

# AGT's Least-Squares Migrations (LSM)

Advanced Geophysical Technology

*June 2022*



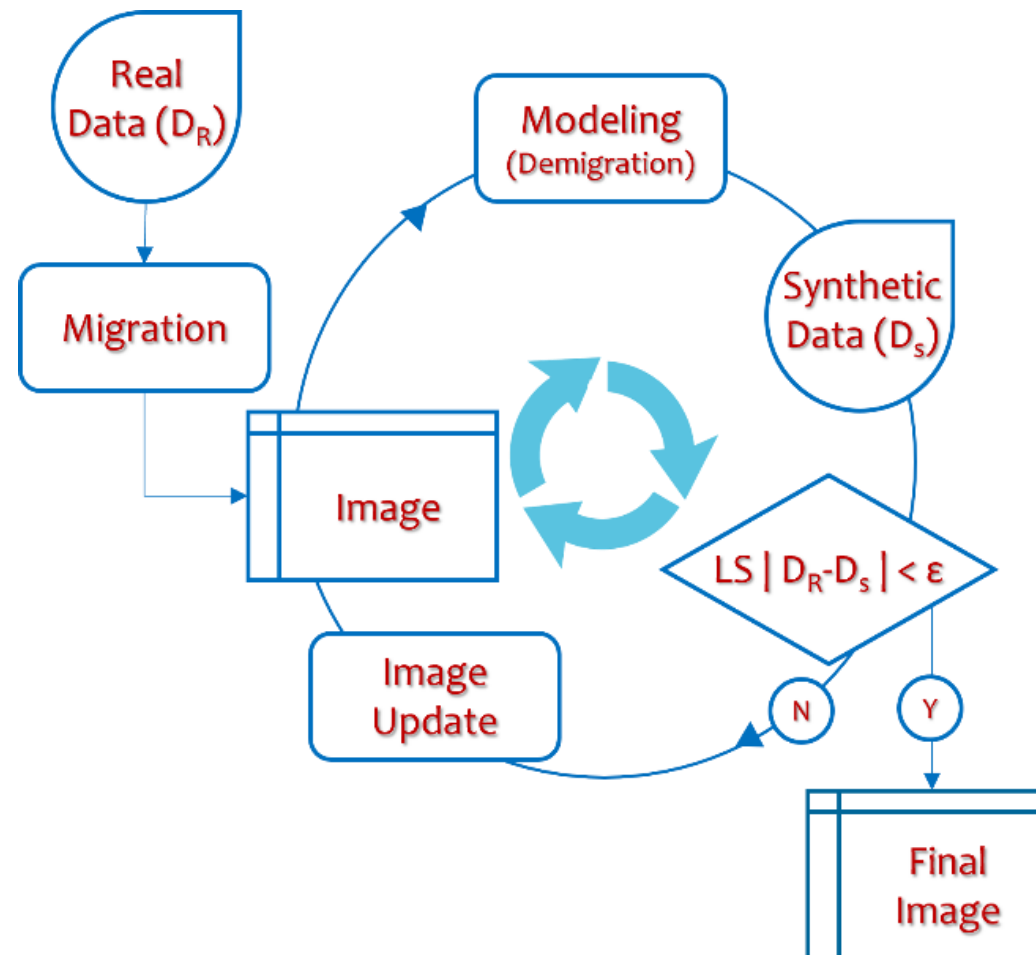
# AGT's Least-Squares Migrations (LSM)

Seismic migration has evolved since the 70s and still plays a key role in the Exploration and Development phases for Oil and Gas, turning into a combined instrument, aiming at velocity estimation, structural positioning, and amplitude fidelity.

Utilizing unique, patented, multi-petaflops of compute, with highly efficient low memory GPU cards, AGT has a full portfolio of migration algorithms that allows for simultaneous workflows, notably reducing the overall turnaround time of projects.

Least-Squares Migration (LSM) is a relatively recent inversion-based imaging procedure that minimizes the misfit between observed and synthetic data, gradually attenuating migration errors and producing improved seismic images (Fig. 01).

# LSM Inversion Loop\* (Fig. 01)



Like FWI, LSM is an inversion-based approach, but it updates the reflectivity rather than velocity model. LSM also prove to be an ideal partner for FWI, as it benefits from its highly detailed velocity models.

\*S. Lu, F. Liu, N. Chemingui, A. Valenciano, and A. Long, 2018

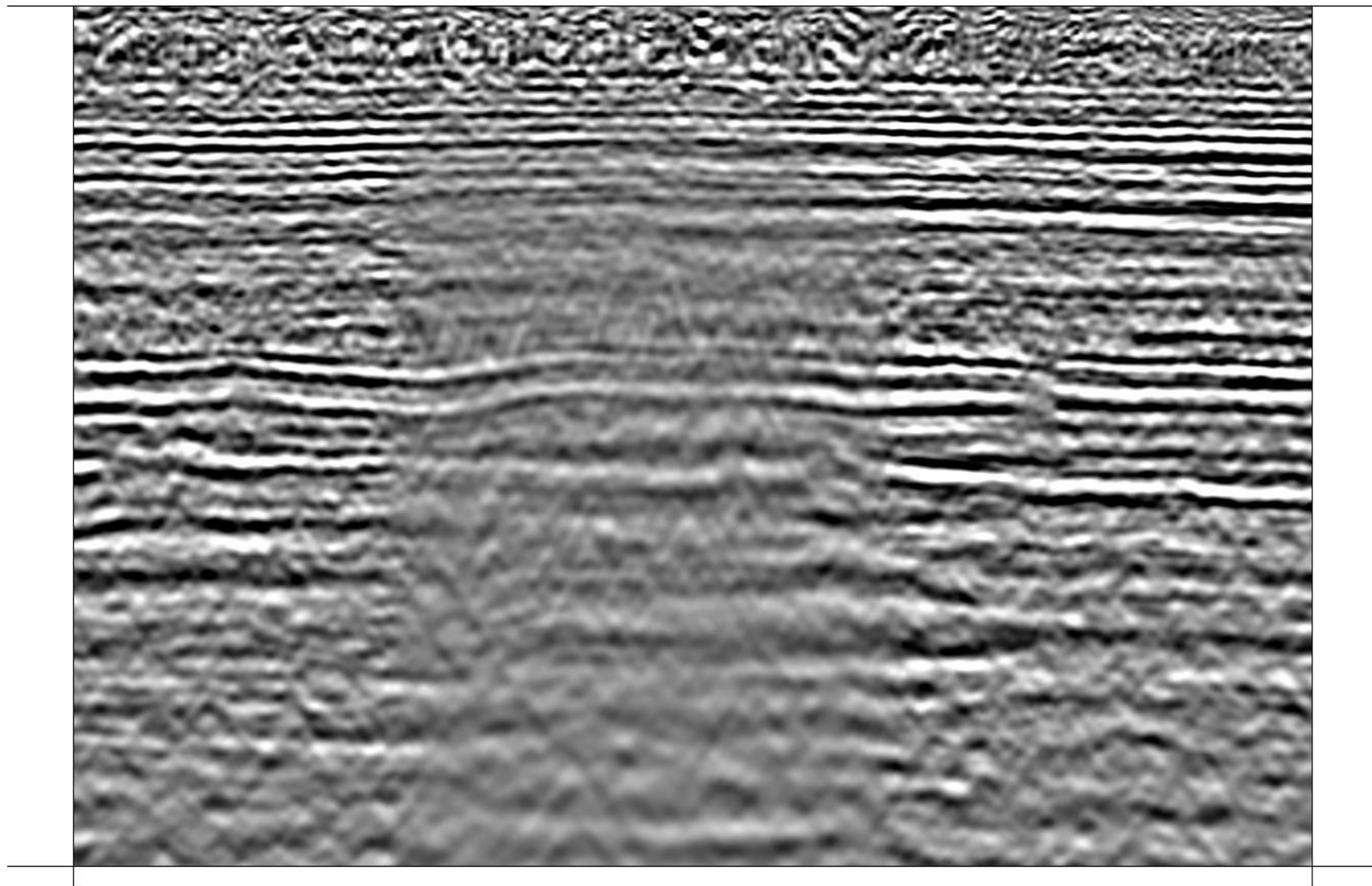
# AGT's Least-Squares Migration (LSM)

Typically, field shot gathers are compared with synthetic ones, obtained by demigration. The residuals are then migrated to get the reflectivity update, which is added to the current image. The iteration lasts until the residuals are negligible.

To improve the efficiency and robustness of AGT's LSM, a LSM approach with not many iterations is often utilized, based on estimating the inverse of the demigration-remigration operator (i.e., the Hessian operator) and applying a matching filter.

AGT's LSM refines Kirchhoff and RTM images through the above-mentioned approach, also accounting for anisotropy and Q, thereby obtaining balanced amplitudes, less migration artifacts, improved steep dips and overall higher resolution.

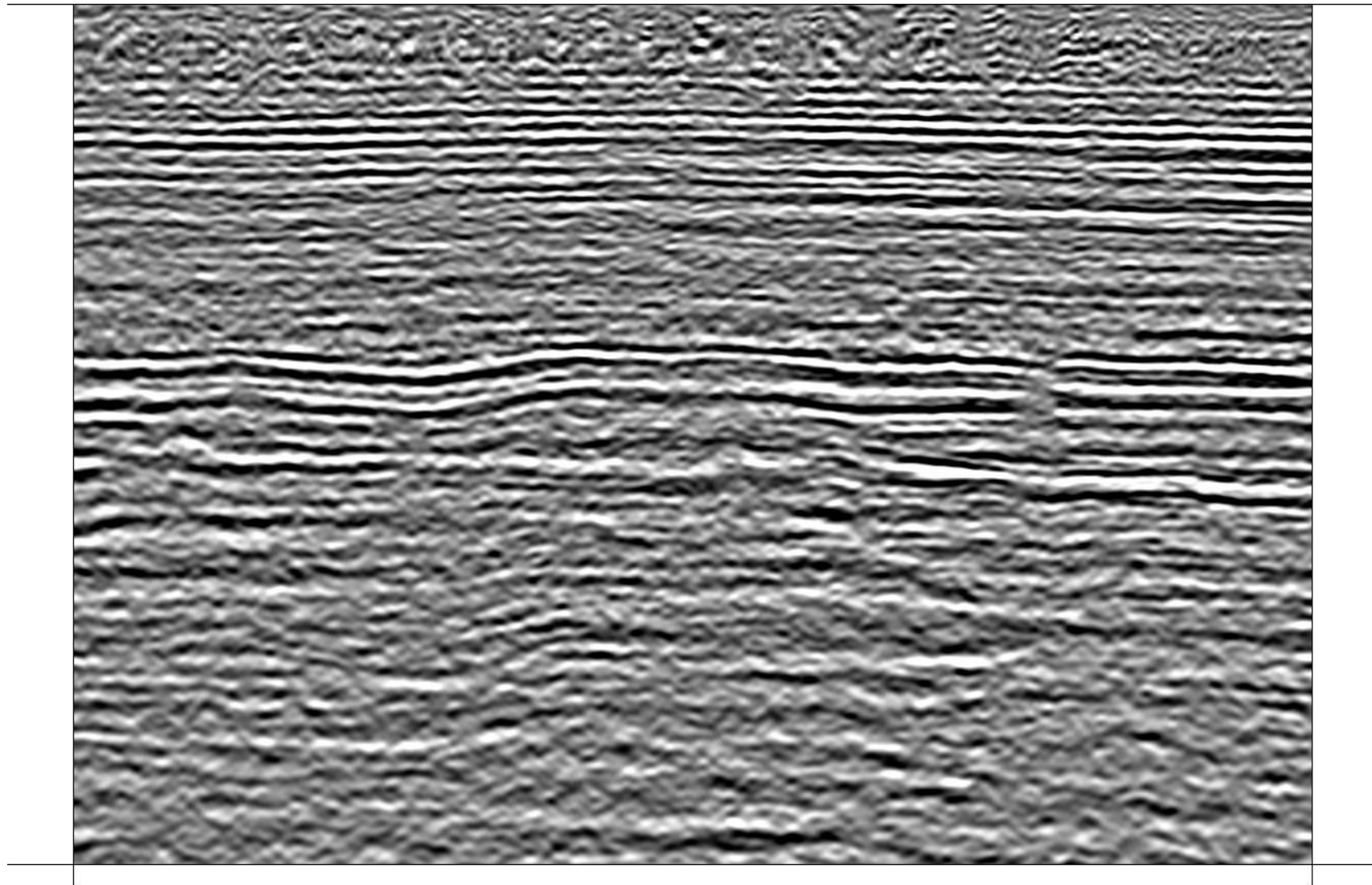
# Example from Project A – Confidential (Fig. 02a)



*KDM*

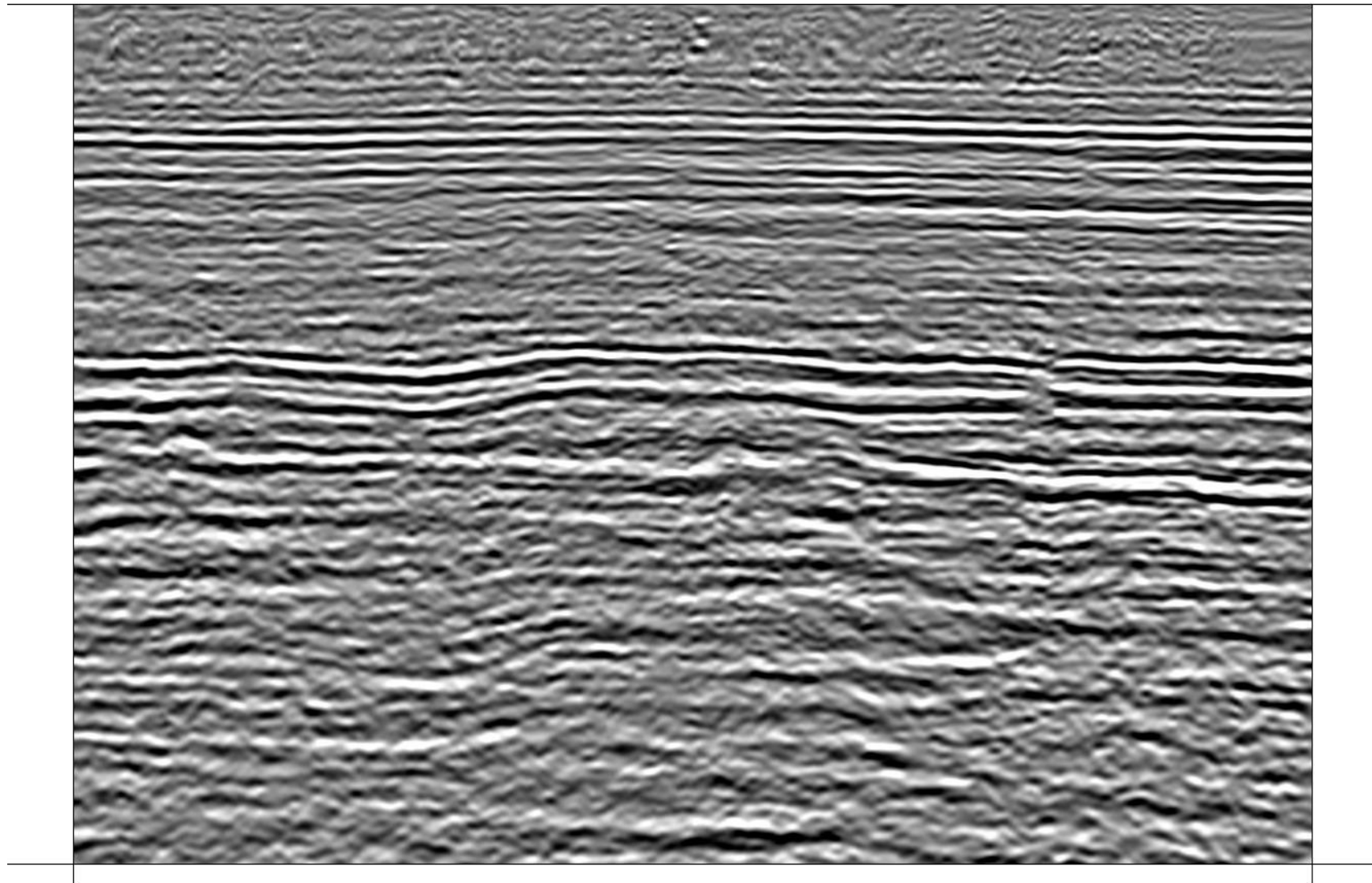


# Example from Project A – Confidential (Fig. 02b)



*Q-KDM*

# Example from Project A – Confidential (Fig. 02c)



*Least Squares Q-KDM*