

Research on seafloor liquid CO₂ emission sites and its implication in CO₂ sequestration technology

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Discovered all four natural liquid CO₂ emission sites are distributed around Japanese islands.

1. Izena Hole, Middle of the Okinawa Trough

Liquid CO₂ emissions occur from altered sediment surface near hydrothermal mounds either at JADE hydrothermal site in the northeastern wall of the hole or at HAKUREI hydrothermal site in the middle of the hole. Native sulfur crusts are frequently observed on and beneath the seafloor. Selected ref.: Halbach, Nakamura, et al., 1989, *Nature*, 338, 496-499. Sakai et al., 1990, *Science*, 248, 1093-1096. Nakamura, Marumo and Aoki, 1990, Technical reports presented at the 6th symposium on deep-sea research using the submersible 'Shinkai 2000' system, 33-50, JAMSTEC. Sakai et al., 1990, ditto., 69-85.

2. Hatoma Knoll, NNE of Ishigaki Island, Southern Okinawa Trough

Liquid CO₂ emissions were observed on hydrothermal mounds located at the top of this submarine volcano. Selected ref.: Tsuchida, Watanabe et al., 2000, *JAMSTEC Journal of Deep Sea Research*, no. 17, 35-42. Watanabe, 2001, ditto., no. 19, 87-94.

3. Dai-yon Yonaguni Knoll, Westernmost part of the Okinawa Trough

Liquid CO₂ emissions were observed either from space between sulfide gravel on the body of hydrothermal sulfide mound, where high temperature vents were located or from altered sediment near hydrothermal mounds. Native sulfur crusts are frequently observed on and beneath the seafloor. Selected ref.: Matsumoto, Kinoshita et al., 2001, *JAMSTEC Journal of Deep Sea Research*, no. 19, 95-107. Fujikura et al., 2001, ditto., 141-154.

4. NW Eifuku Seamount, Northern Mariana arc

Liquid CO₂ emission was observed near native sulfur chimneys at the top of this submarine volcano at the depth of 1,607 m. There was no sulfide collected from this hydrothermal site. Liquid CO₂ droplets were often trapped by the volcanic gravel at the surface. Thick bacteria mats developed near the site. Selected ref.: Embley et al., 2004, *EOS*, 85, 37-44. <http://oceanexplorer.noaa.gov/explorations/04fire/logs/april10/april10.html>, also [/april11/april11.html](#), and [/april12/april12.html](#)

Liquid CO₂ were thought to be originated from volcanic gas. Although past researches on liquid CO₂ droplet behavior were related to the CO₂ behavior in the middle depth ocean CO₂ sequestration, CO₂ behavior in deep sea sediments must be the natural analogue of the leaked CO₂ from the CO₂ storage beneath the seafloor. We will present some results from our geological, geochemical and microbiological investigations at these sites focussing on several results, which should have implications in research and development of the CO₂ sequestration technology.