). Site A is near the northern edge of the study area and is located at 25.9890 N, 122.5259 E. It is anticipated that Site A will have low uncertainty in terms of prediction of acoustic propagation characteristics and Site B will have high uncertainty. In addition to the oceanographic moorings, two SHRU moorings (Single Hydrophone Recording Unit) will be deployed. The thermistor chains, HLA, and SHRUs will be recovered at each site in Leg 1 and the two ADCPs will be left until the end of Leg 2. Moorings from YJ Yang will also be recovered at the end of Leg 2.

NTU SeaSoar

The NTU SeaSoar will be used to measure the thermohaline structure in the vicinity of sites A and B. Sampling will consist of a mixture of along-shelf and cross-shelf sections with the scientific goal of identifying both potential Kuroshio Intrusions onto the shelf as well as the Cold Dome structure. This data will be processed after recovery and sent to MIT for assimilation into the regional model. This data will also be used to identify likely features for Mobile Acoustic Source sampling (edge of the Cold Dome, across a Kuroshio Intrusion, in thermohaline intrusions if present, etc.).

Mobile Acoustic Sources

The mobile acoustic sources are small expendable devices that send acoustic signals at pre-set frequencies. These are pre-programmed before launch. They navigate by dead reckoning and thus are affected by ocean currents. We will be deploying up to 18 of these devices for the two legs. In Leg 1, we will be deploying OMAS (OASIS Mobile Acoustic Sources) from Site B and then Site A, and similarly for Leg 2. Again, we will have pre-planned tracks for Leg 1 and use adaptive sampling in Leg 2.

Other Activities

In addition to activities listed above, the OR1 will be used as necessary to recover Restrained Moorings or other instruments which move out of the study area.

Timetable for Activities

LEG 1

August 21- Afternoon- Mobilization and Loading- Kaohsiung

August 22- Mobilization and Loading

August 23- Depart for QPE Study Area Site B

August 24- Begin mooring deployment Site B. Deploy 3 Thermistor chains, 2 SHRUs, HLA, 1 ADCP.

August 24- Night. OMAS Shakedown run Site B. Along/across 130 m isobath (L shape)

August 25- Day Complete mooring operations. SeaSoar Operations. Along-shelf sections over 130 m isobath and upper slope

August 25- Night OMAS Operations at Site B. Two circles approximately 10 km apart to test for translational and azimuthal isotropy.

August 26- Day SeaSoar Operations. Cross-shelf sections over shelfbreak (larger safety margin). 4 cross-shelf sections.

August 26- Night OMAS Operations. Offshore run with stairstep pattern (depth increasing with offshore distance). Run oriented from Site B to second SHRU location at 200 m isobath

August 27- Day SeaSoar Operations. Alongshelf sections near shelfbreak at 130 m isobath and further onshore to examine Cold Dome structure

August 27- Night OMAS Operations. Canyon run in vicinity of SHRU at 200 m isobath

August 28- Day Recover SHRUs, HLA, 3 thermistor chains. Steam to Site A. Deploy SHRUs, HLA, ADCP, and thermistor chains. With any available daylight either coarse CTD section or short SeaSoar section.

August 28- Night OMAS operations. Site A. Along/across 110 m isobath (L shape)

August 29- Day SeaSoar Operations. Alongshelf runs at Site A and 20 km south of Site A to resolve Cold Dome structure

August 29- Night OMAS Operations. 24 Hour OMAS circle runs to resolve effect of internal tides.

August 30- Day OMAS Operations. Continue 24 Hour OMAS circle runs for tidal effects.

August 30- Night Coarse CTD survey in region of Site A to resolve Cold Dome structure.

August 31- Day. Recover 3 thermister chains, 2 SHRUs, HLA.

August 31- Night Steam back to Keelung.

September 1- Morning Arrive Keelung

September 2-3 Processing of data, science meetings for planning adaptive sampling.

LEG 2

Sept. 4 - Day Depart Keelung. Steam to Site B. Deploy SHRUs and thermistor chains

Sept. 4- Night OMAS operations. Site B Adaptive sampling run #1- Focus on alongshelf variability at 125 m isobath based on model uncertainty

Sept. 5- Day SeaSoar operations. Along-shelf lines over outer shelf and upper slope. Adaptive sampling of high uncertainty areas.

Sept. 5 – Night OMAS operations. Site B Adaptive sampling run #2- Focus on along-shelf variability over shelfbreak near 125 m isobath (Site B)

Sept. 6- Day SeaSoar Operations. Cross-shelf lines over outer shelf and upper slope. Adaptive sampling of high uncertainty areas.

Sept. 6- Night OMAS Operations. Site B Adaptive sampling run #3 Focus on cross-shelf variability over upper slope

September 7- Day SeaSoar Operations Along-shelf lines at 130 m isobath and further onshore to determine Cold Dome structure, adaptive sampling.

September 7- Night OMAS Operations. Site B Adaptive sampling run #4. Focus on Cold Dome structure onshore of 125 m isobath

September 8- Day SeaSoar Operations. Lines over canyons, adaptive sampling

September 8- Night OMAS Operations. Adaptive sampling of canyons run #5- Focus on canyon effects

September 9- Day Recover SHRUs HLA and thermistor chains from Site B. Steam to Site A. Redeploy SHRUs Hand thermistor chains at Site A.

September 9- Night OMAS Operations. Adaptive sampling near Site A- Focus on onshore edge of Cold Dome

September 10- Day SeaSoar Operations. Adaptive sampling near Site A

September 10- Night OMAS Operations. Adaptive sampling near Site A. Focus on contrasting bottom types (sand ridge versus muddy depressions)

September 11- Day Recover moorings at Site A. Steam down to site of YJ Yang moorings. Recover Yang moorings. Steam to site of WHOI Site B ADCP. Recover WHOI ADCP mooring.

September 11- Night. Steam back to Keelung.

September 12- Day. Arrive Keelung. Unload and demobilize.