Claims

1. A system, comprising:

means for updating a velocity model and adjusting corresponding anisotropy parameters via wavelet shift tomography to solve for relatively longer wavelengths in the velocity model;

means for performing full waveform inversion to solve for relatively shorter wavelengths in the velocity model;

means for using the velocity model after full waveform inversion to migrate up-going wavefields and down-going wavefields including primaries and multiples recorded in a non-transitory machine-readable medium;

means for creating a plurality of angle gathers from the migration and recording the plurality of angle gathers in a non-transitory machine-readable medium, thereby imaging a subsurface location with multiples in a near-offset range and with primaries outside the near-offset range, wherein the subsurface location is shallow such that primaries are not received from the subsurface location for a near-offset range;

means for applying an amplitude-versus-angle analysis to the plurality of angle gathers to produce a quantitative interpretation pertaining to the shallow subsurface location, the quantitative interpretation comprising a direct hydrocarbon indicator; and

means for recording the quantitative interpretation on a non-transitory machine-readable medium.

2. The system of claim 1, further comprising means for separating recorded seismic data into the up-going wavefields and the down-going wavefields including the primaries and the multiples.

3. The system of claim 2, wherein the recorded seismic data was recorded with multi-sensor seismic receivers in water having a depth less than 600 meters.

4. The system of claim 1, further comprising means for creating the plurality of angle gathers from imaging the subsurface location with multiples outside the near-offset range.

5. The system of claim 1, wherein the means for producing the quantitative interpretation comprise means for determining a property of the subsurface location.

6. The system of claim 5, wherein the property of the subsurface location comprises an existence of a reservoir.

7. The system of claim 5, further comprising means for applying a deconvolution imaging condition at the subsurface location to reduce crosstalk from unrelated correlation of the primaries and the multiples.

8. The system of claim 1, wherein the means for producing the quantitative interpretation comprise means for predicting a lithology of the subsurface location.

9. The system of claim 1, wherein the means for producing the quantitative interpretation comprise means for predicting presence of a fluid at the subsurface location.

10. A method, comprising:

performing, by a machine, separated wavefield imaging, including separating recorded seismic data into up-going wavefields and down-going wavefields recorded in a non-transitory machine-readable medium, to provide seismic data for a near-offset range;

wherein providing seismic data for the near-offset range includes illuminating angles in the near-offset range to improve discrimination of amplitude with angle for an amplitude-versus-angle analysis;

migrating, by the machine, the up-going wavefields and the down-going wavefields to the subsurface location;

applying, by the machine, a deconvolution imaging condition at the subsurface location after the migration to create a plurality of angle gathers from imaging a subsurface location with multiples over a plurality of angles, wherein the subsurface location is shallow such that primaries are not received from the subsurface location for a near-offset range, and recording the plurality of angle gathers in a non-transitory machine-readable medium;

applying, by the machine, the amplitude-versus-angle analysis to the plurality of angle gathers to produce a quantitative interpretation pertaining to the shallow subsurface location, the quantitative interpretation comprising a direct hydrocarbon indicator; and

recording the quantitative interpretation on a non-transitory machine readable medium.

11. The method of claim 10, wherein the method includes applying a radial trace transform to a plurality of subsurface offset gathers to create the plurality of angle gathers.

12. A non-transitory machine-readable medium storing instructions executable by a processing resource to:

update a velocity model and adjust corresponding anisotropy parameters via wavelet shift tomography to solve for relatively longer wavelengths in the velocity model;

perform full waveform inversion to solve for relatively shorter wavelengths in the velocity model;

use the velocity model after full waveform inversion to migrate up-going wavefields and down-going wavefields including primaries and multiples recorded in a non-transitory machine-readable medium;

create a plurality of angle gathers from the migration and record the plurality of angle gathers in a non-transitory machine-readable medium, thereby imaging a subsurface location with multiples over a plurality of angles, wherein the subsurface location is shallow such that primaries are not received from the subsurface location for a near-offset range;

apply an amplitude-versus-angle analysis to the plurality of angle gathers to produce a quantitative interpretation pertaining to the shallow subsurface location, the quantitative interpretation comprising a direct hydrocarbon indicator; and

record the quantitative interpretation on a non-transitory machine-readable medium.

13. The medium of claim 12, wherein the multiples comprise down-going sea surface reflections in a near-offset range.

14. The medium of claim 13, wherein the instructions to create the plurality of angle gathers further include instructions to create the plurality of angle gathers from imaging the subsurface location with primaries outside of the near-offset range.

15. The medium of claim 12, wherein the quantitative interpretation includes at least one of the group of quantitative interpretations including:

a determination of a property of the subsurface location;

a prediction of a lithology of the subsurface location; and

a prediction of a fluid at the subsurface location.

16. A method of generating a geophysical data product, the method comprising:

obtaining geophysical data;

processing the geophysical data to generate the geophysical data product, wherein processing the geophysical data comprises:

updating, by a machine, a velocity model and adjust corresponding anisotropy parameters via wavelet shift tomography to solve for relatively longer wavelengths in the velocity model; and

performing, by the machine, full waveform inversion to solve for relatively shorter wavelengths in the velocity model;

using, by the machine, the velocity model after full waveform inversion to migrate up-going wavefields and down-going wavefields including primaries and multiples recorded in a non-transitory machine-readable medium;

creating, by the machine, a plurality of angle gathers from the migration and recording the plurality of angle gather in a non-transitory machine-readable medium, thereby imaging a subsurface location with multiples in a near-offset range and imaging primaries outside the near-offset range, wherein the subsurface location is shallow such that primaries are not received from the subsurface location for a near-offset range; and

applying, by the machine, an amplitude-versus-angle analysis to the plurality of angle gathers to produce a quantitative interpretation pertaining to the shallow subsurface location, the quantitative interpretation comprising a direct hydrocarbon indicator; and

recording the geophysical data product on a non-transitory machine-readable medium.

17. The method of claim 16, wherein processing the geophysical data comprises processing the geophysical data offshore or onshore.