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IODP Expedition 331 Deep Hot Biosphere

NUNOURA, Takuro[1*], TAKAI, Ken[1], IODP Exp331 onboard scientists[1]

[1]Extremobiosphere Research Program, JAMSTEC

The Iheya North hydrothermal field is located in the middle Okinawa Trough, an ac- tively spreading backarc basin that extends for 1200 km between the Ryukyu arc- trench system and the Asian continent, in a transitional region between continental and oceanic crust. Because the Okinawa Trough contains both hemipelagic and vol- canic sediment, in some places >1000 m thick, its hydrothermal systems provide abundant H2, CO2, CH4, NH4, H2S, and CO derived from sedimentary organic matter and from magmatic gases that could feed a variety of microbial communities, sus- tained by different chemolithoautotrophic primary producers within a range of sub- seafloor habitats. Integrated Ocean Drilling Program (IODP) Expedition 331, the Deep Hot Biosphere project, drilled into the Iheya North hydro- thermal system in order to investigate metabolically diverse subseafloor microbial ecosystems and their physical and chemical settings.

We drilled five sites during Expedition 331: the active hydrothermal vent site and sulfide-sulfate mound at North Big Chimney (NBC) (Site C0016); three sites east of NBC at distances of ˜100, 450, and 1550 m from the active vents (Sites C0013, C0014, and C0017, respectively); and one site on a hill ˜600 m northwest of the active vents that represents a potential migration path for hydrothermal fluid (Site C0015). Our maximum penetration was 151 meters below seafloor (mbsf) at recharge Site C0017. We will introduce summary of the drilling, geochemistry, mineralogy and microbiology among the sites, and discuss about the sub-vent hydrogeology of the hydrothermal field.

Keywords: IODP, Okinawa Trough, hydrothermal, subsurface biosphere, sub-vent biosphere