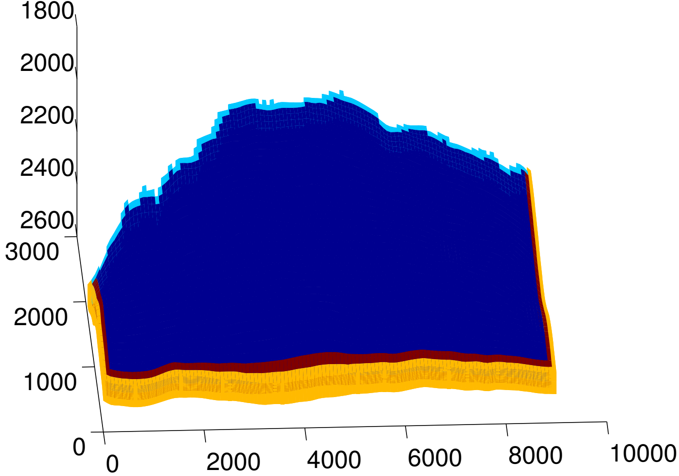

Figure 6: Boundaries in the flow simulation model; the crest boundary (light blue) is considered closed to flow. The pore volume of the cells at the other sides of the model are multiplied by 10^3 (red) and 10^6 (yellow) to model open boundaries.

the required number of detailed flow simulations, such simulations are not conducted in this study.

Instead, we will consider two strategies for injecting a volume of 4×10^7 m^3 of supercritical CO_2, which amounts to 20% of the total pore volume of the models. In the first strategy, which is similar to the one used in [2], the entire CO_2 volume is injected within 30 years using a constant volumetric rate. In the second strategy, the injector operates with the priority of injecting a volumetric rate of 3650 m^3/day. A pressure constraint of 400 bar is set on the injector. If the well bottom-hole pressure goes higher than that, the well priority changes to continue operating at 400 bar by reducing the injection rate until the target CO_2 volume is injected into the medium. As soon as the total injected volume reaches total target, the injector is shut in from the bore-hole and no injection happens for the rest of simulation time up to 100 years.

A standard simulator for multiphase flow in porous medium is used that is based on finite volume method [15]. Two phases (water and supercritical CO_2) are considered with no mass exchange between them. The fluid compressibility C_{fluid} is used to model the phase density changes with pressure variation from reference pressure P_0:

$$\rho = \rho_0 + C_{fluid}\rho_0(P - P_0).$$

Effect of rock compressibility is considered by C_{rock}:

$$C_{rock} = \frac{\partial \phi}{\partial P}.$$

The water and supercritical CO_2 are assumed to be slightly compressible, with fluid parameters described in Table 4.