Designing of overlapping subdatasets in 3D Pre-Stack Merging™. Technical aspects, case study.

3D Pre-Stack Merging™ is a method of processing of multiple 3D projects acquired in different conditions (time of realization, geometry, grid orientation, other parameters), offering the same results as if in case of single, coherent set of data acquired and processed as one large project.

The proper choice of overlapping zones is a crucial point in 3D Pre-Stack Merging™, determining final result of its performance. Sequential steps of this aspect determining necessary dataset for multi projects processing are presented in this paper.
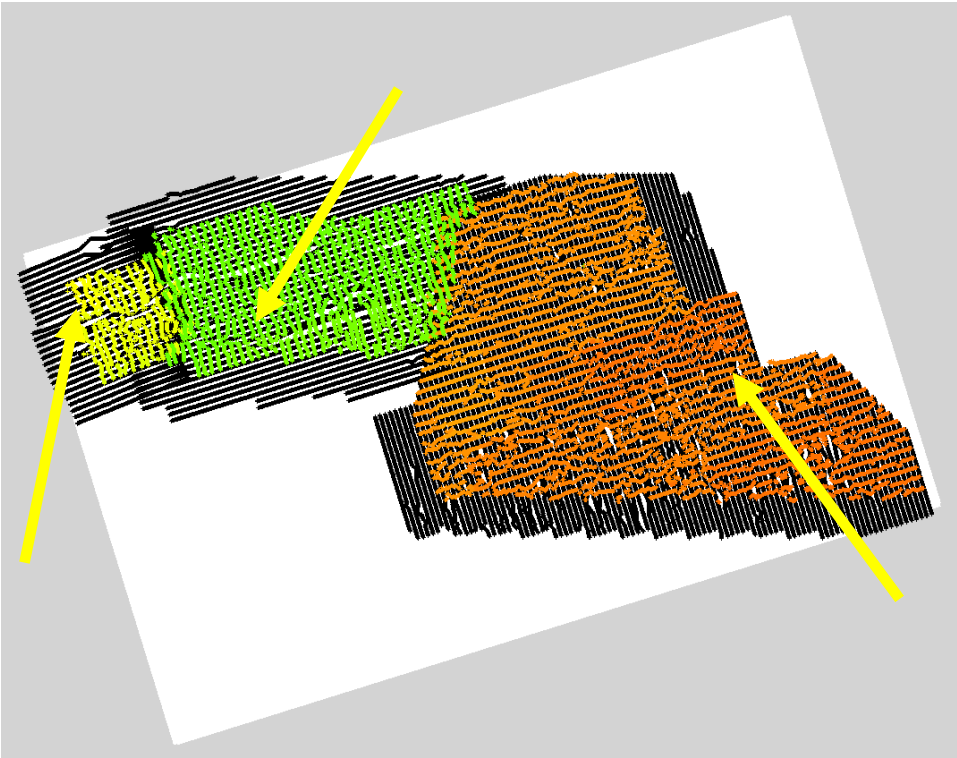

Figure 1. Three 3D projects. The new one is to be merged with two old projects.
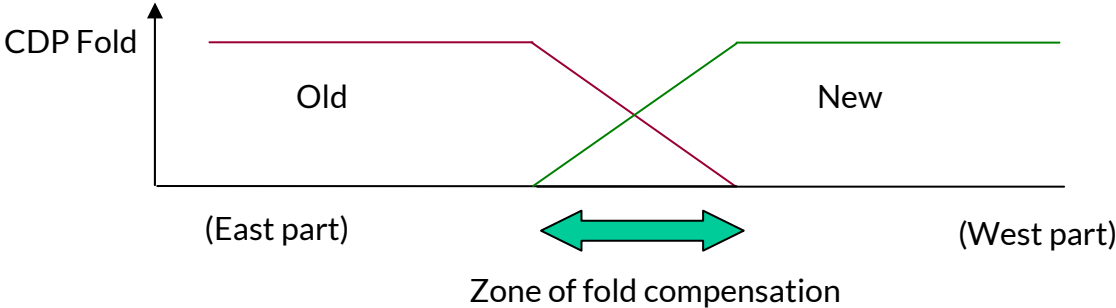

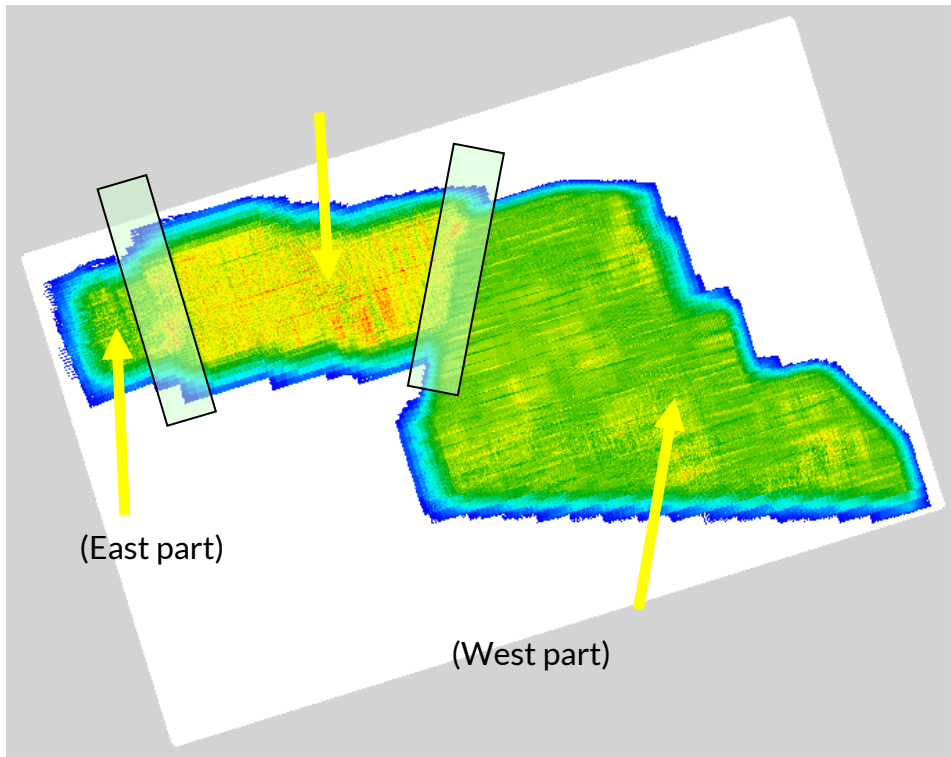Figure 2. Idea of maintaining of CDP fold coherency through overlapping zone.

Figure 3. Three 3D projects. Illustration showing overlapping zones.

Fold continuity is a **first criterion** for successfully 3D Pre-Stack Merging™.
In overlapping zones CDP fold must be:

♦ not higher then average on highest one
♦ not lover then average on lowest one

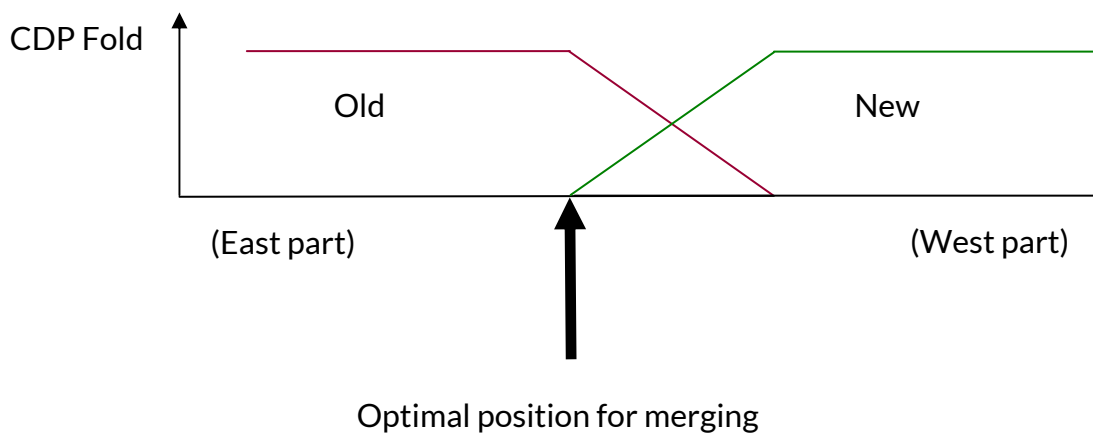The fold continuity criteria must be realized on acquisition stage.

Figure 4. Optimal position for merging relative to overlapping zone.
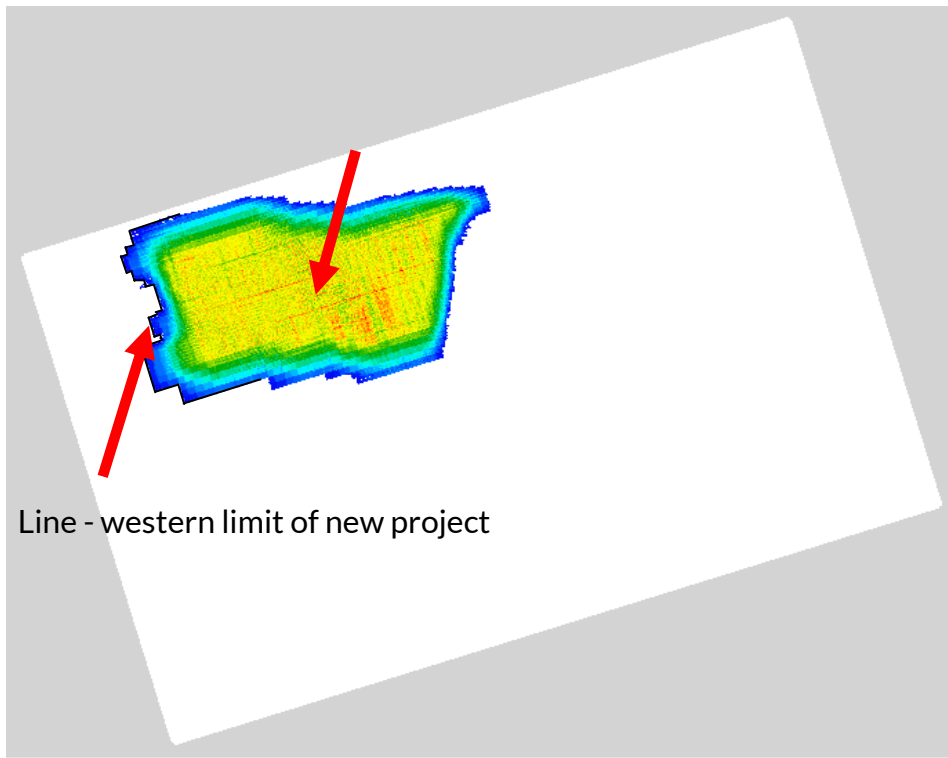
Line - western limit of new project

Figure 5. Optimal position for merging line.
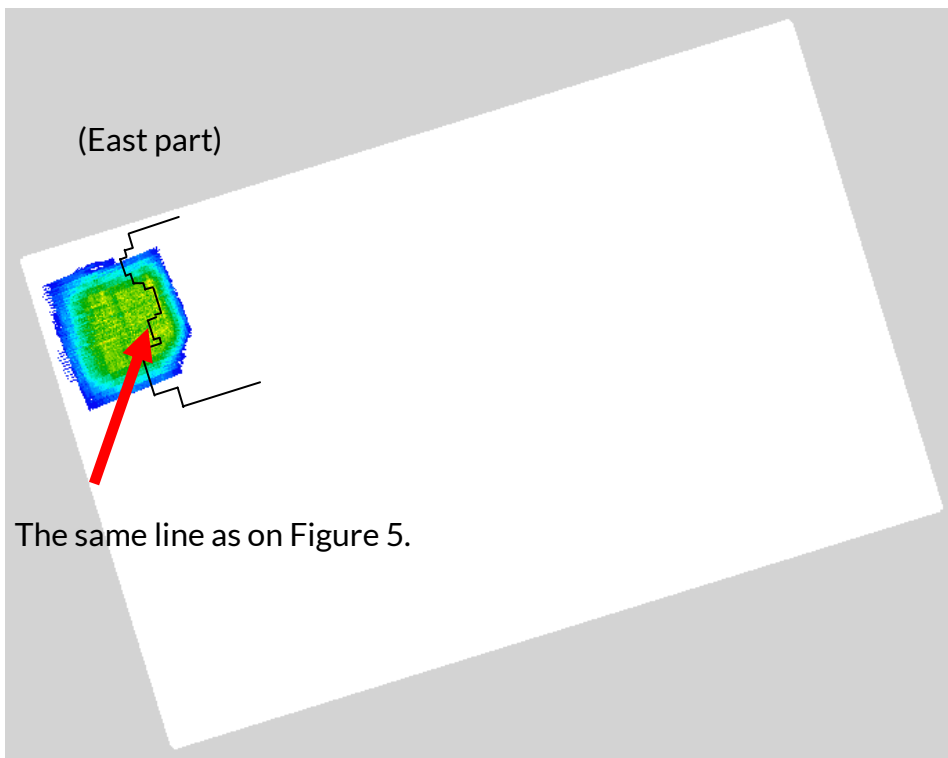
(East part)

The same line as on Figure 5.

Figure 6. Line for merging overlaying on old project. The merging line positioned on eastern part of old project

Using this line a polygon for old project is build. This polygon is used for data selection in overlapping zone.

Database projection method between CDP and SIN (Sequence Index Number) order is used.
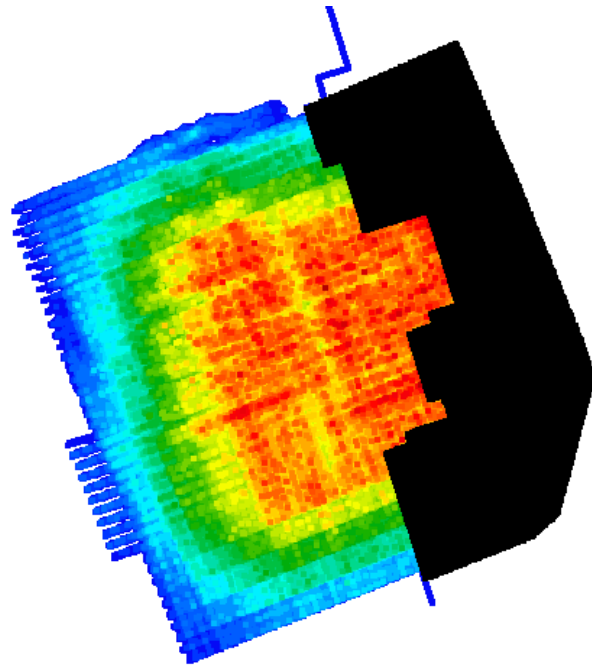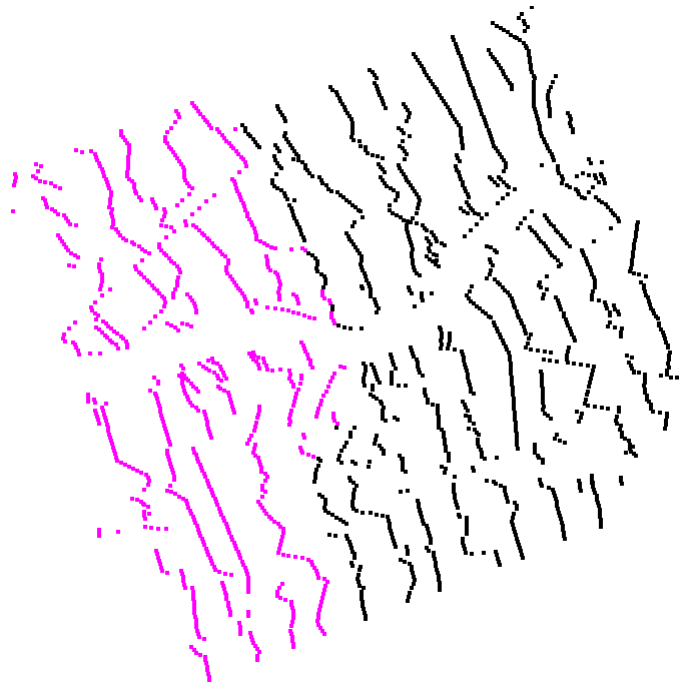

Figure 7. Polygon on CDP Fold Map (black color)

Figure 8. Shot points corresponding with selected polygon (black color).

Semi-automatic method of data selection (for processing) - first for eastern part. This records (black color) must be added to new dataset for new processing (3D Pre-Stack Merging™).
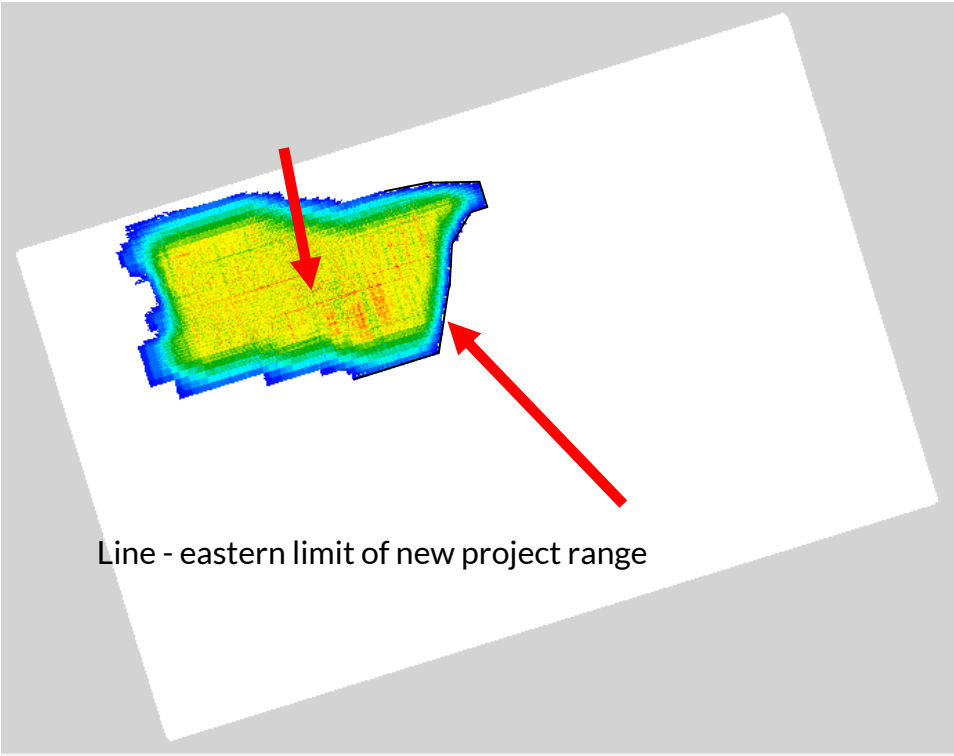
Using similar method for east side

Line - eastern limit of new project range

Figure 9. Optimal position for merging line.
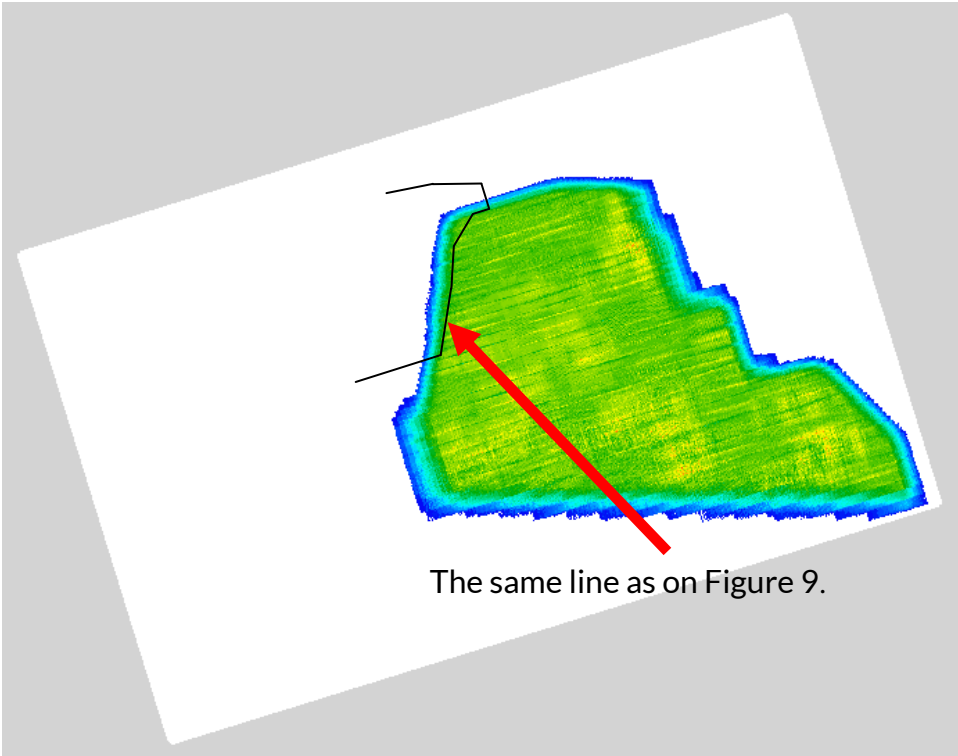

The same line as on Figure 9.

Figure 10. Line for merging overlaying on old project. The merging line positioned on eastern part of old project

Using this line a polygon for old project is build. This polygon is used for data selection in overlapping zone.

Database projection method between CDP and Sequence Index Number order will be used
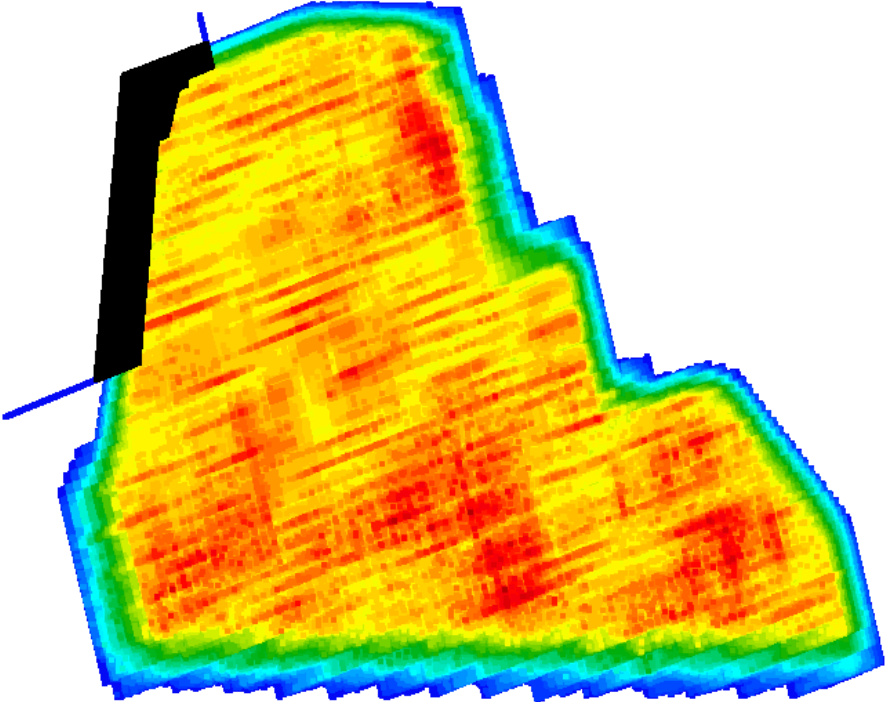

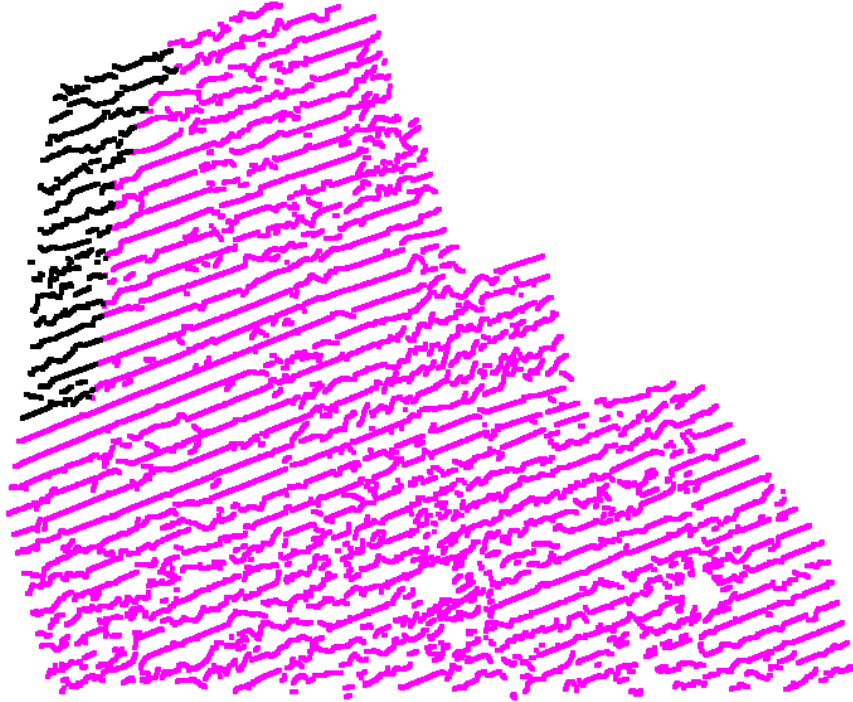Figure 11. Polygon on CDP Fold Map (black color)

Figure 12. Shot points corresponding with selected polygon (black color).

Semi-automatic method of data selection (for processing) - first for eastern part. This records (black color) must be added to new dataset for new processing (3D Pre-Stack Merging™).

In most of 3D Pre-Stack Merging™ situation records with all traces are added from old data to new dataset. This provide to comfortable situation for respective the **second criterion** for successfully 3D Pre-Stack Merging™– necessary border for surface consistent procedure.
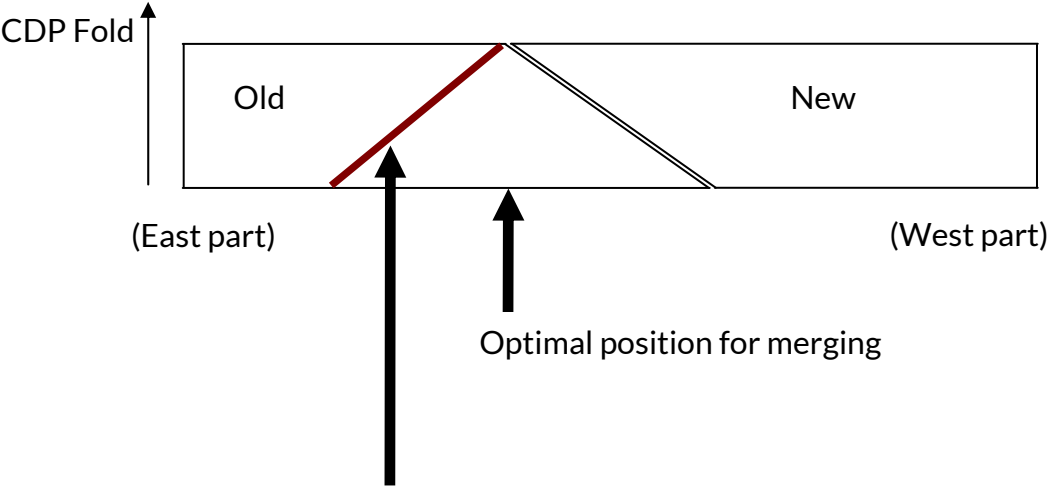
Figure 13. Optimal position for merging and line describing region of fold discrimination.

Assuming for first two criteria of Pre-stack Merging™ dataset for processing must like as on Figure 15 although new dataset like as on Figure 14.
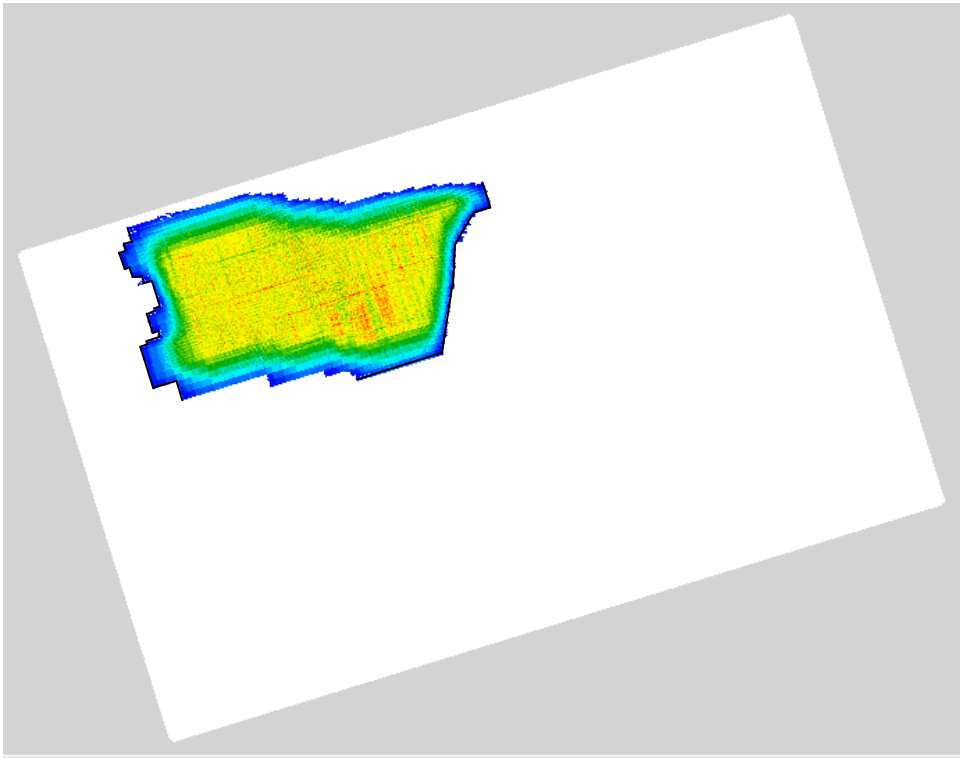
Figure 14. New project dataset (CDP Fold Map)

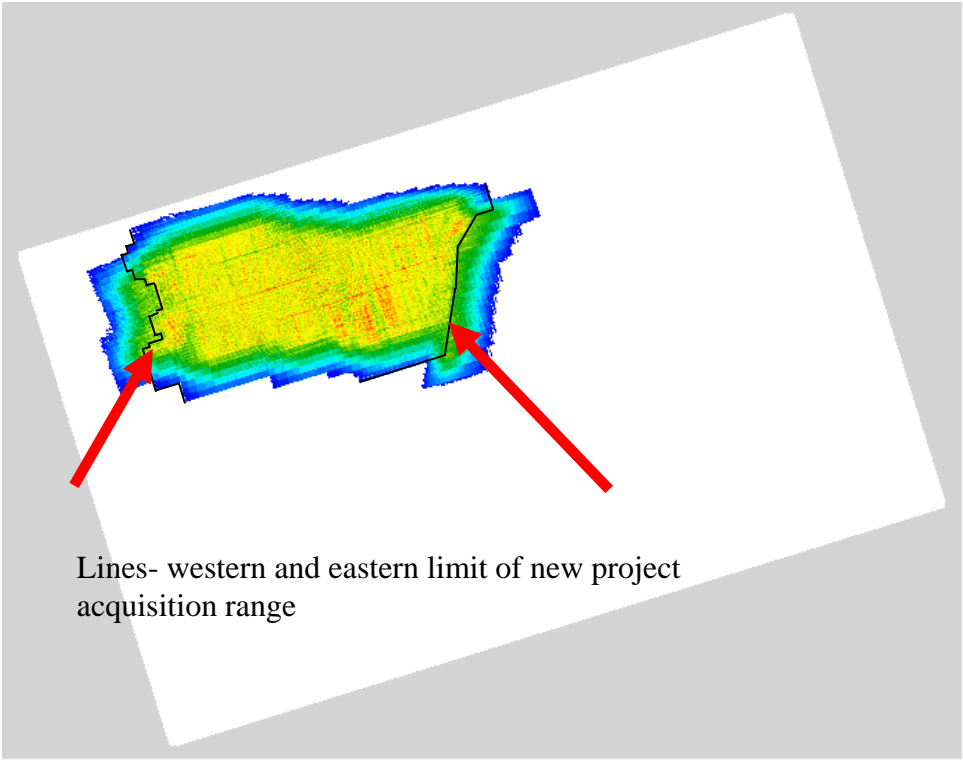Lines- western and eastern limit of new project acquisition range

Figure 15. New project dataset with added overlapping subdatasets for 3D Pre-Stack Merging™

The **third criterion** is necessary aperture for 3D post stack migration.

To realize migration first we merge new cube with old cubes along merging lines and than select dataset for migration. Dataset for migration may be as large as we need to despite length of aperture – see rectangular below.
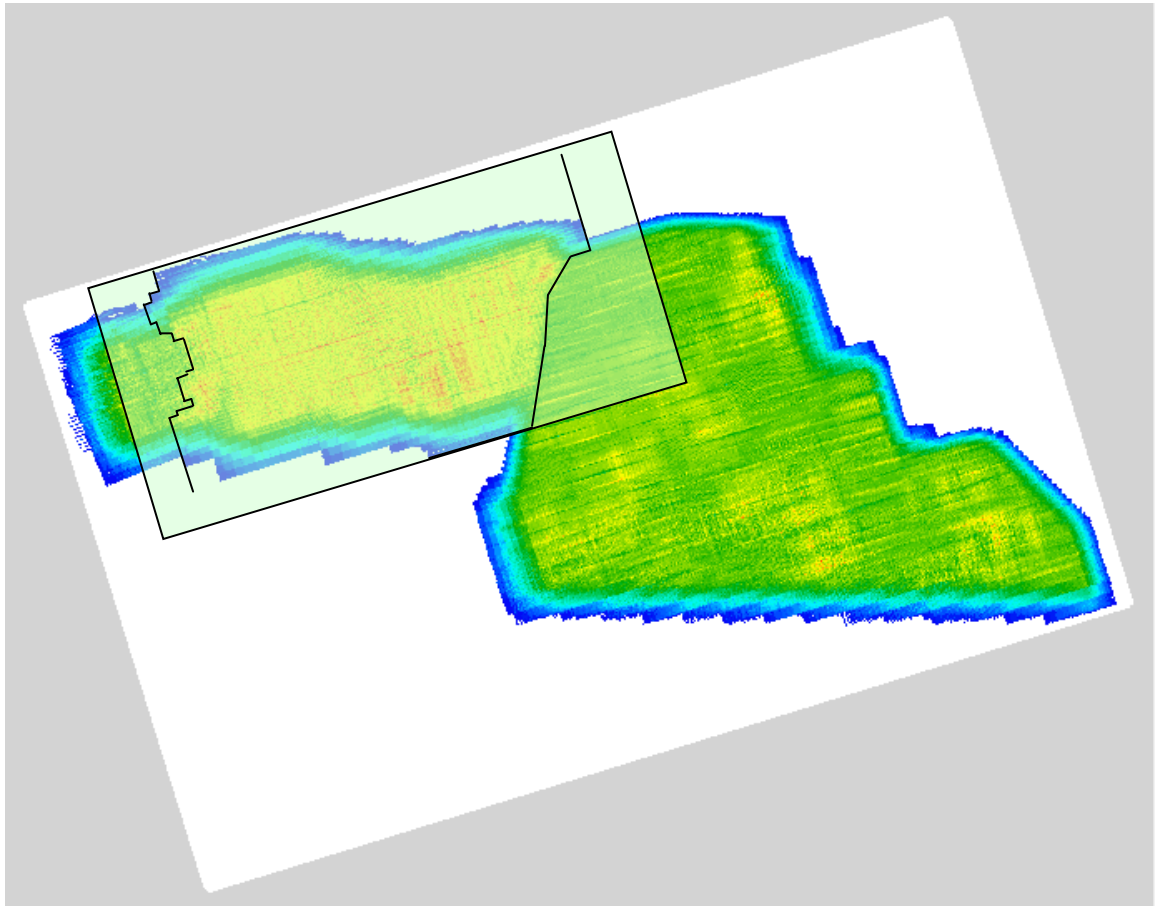

Figure 16. 3D dataset prepared for migration (rectangular)– after merging with old 3d Stack cubes.

After migration of data extended to rectangular (see Fig. 16) the final migrated volume will be merged with old migrated volumes along lines of merging.