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A predictive numerical model for potential mapping of the gas hydrate stability zone in the Gulf of Cadiz

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This comunication presents a computational model for mapping the regional 3D distribution in which seafloor gas hydrates would be stable, that is carried out in a Geographical Information System (GIS) environment. The construction of the model is comprised of three primary steps, namely (1) the construction of surfaces for the various variables based on available 3D data (seafloor temperature, geothermal gradient and depth-pressure); (2) the calculation of the gas function equilibrium functions for the various hydrocarbon compositions reported from hydrate and sediment samples; and (3) the calculation of the thickness of the hydrate stability zone. The solution is based on a transcendental function, which is solved iteratively in a GIS environment.
The model has been applied in the northernmost continental slope of the Gulf of Cadiz, an area where an abundant supply for hydrate formation, such as extensive hydrocarbon seeps, diapirs and fault structures, is combined with deep undercurrents and a complex seafloor morphology. In the Gulf of Cadiz, model depicts the distribution of the base of the gas hydrate stability zone for both biogenic and thermogenic gas compositions, and explains the geometry and distribution of geological structures derived from gas venting in the Tasyo Field (Gulf of Cadiz) and the generation of BSR levels on the upper continental slope.