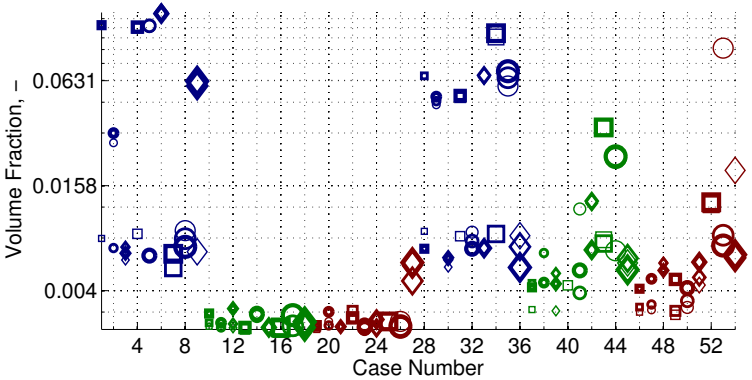
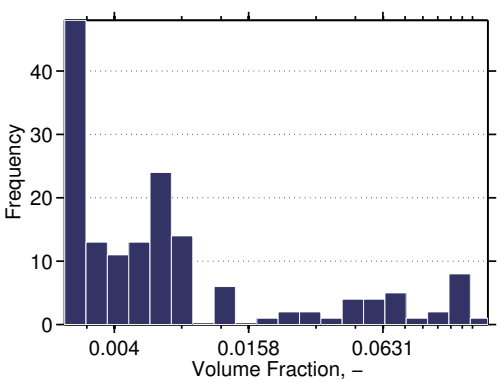


(a) Case plot of pressurized volume fractions.



(b) Histogram.

Figure 12: Pressurized volume fraction for all cases in the rate-constrained scenario. (The case numbers refer to the different petrophysical realizations; in addition, each realization can have three different degrees of faulting. See Table 3.)

4.3 Pressurized region

Here, we study the overpressure distribution in the medium defined so that all cells with a pressure higher than 300 bar value form a region that is called the pressurized region. Case plots and histogram of the ratio of pressurized volume to the total volume of all active cells in the model at the start of injection are given in Figure 12. Here, we clearly see that low aggradation 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, but there are also a number of cases with low aggradation angles 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 12a is the progradation effect; down-dip progradation shows a rise in pressurized fraction for higher aggradation angles.

4.4 Buildup 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, in which the pressure has increased from its initial value by 10 bar. The value of 10 bar was 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 aquifers (Figure 13).

Higher pressure in the medium will obviously cause a larger buildup region. Impact of progradation on the pressure buildup is illustrated in Figure 13a. Up-dip progradation shows a relatively lower pressure buildup compared to down-dip progradation cases. However, this effect is clearly overruled by aggradation, as cases with low aggradation angle show the same pressure buildup for both types of progradation directions (Note the blue colored markers that do not follow the lines in Figure 13a).