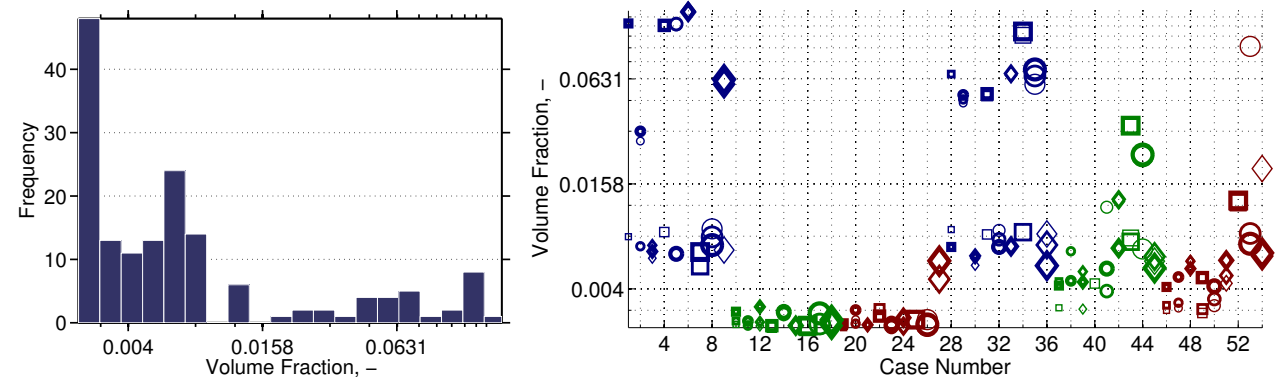

(a) Histogram of pressurized volume fractions.

(b) Case plot of pressurized volume fractions.

Figure 14: Pressurized volume fraction for all cases in the rate-constrained scenario.

4.3 Pressurized region

Here, we study the overpressure distribution in the medium. An absolute pressure limit of 300 bar is set as threshold, such that all cells with a pressure higher than this value form a region that is called the pressurized region. The volumetric fraction of this region is defined by the ratio of pressurized volume to the total volume of all active cells in the model.

Histogram and case plot of the pressurized volume fraction at the start of injection are given in Figure 14. Here, we clearly see that low agrradation angle is very influential in the pressure buildup in the injection zone. A group of cases with low aggradation angle have a relatively large pressurized region in Figure 14b. However, there are number of cases with low aggradation angle in Figure 14b that have a relatively low pressurized fraction. In these cases, the medium is conductive toward the open boundaries and the heterogeneity in the medium does not cause a major pressure buildup. Other observation in Figure 14b is the progradation effect; down-dip progradation, shows a rise in pressurized fraction for higher aggradation angles.

4.4 Build-up region

To study the pressure change, and how a pressure disturbance spreads through the medium, we use another metric. We calculate the pressure change by subtracting the initial hydrostatic pressure at each location from the current pressure. Different realizations are compared for the size of a region, which we call the buildup region, where the pressure increases from its initial value by 10 bar. The value 10 bar is chosen to make sure that the region has not reached the boundaries in any of the studied cases. The smaller the buildup region is, the less volume will be exposed to pressure change in the aquifer (Figure 15).

Higher pressure in the medium will obviously cause a larger buildup region. Impact of progradation on the pressure build-up is illustrated in Figure 15b. Up-dip progradation shows a relatively lower pressure buildup compared to down-dip progradation cases. We also see that aggradation dominates this effect, where cases with low aggradation angle show the same build-up pressure for both types of progradation directions (Note the blue colored markers