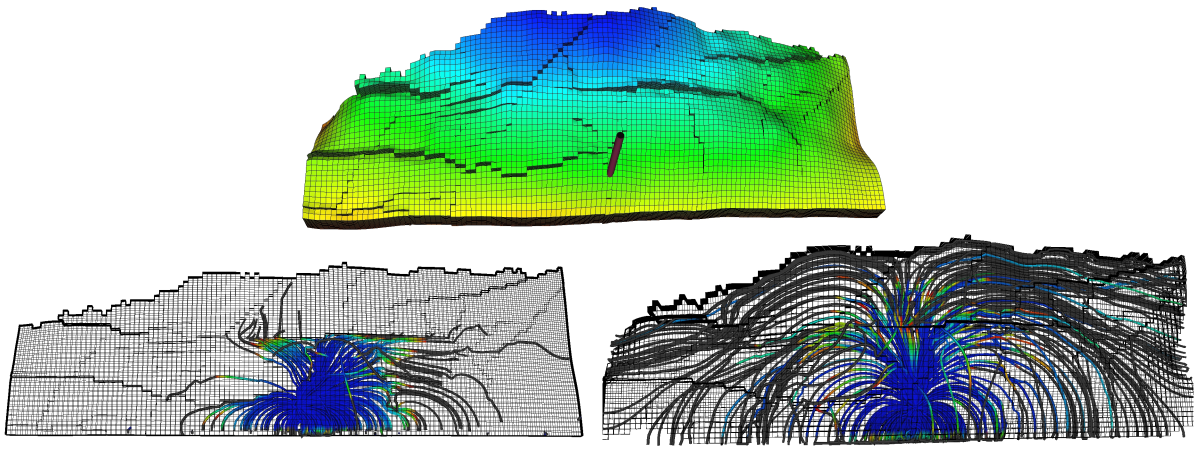

Figure 2 *The studied fault features: the picture on the top shows the orientations and intensity of the faults, down left picture shows the flow path in almost closed faults case and the one on the right is showing the flow in the almost open faulted medium. The streamlines are shown for the same time step in both pictures. Notice that the flow is confined in the closed faults model.*

In all outputs, we recognize the effect of aggradation. Cases with low aggradation have continuous facies layering parallel to the horizontal direction of the grid. Because the three lowest layers, in which the well is completed, are sealing in the cross-layering direction, the flow is forced to stay in the same layers rather than accumulating in the crest (Fig. 3).

Important responses

Reservoir pressure: The pressure response in general shows a sharp jump at the start of injection and a declining trend during the injection and plume migration. Pressure behaviour of different cases at the end of the injection period is shown in Fig. 4. Low aggradation cases show higher pressure.

Boundary fluxes: The flux out of the open boundaries is a measure of the sweep efficiency of the CO_2 plume. As channelling can lead to early CO_2 breakthrough at boundaries, we prefer cases with less fluxes out of the boundaries. The down boundary that is closer to the injector is a potential loss for the injected volume (Fig. 5(a)). Again, the flow is led to the boundaries in cases with low aggradations.

Total mobile/residual CO_2: If the CO_2 saturation is below the critical value, it will be immobile in the bulk flow, although not in the molecular sense. Less mobile CO_2 means less risk of leakage and more residual volumes (with saturations less than the critical) resulting from a more efficient volume sweep as preferable (Fig. 5(b)). We use critical saturation of 0.2 for both water and CO_2.

Connected CO_2 ***volumes***: To estimate the risk of leakage from the cap-rock, we assume that all mobile CO_2 connected to a leakage point will escape out of the reservoir. Hence, it is preferable if the total mobile CO_2 volume is split into smaller plumes rather than forming a big mobile plume. Though the area exposed to potential leakage points will increase by splitting the plume, yet the volume reduction is overtaking the area effect.

On the other hand, the split CO_2 plumes can sweep more cross-areas than a big single plume. The no-flow faulted side can be considered to be connected to an imaginary large volume available for long-term plume migration. Thus, it makes sense to talk about plume sweeping cross area. Larger areas leave more residual CO_2 in the tail of the plume. Hence, we looked at the largest plume size, the number of plumes, and other statistical parameters. The number of plumes at the end of simulation for all cases are given