Migration of velocity spectra: an example from the Philippines

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Successful seismic imaging of complex geology such as that found in the Philippine Islands requires accurate migration of the seismic data to collapse diffractions, image faults, and position reflectors in the correct spatial location. While today's migration algorithms are in theory generally quite accurate, in practice, migration accuracy for steep dips is critically dependent on the migration velocity.

An approach used routinely to estimate the migration velocity is to minimize the effects of dip and azimuth by applying dip moveout (DMO) to the data. However, velocity derived from DMO corrected data is located at an unmigrated position and thus should be repositioned prior to use as a migration velocity. The effect of this phenomenon will be demonstrated through an example from the Visayan Sea region of the Philippines in which, prior to migration, reflections from the steep flanks of a low-velocity shale diapir conflict with those from a deeper low-relief carbonate resulting in poorly resolved velocity analyses.

This problem can be overcome by employing conventional migration to ***migrate the DMO velocity*** to the proper spatial location prior to migrating the seismic data. Velocity spectra are first generated from DMO corrected data on a regular spatial grid and then common-velocity slices are extracted and migrated. Finally, the migrated velocity is reassembled at common spatial locations into velocity spectra which provide a better estimate of the true subsurface velocity.

By applying conventional migration principles to migrate velocity derived from DMO corrected data, velocity is placed at the correct spatial location as required for migration. The method provides an automated, efficient, and accurate procedure for the determination of migration velocity.