

EGU21-6407

<https://doi.org/10.5194/egusphere-egu21-6407>

EGU General Assembly 2021

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Susceptibility assessment of gas hydrate dissociation occurrence along European continental margins and adjacent areas. GARAH project (GeoERA)

Ricardo León¹, Christopher Rochelle², André Burnol³, Carmen Julia Giménez- Moreno¹, Tove Nielsen⁴, John Hopper⁴, Isabel Reguera¹, Margaret Stewart⁵, Miguel Llorente¹, Pilar Mata¹, and Silvia Cervel¹

¹Instituto Geológico y Minero de España (IGME), Ríos Rosas 23, 28003 Madrid, Spain (r.leon@igme.es; j.gimenez@igme.es; mi.reguera@igme.es; m.llorente@igme.es; p.mata@igme.es; s.cervel@igme.es)

²British Geological Survey (BGS), Environmental Science Centre, Nicker Hill, Keyworth, Nottingham, NG12 5GG (caro@bgs.ac.uk)

³Bureau de Recherches Géologiques et Minières (BRGM), Orléans, France (a.burnol@brgm.fr)

⁴Geological Survey of Denmark and Greenland (GEUS), Copenhagen, Denmark (tni@geus.dk; jrh@geus.dk)

⁵British Geological Survey (BGS), The Lyell Centre, Research Avenue South, Edinburgh, EH14 4AP, UK (mstewart@bgs.ac.uk)

The Pan-European gas-hydrate related GIS database of GARAH project has allowed assessing the susceptibility of seafloor areas affected by hydrate dissociation. This study has been applied as a first step for the hydrate related risk assessment along the European continental margins. Several factors and variables have been taken into account. They have been defined by their relationship with the presence of hydrates below seafloor and weighted depending on the confidence of finding hydrates in this site. The maximum weight (or confidence) has been given to the recovered samples of gas hydrates or hydrate-dissociation evidences such as degassing or liquation structures observed in gravity cores. Seismic indicators of the presence of gas hydrate or hydrocarbon seabed fluid flow such as BSR, blanking acoustic, amplitude anomalies or the presence of geological structures of seabed fluid flow in the neighbouring of the GHSZ have been weighted with a lower value. The theoretical gas hydrate stability zone (GHSZ) for a standard composition for biogenic gas has been taken into account as another control factor and constrain feature. Seafloor areas out of the theoretical GSHZ have been excluded as potential likelihood to be affected by hydrate dissociation processes. The base of GHSZ has been classified as a critical area for these dissociation processes.

The proposed methodology analyses the geological hazard by means of the susceptibility assessment, defined by the likelihood of occurrence of hydrate dissociation, collapses, crater-like depressions or submarine landslides over seafloor. The baseline scenario is that gas hydrate occurrence is only possible in seafloor areas where pressure (bathymetry) and seafloor temperature conditions are inside the theoretical GHSZ. Inside GHSZ, the occurrence of gas hydrate is directly related to the presence of its evidences (direct samples of hydrates) or indicators (eg. pore water and velocity anomalies, BSR, gas chimneys, among others), as well as the

occurrence of hydrocarbon fluid flow structures inside GHSZ. Finally, the likelihood of the seafloor to be affected by gas hydrate dissociation processes will be major at the base of the GHSZ and in the neighbourhood of the gas hydrate evidences and indicators. In order to prove this initial hypothesis, a susceptibility assessment has been carried out throughout map algebra in a GIS environment from a density map of evidences and indicators and the Pan-European map of the GHSZ over seafloor. Specifically, it has been conceived as a segmentation in three levels by quantiles resulting from the addition of the density map of evidences and indicators and the weighted map of the GHSZ over seafloor.

Acknowledgment

GARAH project. GeoERA - GeoE.171.002