

## CO<sub>2</sub> monitoring

Assume we have a 3D baseline seismic volume and want to know which minimum seismic acquisition would be appropriate for monitoring. A way to determine that is to apply sparsity to the baseline by removing sources and receivers and see if after processing, the data still contains the necessary information. If so, then apply that sparse acquisition for the monitor surveys. This can lead to significant data reduction.

In an August 2025 TLE publication 3 strategies were tested with increasing monitor sparsity.

1) Reconstruct a dense 3D data volume from the sparse monitor data and apply full 3D processing, 2) 2D **image** to 3D **image** conversion of the monitor data, thereby avoiding 3D processing, 3) 3D Characterization from 2D lines, using additional point-seismic measurements and available well logs. Additionally, a time-lapse repeatability enforcement method was introduced.

Several tailored networks were used: Supervised and self-supervised CNN, U-net and conditional GAN.

The methods were tested on synthetic and real data from the Sleipner field. Remarkable results were presented, but it was also mentioned that for specific applications it is necessary to test and choose the most appropriate one.

The case study will be discussed in my 4D, CO<sub>2</sub> sequestration and QI course.