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Better Imaging of the Subsurface using Primaries and Multiples: A Synthetic Example

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Contrary to the standard seismic processing which is to run seismic migration after demultiple, a synthetic line mimicking a seismic line in the Malay Basin was imaged by simultaneously migrating the primaries and the multiples. The motivation for this approach are 1) illumination from multiples covers greater subsurface extent, 2) angle gathers generated from imaging of multiples are much denser than those produced by imaging of primaries alone, 3) multiple imaging can supplement subsurface illumination that is not found in the primary signals. The method applied is the Joint Migration Inversion (JMI). Seismic migration is done in

a closed-loop manner as opposed to the standard seismic processing open-loop method. The initial migrated seismic image is feedback to a forward modelling algorithm. This allows an iterative minimization of the difference between the simulated and the real measurements. Additionally, this also enable velocity estimation to be carried-out simultaneously. The JMI method is currently tested with a synthetic data before an application to a real data set. The results obtained showed that multiples can be utilized to get a much better seismic image of the subsurface than the standard method. The good final velocity model resulted from the JMI method is a welcome bonus.