SF	Supplement: Participation in JAMSTEC R/V Natsushima cruise NT0517	
	Robert Stern, UT Dallas; Sherm Bloomer; Alison Shaw; Ed Kohut	
	10/2005	Supplement to OCE 00-01827

A modest supplement to the NSF OCE 00-01827 grant supported participation of several US scientists (Robert Stern, Sherm Bloomer, Alison Shaw, and Ed Kohut) and students (Neil Basu UTD and Julie O'Leary CIT) in the October 2005 JAMSTEC NT0517 cruise with aboard R/V Natsushima with ROV HyperDolphin 3K (Guam to Saipan). Bob Embley (NOAA) also particpated. Japanese scientists included Yoshii Tamura (JAMSTEC) and Osamu Ishizuka (GSJ).

The collaboration between JAMSTEC, MARGINS and NOAA Ocean Explorations, jointly proposed by Robert Stern and Yoshi Tamura, was extremely successful. The ROV operated flawlessly, the ship's crew and ROV team were great, and the seas were relatively calm; we were able to complete all 10 scheduled dives. The scientific team then enjoyed a one day field trip to study the geology of Saipan. U.S. scientists interested in developing similar partnerships with Japanese scientists to study the IBM using JAMSTEC submersibles are welcome to contact Bob Stern <rjstern@utdallas.edu> - at time of writing, the next deadline will be in July 2006.

Note that as of October 2005, NW Rota-1 remains active, perhaps more so than when last observed in April 2004.

Edited extract from cruise report:

During [the NT0517] cruise, JAMSTEC's R/V Natsushima and ROV Hyper-Dolphin and a Japan-US team of scientists studied volcanism and sedimentation near the southern end of the active Izu-Bonin-Mariana arc (Stern et al., 2003). We focused on the Southern Seamount Province of the active Mariana Arc between 14°10'N and 15°20'N (Fig. 1). The targets lie just west of the Mariana frontal arc islands, especially Rota, Tinian, and Saipan. The cruise completed additional multibeam maps of the seafloor, completed ten dives of Hyper-Dolphin, and recovered more than 130 samples of rocks, water, and sediment.

The cruise provided important insights to active venting of sulphur, hyaloclastite formation, vent biology, and water chemistry at the summit of NW Rota-1 volcano; the structure and evolution of a silicic caldera at West Rota Seamount; the origin of primitive lavas at Chaife Seamount, the development of giant sediment waves west of Esmeralda Bank; the evolution of arc seamounts at parasitic cones on NW Rota-1 and West Rota; and the nature of volcanism on parasitic cones on NW Rota-1 and W. Rota volcanoes. The following paragraphs summarize our findings; more detailed discussions are found in individual dive summaries that follow the introduction.

NW Rota-1 volcano: Dives 480 and 481 (Oct. 9 & 10) revisited the summit region of this young submarine volcano. Activity near the summit region of NW Rota-1 was discovered by CTD casts in 2003 (Embley et al., 2004) and observed with ROV ROPOS during TT-167 in Spring of 2004 (Embley et al., submitted). These studies discovered a deep pit (Brimstone Pit) just south of the summit that was throwing out sulphur globules and basaltic lapilli. Acidic vent fluids stimulated a biological community, dominated by shrimp.

NW-Rota-1 Brimstone Pit represents an extremely early stage in the evolution of a submarine arc hydrothermal field. The associated biota also seems to be in the earliest stages, with a low diversity community that consists of only the most mobile invertebrate species, especially shrimp. Studies during NT05-17 indicate that vigorous activity around the pit continues and is at an increased level of intensity relative to observations in 2004. Dive 488 (Oct. 18) examined and sampled two small parasitic cones on the southeastern flanks of NW Rota-1. The pillow lavas, sampled at deeper depths and that run down from the ridge trending east-southeastwardly are primitive cpx-ol basalt lavas. The two parasitic knolls themselves consist of pl-phyric ol-cpx basalts. These may represent two types of basalt lavas derived from a wet and dry mantle source beneath a single volcano, as suggested in the Sumisu caldera volcano, Izu-Bonin arc (Tamura et al., 2005), or these may be primitive and evolved lavas derived from the same primary basalt magma.

W. Rota Volcano: Dives 482, 483, and 484 studied the steep eastern wall of West Rota caldera. Dive 489 (Oct. 19th) traversed two parasitic cones on the southeastern flanks of West Rota. W. Rota is an extinct submarine volcano with a caldera that is similar in size to Crater Lake, Oregon. This is by far the largest caldera in the Mariana arc but was unknown until 2001. The four Hyper Dolphin dives were very successful, identifying the location of hydrothermally altered lavas and stockwork sulfide mineralization towards the bottom of the caldera walls in Dives 482 and 484. This marks the exhumed roots of an arc hydrothermal system. Dive 483 found a weak but active low-T hydrothermal vent at the bottom of the SE caldera wall. Chemosynthetic macrofauna was not present, but tan to orange microbial mat was actively forming. Abundant dacitic dikes were observed during dive 483 which could be traced upwards into coarse pyroclastic flows, and the abundance of basaltic material erupted simultaneously with rhyodacitic pyroclastics suggests that the final, caldera-forming eruptions were triggered by injection of basaltic melt into a felsic magmatic body. The abundance of dikes observed during HD 483 suggests that the SE portion of the volcano was its magmatic apex.

Dives 485 and 486 provided important new data on the nature and composition of Chaife Seamount and Mt. Manganese. Although locally faulted, Chaife appears to be built on top of a NNE striking fissure. Lavas recovered from blocky flows were CPX-PLAG phyric basalts on the lower slopes (2300-2050 meters depth), ankaramitic and picritic on the mid- slopes (2055-1896 m) (similar to those sampled in 2001 by Cook 7), and aphyric basalts on the upper flanks (1875-1686 m). These lavas occurred in steep ridges, separated by flatter sediment covered slopes. Mt. Manganese is bisected by the fracture zone on its northern side. The bottom of the rift valley contains NNW-ESE trending flow channels in pumiceous sediment and small cones of tephra, lava and breccias. The cones are eroded and Mn-encrusted. Some lavas in the may have be primitive. The western fault scarp of the fracture zone exposes the flows on Mt. Manganese. These were basaltic in composition and Mn-coated. No intermediate or felsic lavas were observed.

Giant sediment waves around Esmeralda (Dive HD-487): On the aprons of many volcanic islands and larger submarine volcanoes, sediment waves with wavelengths of up to 2.0 km and amplitudes up to 100 m commonly occur (Embley et al. 2003). Giant sediment waves (GSW) of similar scale commonly occur in fine-grained sediments associated with turbidite channel levees and bottom current depostional areas Stow and Wynn, 2002). GSW in the Marianas appear to be limited to submarine slopes around active volcanoes and probably formed by major eruptions which discharged great volumes of sediment. HD 487 examined 2 lee slopes and one intervening upcurrent slope of GSW on the SW

flanks of Esmeralda bank volcano, an active submarine volcano west of Tinian. The deeper of the two lee slopes appeared to be a depositional feature (perhaps draped over thinly-bedded volcaniclastics) whereas the shallower lee slope clearly revealed a cut bank of well-bedded volcaniclastics, which we infer were exposed by currents that deposited GSW farther downslope.

Figures and Captions

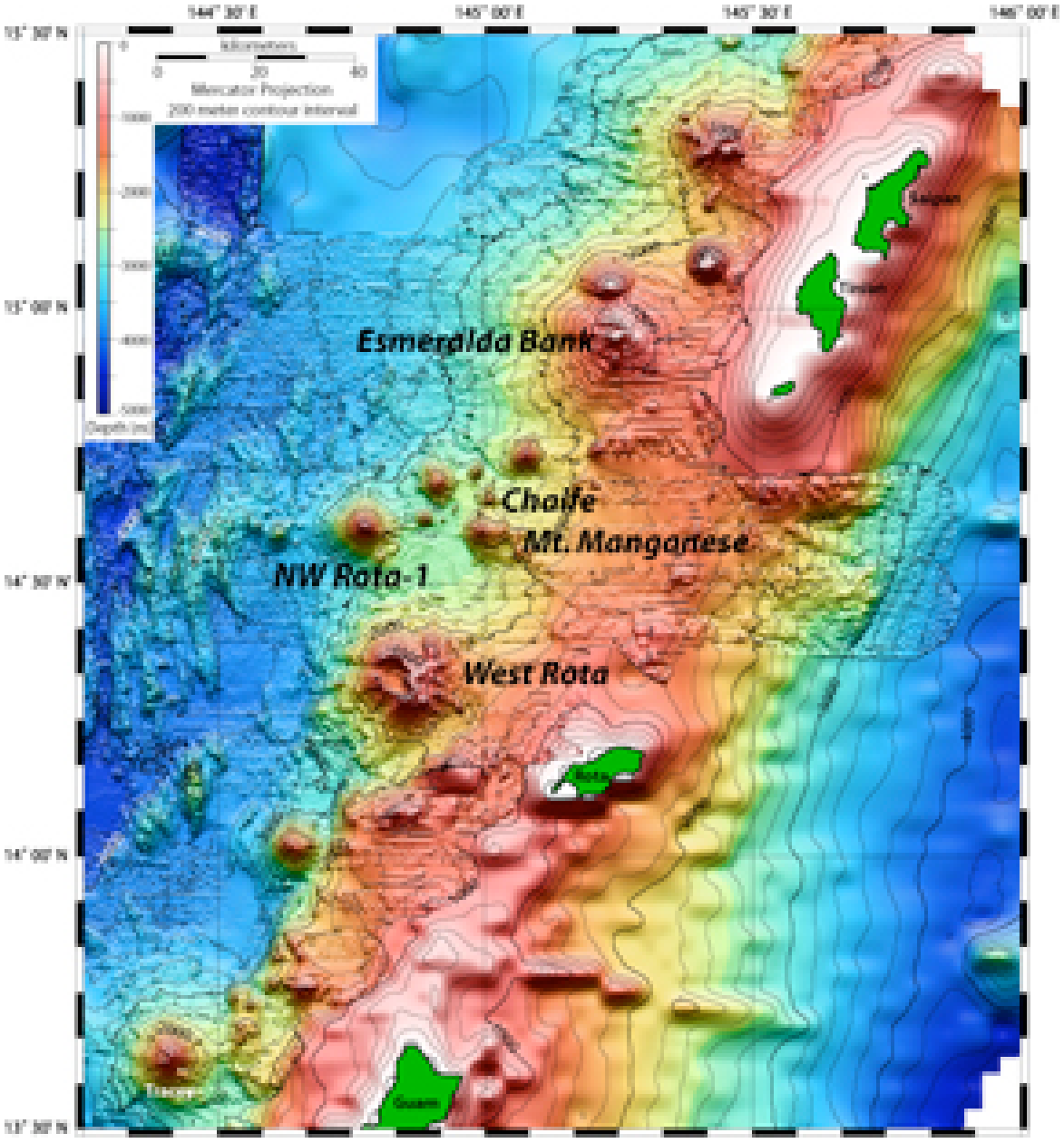

Figure 1: Bathymetric map of the southern Mariana arc. Four data sets are used, with gridcell size in parentheses: Satellite data (3500m), Hawaii MR1 (300m), Seabeam (150m), EM300 (50m). Figure by Susan Merle (NOAA). Features studied during NT0517 and HD 480-489 are shown in boldface italics.