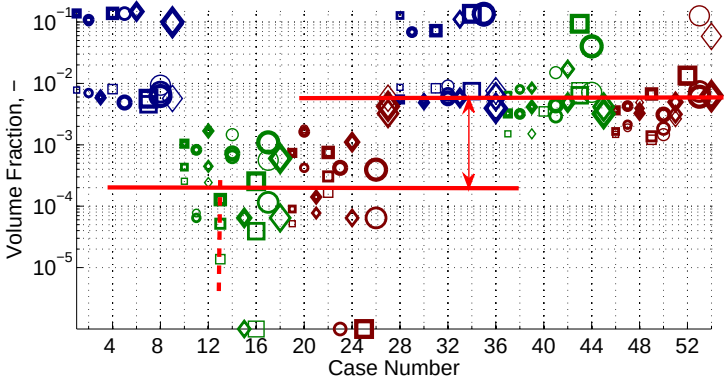
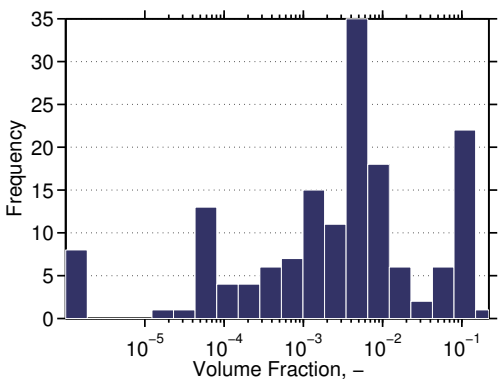


(a) Case plot of buildup volume fractions.



(b) Histogram.

Figure 13: Buildup 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.)

Several cases in Figure 13a show a trend for the fault parameter. The dashed line shows the trend of buildup pressure increase due to fault feature variations in three cases. Faulting changes the geometry of layers and puts different layers adjacent to each other. This enhances the connectivity in the medium. Local heterogeneities and closed faults around the injector make a larger buildup region, because they cause higher pressure buildup in the domain. In these cases, the effect of heterogeneity of different scales, namely on the scale of near injector and far from injector, are combined causing a larger buildup fraction.

4.5 Farthest pulse

As discussed earlier, irregular geometries like faults and unconformities can lead to pressure spread in the domain. Looking at the volume fraction of pressurized and buildup regions helps in comparing cases for their pressure conductivity, but it does not show the extent of pressure spread in the medium. For that reason, we also look at the farthest cell from the injection point that falls within the buildup region defined earlier.

Figure 14 shows the farthest distance from the injector at which pressure buildup is observed for the different injection scenarios. In Figure 14b, three groups of cases can be identified: cases with zero distance of farthest pressure buildup pulse, cases with medium distances, and those with large distances from the injection point. Three specific cases are chosen as samples from each of the groups (see Figure 15 for example). In the first group (Figure 15a), the injector is placed in a permeable region and the medium is conductive toward open boundaries and hence the imposed injection pressure does not build up beyond the 10 bar threshold from its initial value, neither locally around the well nor globally in the aquifer scale. The cases in the second group (Figure 15b) have a medium range of 3–4 km of pressure-propagation distances from the injection point. Heterogeneity in these cases is not making a high pressure buildup around the injector and throughout the medium.