



Figure 5: Time to inject quarter of the total specified CO_2 volume for all cases in the pressure-constrained scenario. The dashed red line in the right plot denotes the targeted injection time of 7.5 year, and the red arrow points to the case shown in Figure 4.

level. Responses for the rate constrained scenario are given in Figures 4a, 4b and 4c, and those for the pressure constrained scenario are given in Figures 4d, 4e and 4f.

The pressure build-up in Figures 4c and 4f tells about heterogeneity impact on maintaining the pressure locally rather than transferring it across the medium. Comparing Figures 4b and 4c with Figures 4e and 4f, we see that imposing a pressure constraint on the injector significantly reduces the pressure build-up in the medium (as should be expected). However, the pressure disturbance propagates widely through the system in both cases (Figures 4c and 4f), far beyond the CO_2 invaded zones in Figures 4a and 4d.

4.1 Injection time

In the pressure-constrained scenario, the less the injectivity of the well is, the longer it will take to inject into the medium, keeping the pressure below the critical limit. In some of the cases it takes longer than 100 years (i.e., longer than the considered total simulation time) to inject the specified CO_2 volume. To compare cases, we therefore calculate the time at which a quarter of the objective volume is injected. In all cases, this amount is injected within the total simulation time.

Figure 5 shows the injection time for all cases, using the pressure-constrained scenario. For many cases, the injector keeps the target rate, and thus, it completes the injection in 7.5 years (the dotted red line in the figure). The rest of the cases require longer injection time, due to the lower injectivity of the medium. This leads to pressure control in the injector, followed by a decrease in the injection rate.

Different codes used in the plot of Figure 5 are describe in Table 1. Most of the cases with lower injection rates in the plot are colored blue, which translates to a low aggradation angle. Also cases with closed faults, denoted by thick markers, have (significantly) longer injection