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Deep Seafloor Versatile Observation Infrastructures in Japan

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The Japanese Islands located on subduction zones, and large number of earthquakes occurred near trenches or plate boundaries, which are many case underwater. The preparation of real-time seafloor observatories are essential for earthquake monitoring and infrequently accompanied Tsunami disaster. The developments and deployments of real-time seafloor observatories started late ‘70s, have disposed 7 submarine cable connected monitoring systems around Japan by present. Precise earthquake monitoring requires a high density observation network, although, on the basis of traditional commercial submarine cable engineering and cable laying method, there is considerable technological difficulty in deploying as many sensors on seafloor as on land. The existing real-time seafloor observatories are invaluable infrastructure but still small scale and insufficient for an ideal observation network covering Japan. To study how to cope with the situation, 3 experimental projects were implemented late ‘90s in Japan. They are VENUS project (establishment of construction method for expandable observatory on seafloor), Hatsushima Observatory (construction of seafloor test site for long-term reliability of observatory and measurement equipment), and AOS (long distance cable extension engineering for real-time mobile observation). The results of these engineering experiments made the scientists hold great expectations in the achieve of the large scale deep seafloor monitoring network encircles Japanese Islands and tectonic plates, and started the examination for the advanced real-time seafloor monitoring system, which named ARENA (Advanced Real-Time Earth monitoring Network in the Area). The concept of ARENA will provide the capability of two way data transmission, power distribution and replaceable interfaces for multidisciplinary measurement equipments. The expandable nodes are placed with 50km intervals in the backbone cable system and each node has the capability to connect

secondary node or variety of measurement equipment. This large scale observation infrastructure will transform traditional expeditionary investigations into interdisciplinary in-situ continuous observations with a variety of spatial and temporal scale coverage and it will be used for not only the natural hazards monitoring but also other societal concerns such as climate change, deposition of mineral resources, and diversity of species.