(#118418) Wavepath tomography for complex velocity areas

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In complex velocity models, such as below rugose salt bodies, wavefield continuation migration is usually superior to Kirchhoff methods because of multi-pathing, sharp velocity contrasts and the band-limited nature of seismic-wave propagation. Wavepath tomography offers a way to build the velocity model in a manner that is consistent with the migration operator. Instead of tracing rays to backproject residual velocities, a *wavepath* is constructed using the actual wavefield continuation operator. The operator represents the wave propagation between surface source-receiver pairs and subsurface reflection points by multiplication of impulse responses downgoing from the surface location and upgoing from the reflection point. The size of the inversion matrix is kept to a manageable size by restricting the wavepath to the first Fresnel zone. The considerable expense of computing a single wavepath kernel can be partially offset in comparison to ray tomography, by the smaller number of backprojections that are required to sample the velocity model adequately. To streamline the velocity-model updating process, we have implemented an automatic method of signal detection that eliminates the need for manual reflector picking by scanning the seismic data volume with prediction-error filters and automatically selecting back-projection points based on dip coherency and semblance strength. This approach can save months of human time on a typical 3-D seismic imaging project and, thereby, shortens seismic imaging project turnaround time while exploiting the full redundancy of the recorded data.