

# **Twenty Five Years of Least Squares Migration: Current Developments and its Future**

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I overview the historical development of least squares migration (LSM) in the seismic industry, starting from Kirchhoff LSM and continuing to today's full wave equation-based methods. The advantage of LSM over standard migration is that the Hessian inverse is approximated to mitigate migration artifacts associated with limited recording aperture, sparse sampling of receivers and sources, and uneven illumination of the subsurface due to strong velocity contrasts. However, the main limitation is that LSM in its conventional implementation costs more than an order-of-magnitude more than standard migration. However, this cost can be dramatically lowered by applying approximate Hessian operators to the conventional migration image. This implementation was first denoted as migration deconvolution, and is also referred to as LSM in the image domain. Cost reduction without much reduction in quality is a key step for regular use of LSM by the industry.