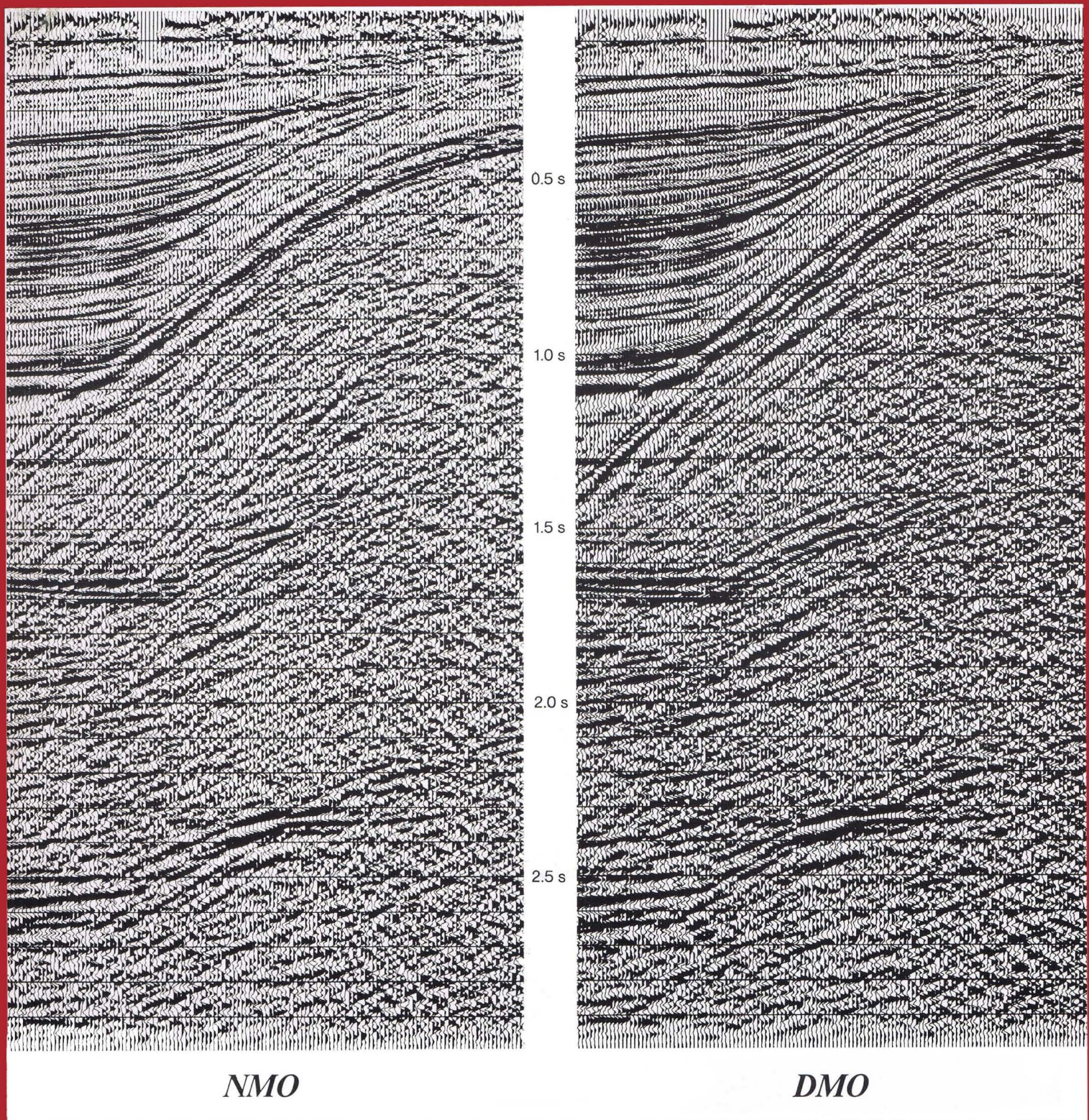
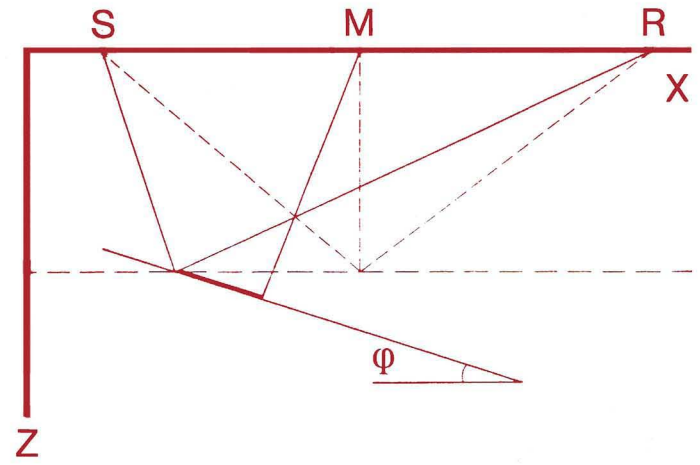
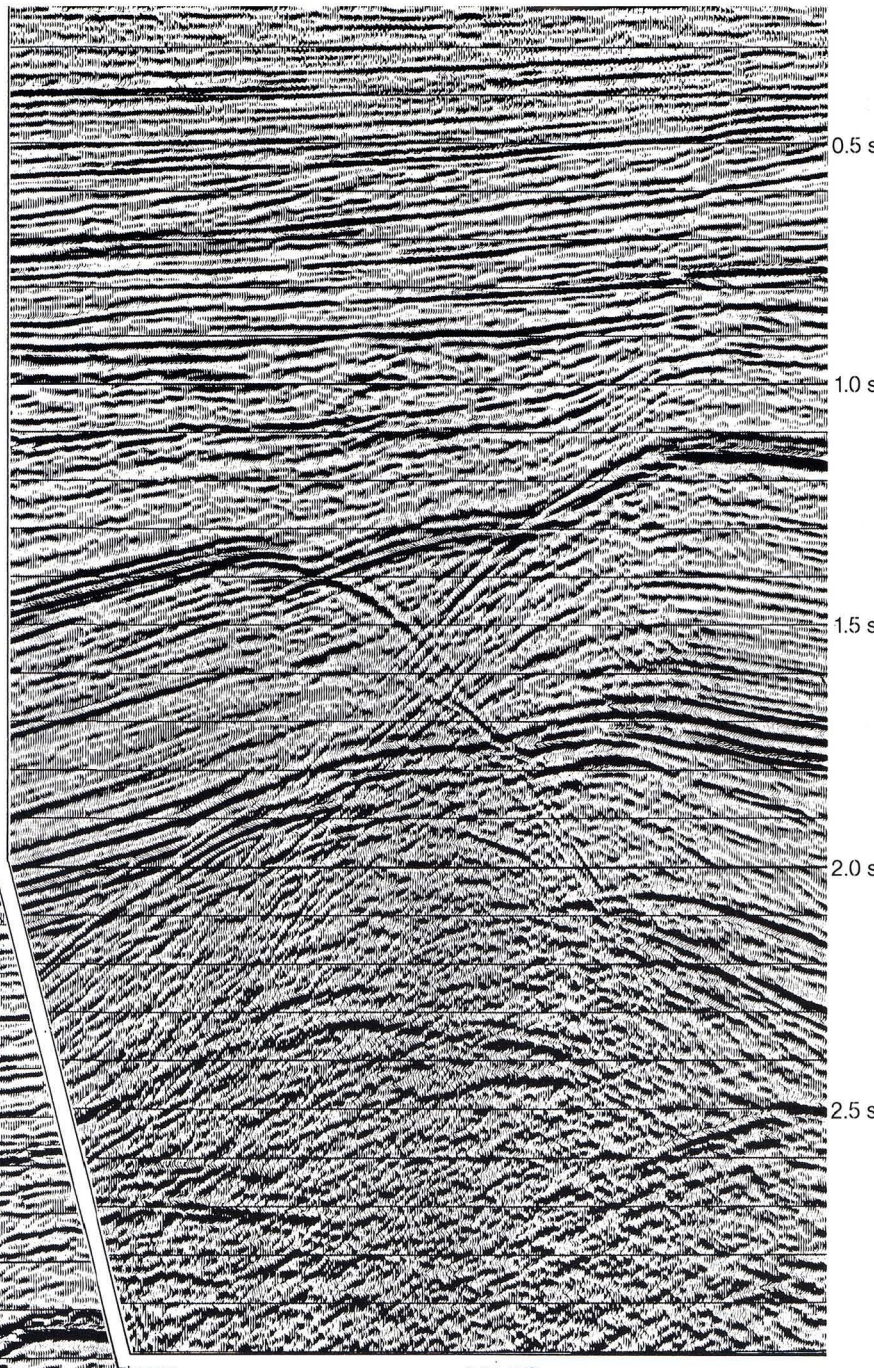
PRAKLA-SEISMOS INFORMATION No. 65

Dip Move Out

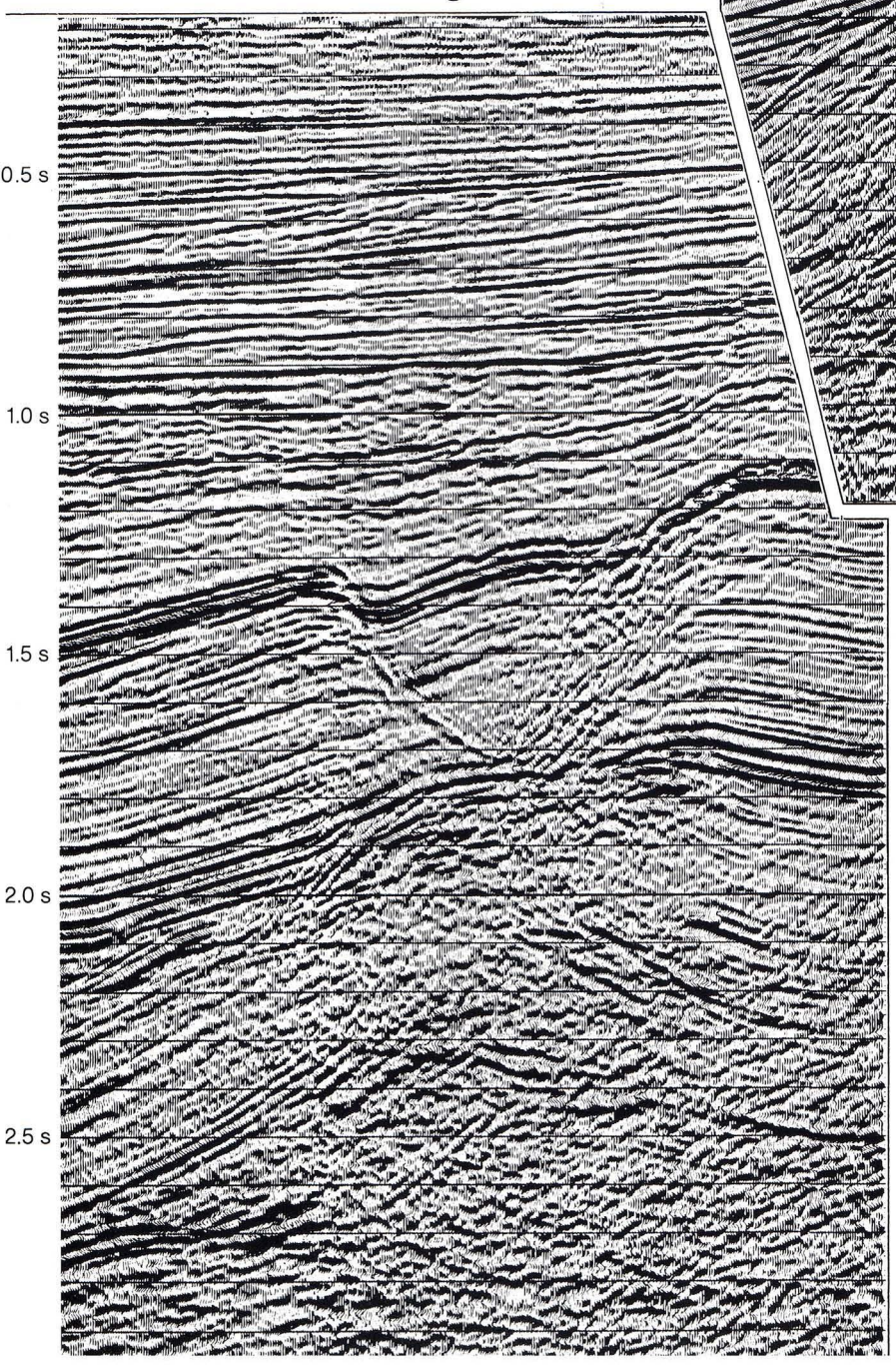






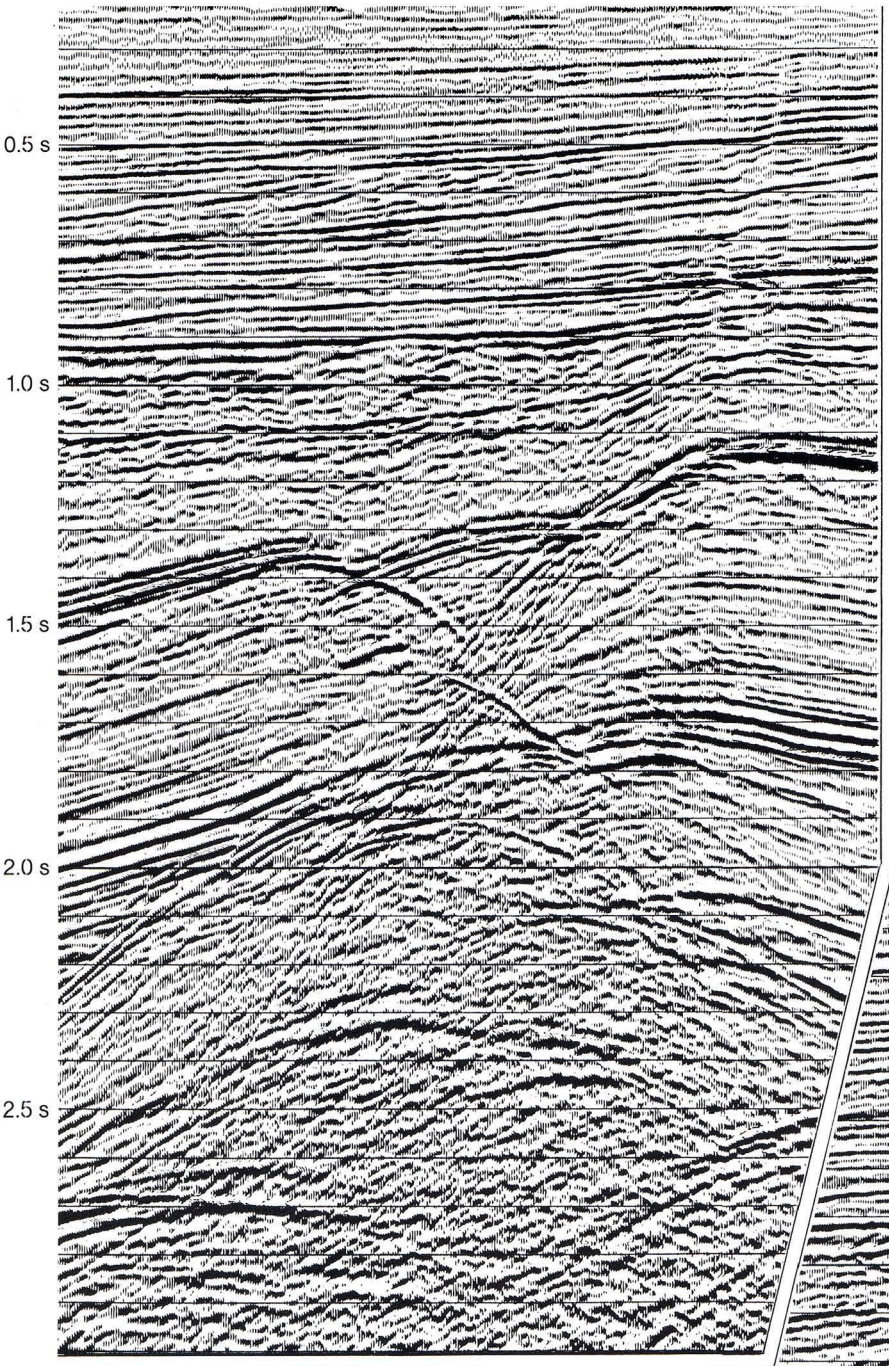
NMO

NMO + Mig

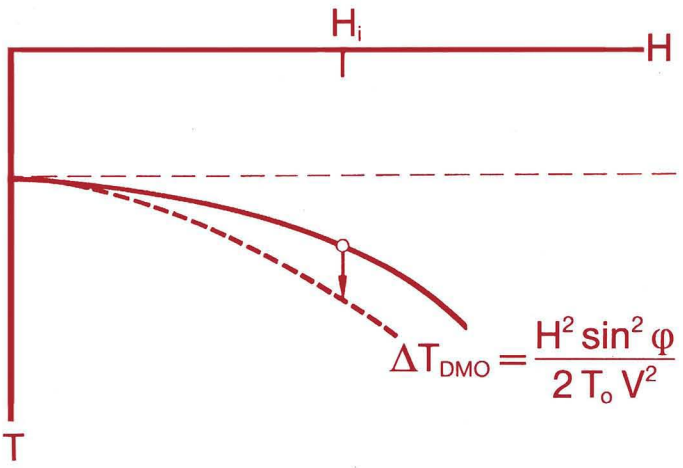


Dip moveout (DMO) processing or pre-stack partial migration may turn out to be a milestone on the path towards proper imaging of subsurface structures. It was introduced to overcome efficiently the shortcomings of normal CMP stacking of steep dips. The DMO operator moves the reflection point on a dipping interface to its zero-offset location. This dip-correcting lateral shift also involves an adjustment of the traveltimes thus reducing the stacking velocities of dipping events.

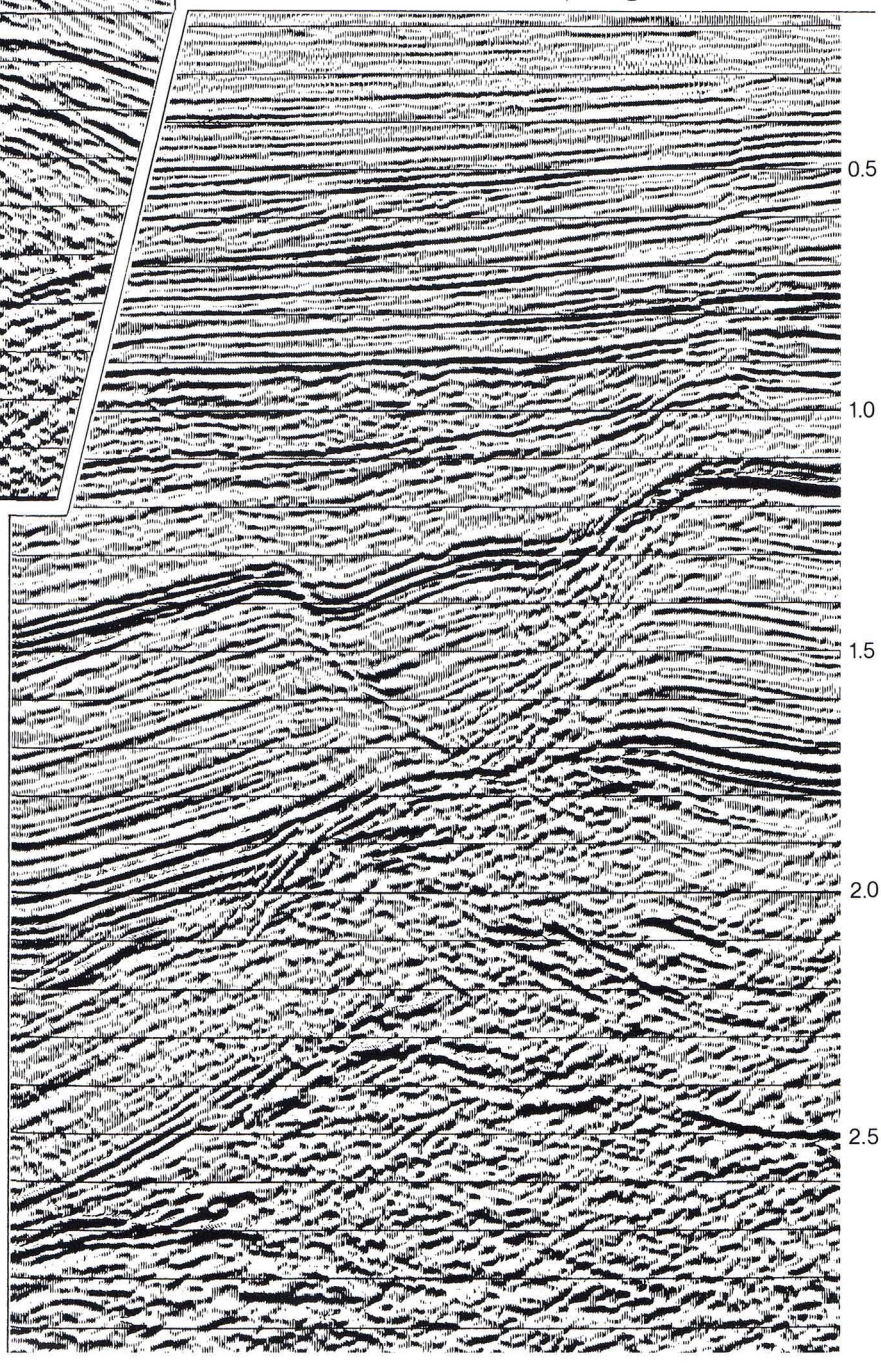
Consequently, events originating from the same reflector with different dips can be stacked with one and the same velocity. On the other hand, the velocity contrast is increased between steeply dipping noise and horizontal reflections observed at the same traveltime.



NMO + DMO



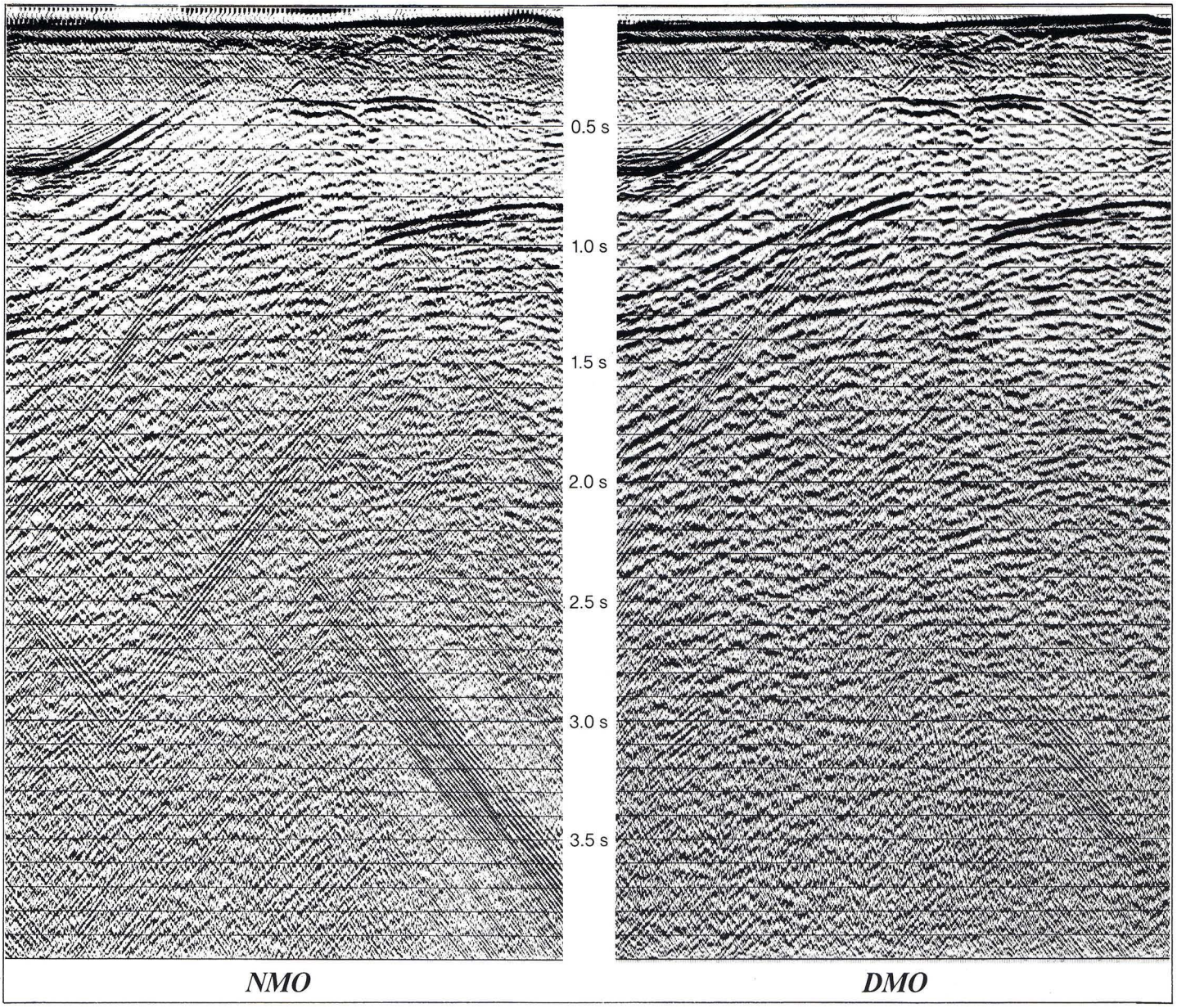
NMO + DMO + Mig



As stacking velocities after DMO processing are independent of dip they can be used to advantage for further imaging processes such as post-stack migration and depth migration.

Thus the main goals of DMO processing can be seen as:

- improving the zero-offset character of NMO corrected data by better approximating common reflection point data and solving the conflicting dip problem,
- providing improved estimates of migration velocities,
- suppressing steeply dipping coherent noise.



It should be noted, however, that for large lateral or vertical velocity gradients DMO processing may supply even worse results than the NMO stack. This is usually the case if the stacking velocity gradients cause a considerable contrast in stacking velocity between horizontal and dipping events after DMO. Such complicated raypaths can be treated successfully only by applying true pre-stack depth migration.

For implementing the wave-theoretical process of dip moveout different schemes are available which normally work either in the space/time or in the wavenumber/frequency domain. A finite difference scheme in the wavenumber/time domain is used with the procedure illustrated in this brochure. The DMO operation is performed on each set of common offset data after correcting for normal moveout.

The examples illustrate different effects. The comparison of NMO and DMO stacks on the front page clearly demonstrates that after dip moveout all dips are stacked coherently. A post-stack migration can image the multiple dip data more correctly, as is seen from the figures on page 2 and 3. The graben structure in particular is resolved in more detail.

Another data enhancing effect of DMO processing is shown by the examples above. The NMO stack is contaminated by steeply dipping noise, a usual occurrence in marine data, whereas in the DMO stack this has been considerably suppressed.

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ISSN 0933-7768