

## Shallow gas hydrate exploration in Japan Sea: Past, Present and Future

Ryo Matsumoto<sup>1\*</sup>

<sup>1</sup>Meiji University OSRI-Gas Hydrate Laboratory

Japan Sea gas hydrate exploration has entered into a new phase since a number of shallow gas hydrate exposure and related phenomena were identified in wide area of in Japan Sea and offshore Abashiri of the Sea of Okhotsk in 2011 and 2012. Academic efforts to explore shallow gas hydrates have focused to delineate the occurrence and distribution in Joetsu Basin where the shallow gas hydrate has been first recovered in 2013. Intensive expeditions on and around the Joetsu knoll and Umitaka spur have demonstrated that shallow gas hydrates are closely associated with gas chimneys, shallow topographic high (hydrate mound), and occasional methane plumes. Gases of gas hydrates are predominated by thermogenic with very small amount of microbial methane. Recent gas hydrate expeditions has revealed that gas hydrates in the Sea of Okhotsk and in the eastern margin of Japan Sea off Akita and Yamagata occur within gas chimneys, though they are composed of the mixture of dominant microbial and minor thermogenic gases, and gas hydrate exposures are not always associated with methane plumes. Thus the gas chimneys and hydrate mounds have become the critical and reliable indicators of the presence of shallow gas hydrates. The criteria has found a number of gas hydrate exposures in western and southwestern part of the Joetsu basin, and is believed and expected to find new gas hydrate mounds not only within Joetsu basin but also off Akita-Yamaga area and off San-in areas.

Keywords: Shallow gas hydrates, Eastern margin of Japan Sea, Gas chimney, Hydrate mound