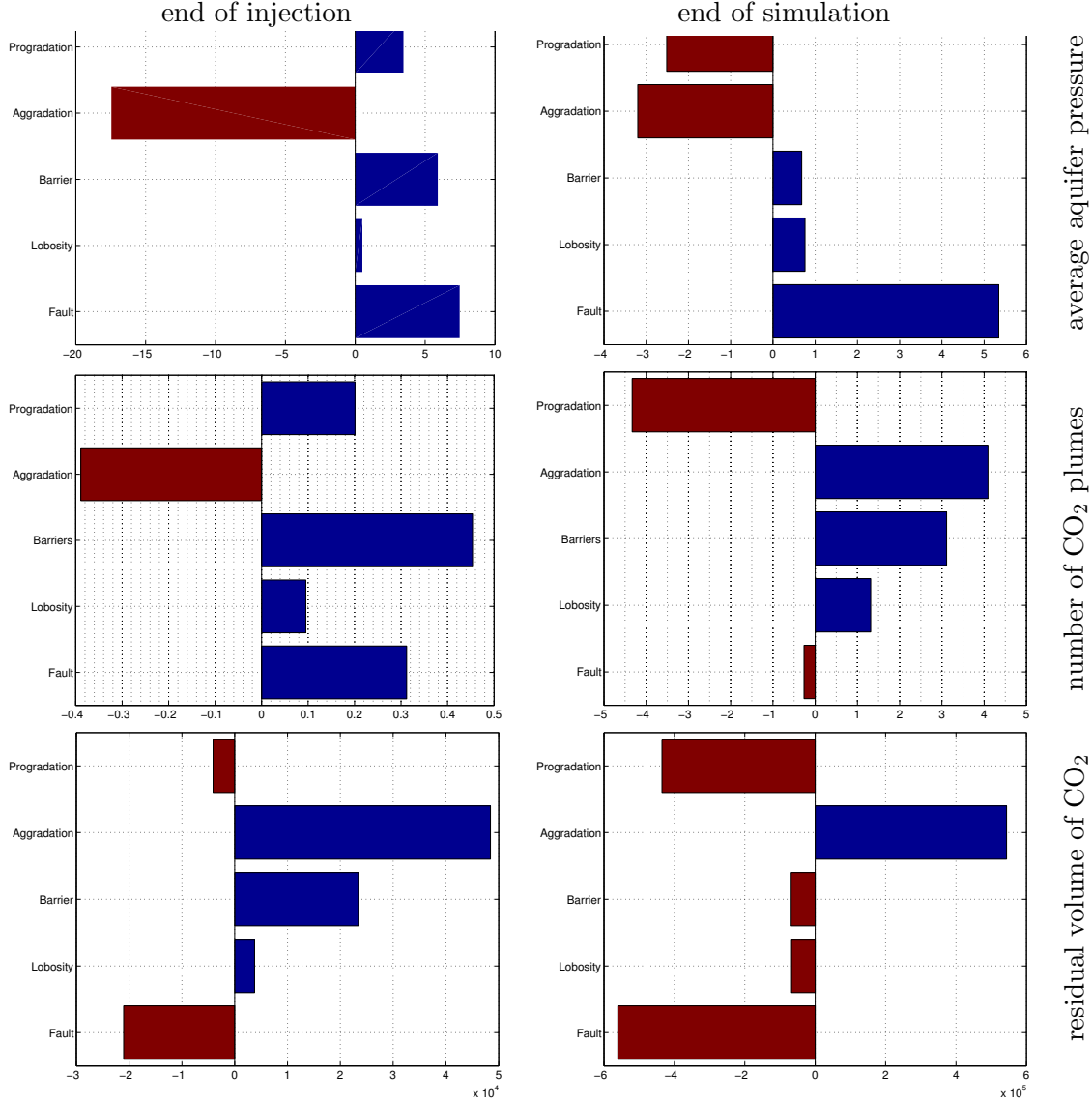

Figure 7: Sensitivities to different geological features at end of injection and end of simulation for the average aquifer pressure, number of CO_2 plumes, and residual volume of CO_2.

To quantify the relative impact of each geological parameter, we will define a normalized gradient for each feature. We will use barriers as an example to explain the analysis. There are three levels of barriers: low, medium and high. Suppose that we want to calculate the sensitivity of the number of plumes with respect to the level of coverage for the barrier sheets. We do this in two steps: first we average the number of plumes for cases of the same level of barriers. Having three levels of barrier, this results in three averaged plume numbers corresponding to each level of barriers. In the next step, we fit a line through these three points and calculate the inclination of this line which represents how the number of plumes increases if the barrier parameter increases one level. For other features like fault and lobosity, we follow the same procedure. We use three levels for each feature and fit a trend through these three points. For example, the first level of fault criteria relates to unfaulted cases, the second relates to open faults, and the third represents cases with closed faults.

Figure 7 shows the sensitivity for three different flow responses. In the upper row, we see that during injection the average aquifer pressure is most influenced by aggradation, while at the end of simulation the most influential feature is the fault specification. The lack of good vertical communication for low aggradation angles means that the CO_2 is confined to the lower (poor quality) layers and relatively high pressures must be imposed to inject the required amount of CO_2 into the aquifer. For higher angles, the CO_2 can flow more easily upward through channels with higher permeabilities and less pressure support is required. Hence, the negative gradient. After the injection ceases, the dominating force is gravity, the main flow direction is vertical, and the pressure is now mostly affected by faults. If the faults are closed, they will prevent the release of pressure through the open