



Case study on the multi-year geophysical and acoustic survey in a gas flare site on the southeastern continental shelf of the East Sea, Korea

Young-Jun Kim¹, Mario Enrique Veloso Alarcon², Gee-Soo Kong¹, Jong-Hwa Chun, Deniz Cukur, Youngho Yoon, and Dong-Geun Yoo

¹KIGAM(Korea Institute of Geoscience and Mineral Resources), Daejeon, Republic of Korea

²GEOMAR Helmholtz Centre for Ocean Research Kiel, Kiel, Germany

Shallow gas escaping from the seafloor is normally observed in poor sedimentary layers and geological structures accompanied by faults, cracks, and fractures. Gas venting, the migration of the fluid between pores, causes seafloor deformation such as pockmarks and can trigger large-scale geohazards such as submarine sliding and tsunamis, so multi-year monitoring is required.

After first discovering a gas flare in the southeastern continental shelf area of the East Sea, Korea in 2019, we conducted multi-scaled seismic and acoustic surveys using R/V Tamhae from 2021 to 2023, except for 2020. In 2019, EK60, sub-bottom profiler (SBP), and high-resolution seismic (HRS) data were acquired, and EK60 and SBP data were acquired in 2021. In 2022, EK60, multi-beam echo sounder (MBES), SBP, and conventional seismic data were acquired, and in 2023, EK60, MBES, and SBP data were acquired. In 2019 and 2021, MBES data was only acquired to detect seafloor deformation such as the pockmark, while water column data using MBES began to be recorded to detect flares from 2022. The flare size from the seafloor to the sea surface was measured in the EK60 data, while the quantification study on the gas flow rate using the ESP3 software and the VBA Lab plugin has been tried since 2022. Through EK60 data acquired over 4 years, it can be estimated that gas venting periodically rather than continuously. MBES data presents evidence of a lot of gas-related seafloor deformation in the study area.

Since the first exploration of a new R/V Tamhae installed EK80, parametric SBP, and acoustic Doppler current profiler (ADCP) will begin this May, we expect that a high-quality seismic and acoustic dataset will be obtained for the site of gas flare. For further research, it will be necessary for sea-water and geological sampling to analyze gas components, and detailed monitoring using ROV and seafloor observation systems installed with a camera should be accompanied to quantify the gas flow rate.