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Seismic blanking zones in the deep-water Ullung Basin, East Sea of Korea.

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A total 12366.395 L.km of 2D multichannel seismic data were acquired by the Korea Institute of Geoscience and Mineral Resources (KIGAM) for detecting and mapping seismic indicators for the presence of gas hydrate in the deep-water Ulleung Basin, East Sea of Korea. The seismic data were acquired using Trilogy System of Geco-Prakla, Bolt Air-gun System onboard the R/V TAMHAE II of KIGAM during the years of 2000 to 2004. The seismic faices of shallow sediments were also analyzed to understand the sedimentary strata developed in the basin. Seismic data were processed to define gas hydrate indicators such as bottom simulating reflectors (BSRs) and seismic blank zones. The BSR was identified by (a) its polarity opposite to the seafloor, (b) its seafloor-parallel reflection behavior, and (c) its occurrence at a sub-bottom depth corresponding to the expected base of gas hydrate stability zone, on heat flow and other thermal data for the region and on seismic velocity data. The seismic velocity analysis was also conducted for determining the velocity deviation effect of high-velocity gas hydrate and underlying low-velocity free gas. The BSRs occur mainly in the southern part of the basin where mass transport deposits are widely occurring. A number of vertical to sub-vertical seismic blanking zones were identified in the basin. The blanking zones are near-vertical broad chimney-like structures of reduced seismic reflectivity. They may be formed by gas and/or fluid upwelling through fractures and faults. Many of the blanking zones show apparent velocity pull-up effects of sediment layering structures that are interpreted to be a result of higher velocity gas hydrate. The presence of substantial amounts of gas hydrate in the blank zones were first found by piston coring in 2007, and subsequently confirmed by two deep-drilling expeditions in 2007 and 2010. Most of the blanking zones occur in well-bedded turbidite/hemi-pelagic sediments in the northern deep basin. The development of blanking zones may be related with coincident deposition and physical property of mass transport sediments (such as overall finer grain sizes and associated low permeability) and linked lateral fluid-flow impediment by these deposits, channelling fluid flow upwards through a network of pre-defined faults and fractures.