Operator-oriented CRS interpolation
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SUMMARY

In common-reflection-surface (CRS) imaging the reflection arrival time field is parameterized by a kinematic description of the recorded wavefield. Using the CRS approach locally in the unmigrated prestack data domain opens a potential for trace regularization and interpolation. The presented CRS interpolation operates in the original prestack data domain and accounts for irregular geometries. A distinction to existing methods is the use of local operators of the second order which are less sensitive to aliasing but imply a considerable increase of the computational expense.

In most data interpolation methods based on local coherency estimation, a single operator is designed for a target sample and the output amplitude is defined as a weighted average along the operator. This approach may fail in presence of interfering events or strong amplitude and phase variations. We introduce an alternative scheme in which there is no need for an operator to be defined at the target sample itself. Instead, the amplitude at a target sample is constructed from multiple operators estimated at different positions. In this case one operator may contribute to the construction of several target samples. Vice versa, a target sample might receive contributions from different operators.

Due to the computational expense, common-reflection-surface interpolation is limited to work in subsets of the prestack data. We present the general workflow of a common-reflection-surface-based regularization/interpolation for 3D data volumes. This workflow has been applied to an OBC common-receiver volume and binned common-offset subsets of a 3D marine data set. The impact of a common-reflection-surface regularization is demonstrated by means of a subsequent time migration. In comparison to the time migrations of the original and DMO-interpolated data, the results show particular improvements in view of the continuity of reflections events. This gain is confirmed by an automatic picking of a horizon in the stacked time migrations.