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# Numerical Analysis of Gas Production from Methane Hydrate by Multistage Depressurization in Large-Scale Reservoir Simulator (LARS)

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Dissociation experiments of methane hydrate in porous media using the multistage depressurization have been investigated in Large-scale reservoir simulator (LARS; 210 sample). In this work, a numerical simulation for the experimental process is carried out by TOUGH-hydrate. The initial pore pressure and temperature are set as 11.5 MPa and 11 $^{o}$C, which is similar to the field conditions of Mallik drill site 2L-38. The initial hydrate and aqueous saturations before dissociation are 90% and 10% in volume, respectively. During the hydrate decomposition, gas is produced from methane hydrate by depressurization in 5 pressure stages: 9.0-7.0-5.0-4.2-3.0 MPa. The numerical results of the cumulative gas produced, the remaining hydrate in the deposit, and the temperature spatial distribution all agree well with the experiments, which completes the validation of the mathematical model and numerical codes employed in this study. The hydrate dissociation can be considered as a moving boundary ablation process, and the hydrate dissociation interface separates the hydrate dissociated zone from the undissociated zone. The temperature increases in the hydrate dissociated zone near the boundaries, while that in the hydrate undissociated zone in the centre of LARS basically remains constant. The heat transfer from the surroundings is predominant in experimental and numerical cases. The analysis of sensitivity to the intrinsic permeability and the hydrate distribution of the numerical simulation are investigated.