



SIMULATION OF CH₄ PRODUCTION FROM SUBSEA GAS HYDRATE DEPOSITS COUPLED WITH CO₂ STORAGE

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INTRODUCTION

In recent years, the interest in methane hydrates as an energy source has increased around the globe. To develop a sustainable hydrate-based energy supply system the sequestration of CO₂ has to be coupled with the CH₄ production from the hydrate deposit. In the recent past, research has focused on the capture and storage of CO₂ from combustion processes (e.g. from CCS power plants) to reduce climate change. While different natural or man-made reservoirs like deep aquifers, exhausted oil and gas deposits or other geological formations are discussed for the storage of gaseous or liquid CO₂, the storage of CO₂ in a solid and immobile form as hydrate in sediments appears to be a promising alternative.

SUGAR PROJECT

In 2008, the SUGAR project was launched in Germany. The project aims at the extraction of natural gas from marine methane hydrate deposits and the storage of CO₂ from power plants and other industrial sources as CO₂ hydrate in marine sediments. One of the working packages is concerned with the numerical simulation of the replacement of CH₄ hydrate by CO₂ hydrate.

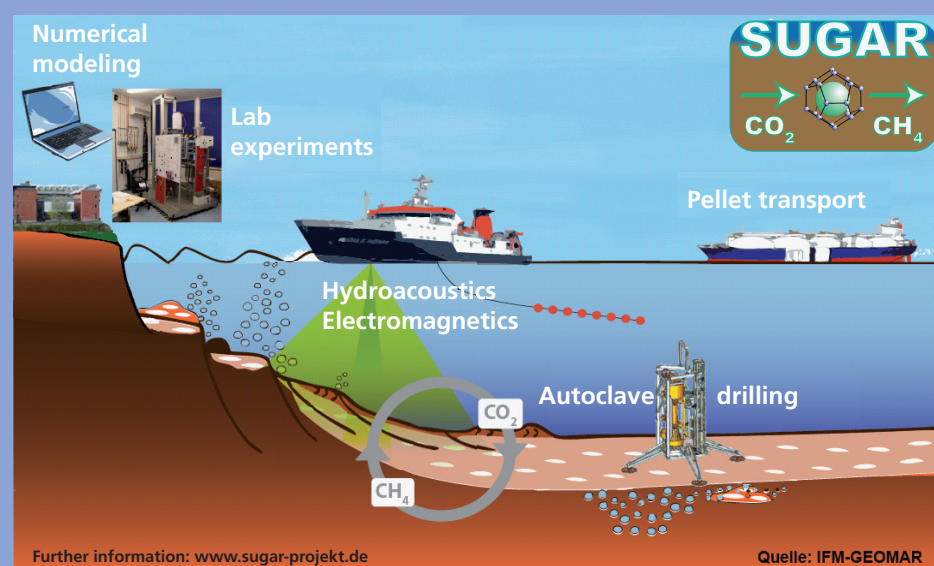


Figure 1: Chart of the SUGAR project

SIMULATION RESULTS

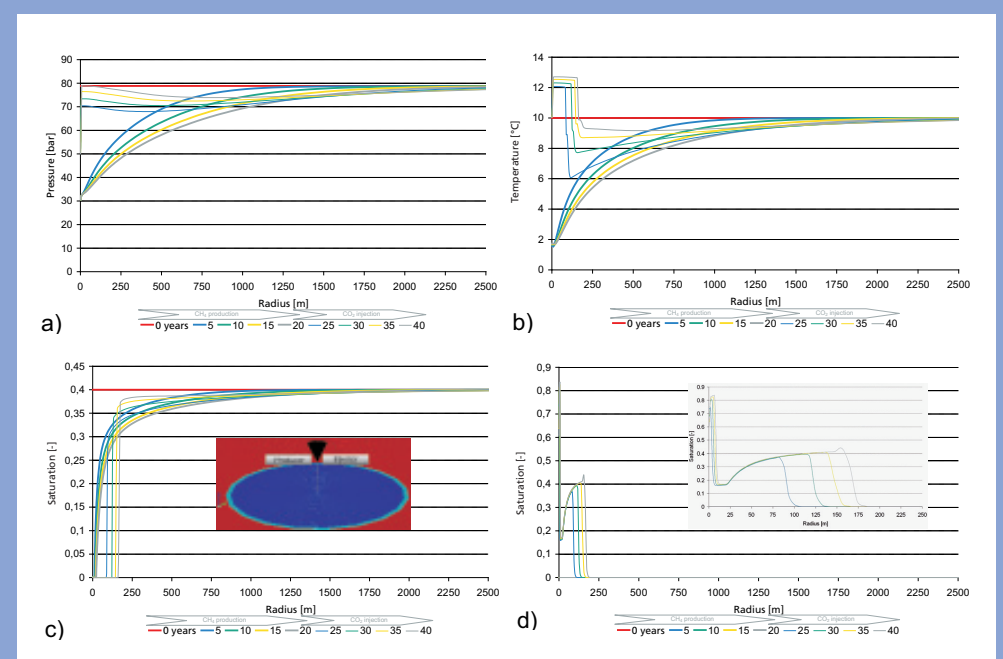


Figure 2: a) Pressure, b) Temperature, c) CH₄ hydrate saturation and d) CO₂ hydrate saturation for single well approach

In both scenarios the pressure at the production well is lowered to 30 bars and CO₂ is injected at 10 °C and 8000 Nm³/day at the injection well successively (Fig. 2) and simultaneously (Fig. 3).

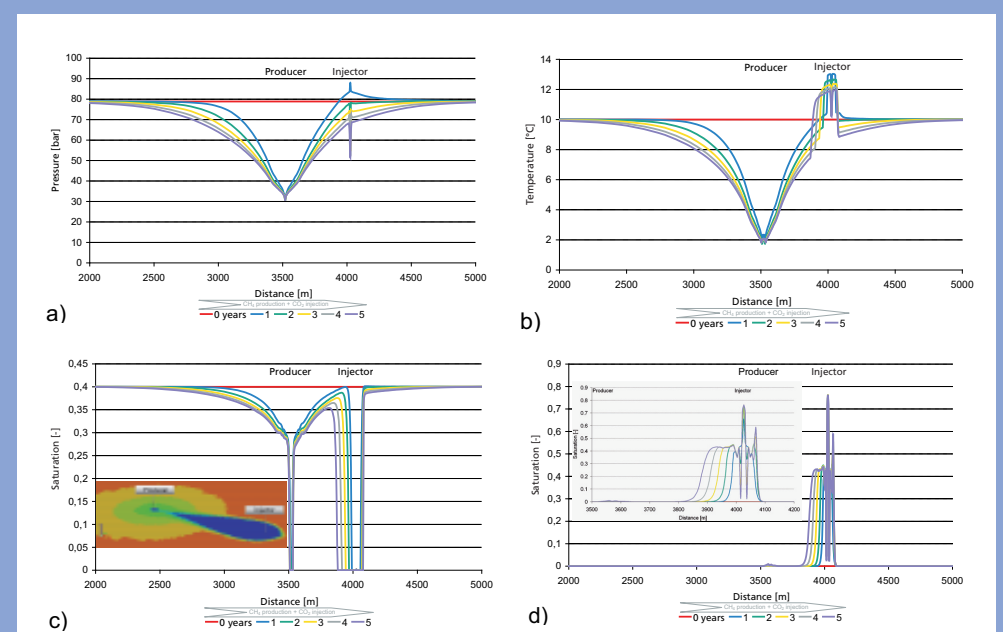


Figure 3: a) Pressure, b) Temperature, c) CH₄ hydrate saturation and d) CO₂ hydrate saturation for a two well approach