leakage path across layers. In addition to increased spatial CO_2 spread, an intensive induced fracture network can result in local earthquakes.

Pressure constraints must be considered for injection operations to limit the pressure buildup. However, this comes with the cost of injection rate reduction. Rock quality within the injection region has significant impact on pressure build up and therefore, geological uncertainty plays a considerable role in assessing the success and feasibility of the operation.

Any risk of breakings in the formation integrity must be assessed to define the appropriate preventive measures. We need to perform pressure sensitivity analysis to identify the influential parameters in the model. Uncertainty reduction in the influential parameters enhances the accuracy of pressure behavior prediction.

Geological uncertainty is a major issue in pressure analysis. Most of the pressure-related studies in the literature provide either deterministic case studies or generic preventive measures based on theoretical studies [9, 13, 6, 14, 12, 11]. It is important to include realistic geological descriptions in any study related to uncertainty. For example, permeability variation on the grid should be in the form of realizations of geological realistic formations. To the best of our knowledge, this is the first pressure study in the context of CO_2 storage that considers the geological uncertainty in the form of stractural variables rather than engineering parameters, such as permeability and porosity.

Within oil recovery context, the impact of geological uncertainty is thoroughly investigated in the SAIGUP project for shallow-marine depositional systems [5, 7, 8]. In the SAIGUP study, variations of geological features are examined in a set of field development strategies via several injection/production patterns. The study concludes that geological uncertainty has a dramatic influence on the oil recovery estimates. A number of geological realizations from the SAIGUP are used in [1, 2] to investigate the impact of geological uncertainty on injection and early migration of CO_2. Certain structural features are considered for those studies and flow responses are defined to measure the storage capacity, the trapping efficiency, and the leakage risk and the sensitivity of these responses to variations in geological parameters is investigated. Large variation in responses are observed. Aggradation angle and barriers are recognized to be the most influential in the CO_2 flow behavior[1, 2]. The focus in [1, 2] is to measure the spatial CO_2 distribution sensitivity to the variation of geological description.

This study is complementing [1, 2], in the sense that we herein analyze the sensitivity of pressure to the same geological parameters. In addition to the injection scenario used in [1, 2], we examine a different injection scenario with more realistic well control for the injection operation. A detailed study is given for the pressure behavior during injection time.

2 Geological parameters

In the SAIGUP study, a large number of realistic realizations were generated based upon a parametrization of a set of carefully selected geological features and a detailed sensitivity analysis study is performed for field oil recovery over number of development scenarios. Both the sedimentological and structural geological parameters have shown to dominate the uncertainty in total oil production. Hence, more accurate geological description enhances the