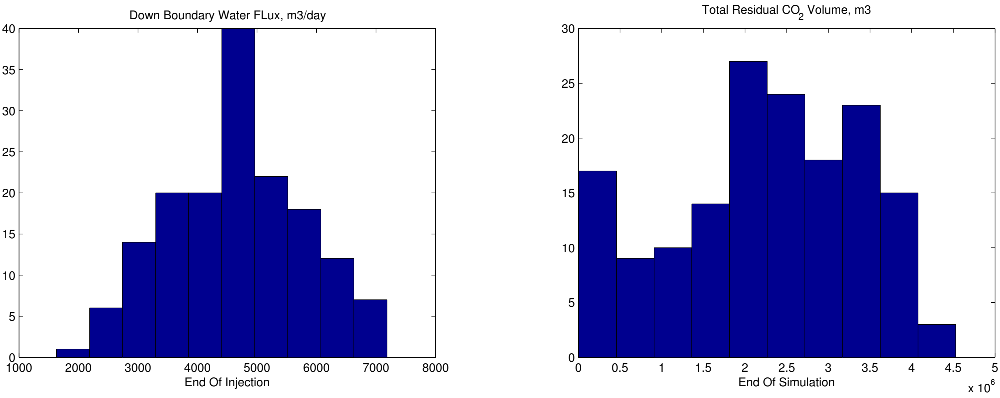

(a) (b)

***Figure 5** (a) Flux histogram for down boundary (b) Total residual CO_2 volume; cases with low aggradation show less values in a separate family.*

in Fig. 7. Two-lobed cases include more branching channels which result in more plume numbers. Also barrier effect increases the lateral distribution of the plume.

Correlation between responses

Here we relate the responses by plotting them against each other. This helps in understanding the degree of correlations between the responses. By looking at these plots we can relate the trends to geological features. This in turn helps in evaluating the effect of uncertainty of each feature on the uncertainty of the simulation outputs.

Fig. 8 shows down boundary CO_2 flux versus average field pressure at the end of injection. Two linear trends can be recognized in the plot: first one starting from 280 bar going until 290 bar in a near vertical slope. The other one starts from 290 bar on the pressure axis and goes about 400 bar in a lower slope. The first trend shows that average pressure is not changing a lot with the increase of CO_2 out-flux. But the second trend shows a dramatic change in pressure corresponding to the change in the down flux rate.

The second trend is made mainly by the cases of blue colour. This is again showing the effect of low aggradation in the flow and pressure behaviour. In low aggradation cases, as the CO_2 flux out of the down boundary increases, the average pressure also increases in the aquifer. Effect of other geological features combined with the low aggradation dictates the amount of CO_2 which goes up to the crest or stays in the bottom-most layers going out from the down boundary. Since the lower layers have poor quality rock, more flow through these layers towards down boundary result in higher pressure in the aquifer.

In Fig. 9, the total number of CO_2 plumes are plotted against total residual CO_2 volumes at end of simulation. The general trend shows positive correlation between these two responses. This is consistent with our discussion in the previous section about the plume size and sweep efficiency. Split plume introduces more residual CO_2. On the other hand, there is a separation in the plotted cases based on the fault criteria. Thin signs are clustered in the lower part of the graph. The medium thickness markers are clustered on the higher part of the graph and the very thick signs are sitting in between. This implies that the unfaulted cases show higher residuals with lower number of plumes, and the open faulted cases introduce more number of plumes. This can be justified by looking at a flow pattern in unfaulted and open faulted case which are shown in Fig. 10. In the open faulted cases, the flow is more laterally distributed. The closed faulted cases restrict the plume migration in the fault compartments and this