CLAIMS

1. In a process for generating an image of a subterranean formation using marine seismic techniques in which one or more sources are activated to generate acoustic energy that is reflected from the subterranean formation and recorded by moving pressure and particle motion sensors, the specific improvement comprising:

computing a near-continuous pressure wavefield in approximately stationary-receiver locations from a recorded near-continuous pressure wavefield recorded by the pressure sensors and distances the pressure sensors moved since starting near-continuous recording of the near-continuous pressure wavefield;

computing a near-continuous particle motion wavefield in the approximately stationary-receiver locations from a recorded near-continuous particle motion wavefield recorded by the particle motion sensors and distances the particle motion sensors moved since starting near-continuous recording of the near-continuous particle motion wavefield;

computing one of an up-going near-continuous pressure or particle motion wavefield in approximately stationary-receiver locations based on the recorded near-continuous pressure and particle motion wavefields in the approximately stationary-receiver locations; and

using one of the up-going pressure or particle motion wavefields to generate an image of the subterranean formation, thereby avoiding contamination of the image from ghost effects created by down-going near-continuous pressure and particle motion wavefields in the recorded pressure and particle motion wavefields.

2. The process of claim 1 wherein computing the near-continuous pressure wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous pressure wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous pressure wavefield, and for each time sample of a trace of the recorded near-continuous pressure

wavefield, computing the distance a pressure sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a pressure amplitude at the time sample by the distance-correction operator.

3. The process of claim 1 wherein computing the near-continuous pressure wavefield in the approximately stationary-receiver locations comprises:

for each component pressure wavefield of the recorded near-continuous pressure wavefield in the approximately stationary-receiver locations, transforming the component pressure wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous pressure wavefield, and for each time sample of a trace of the recorded near-continuous pressure wavefield, computing the distance a pressure sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a pressure amplitude at the time sample by the distance-correction operator.

4. The process of claim 1 wherein computing the near-continuous particle motion wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous particle motion wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous particle motion wavefield, and for each time sample of a trace of the recorded near-continuous particle motion wavefield, computing the distance a particle motion sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a vertical-particle-velocity amplitude at the time sample by the distance-correction operator.

5. The process of claim 1 wherein computing the near-continuous particle motion wavefield in the approximately stationary-receiver locations comprises:

for each component pressure wavefield of the recorded near-continuous particle motion wavefield in the approximately stationary-receiver locations, transforming the component particle motion wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous particle motion wavefield, and for each time sample of a trace of the recorded near-continuous particle motion wavefield, computing the distance a particle motion sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a vertical-particle-velocity amplitude at the time sample by the distance-correction operator.

6. The process of claim 1 wherein computing one of the up-going pressure or particle motion wavefield in the approximately stationary-receiver locations further comprises:

transforming the recorded near-continuous pressure and particle motion wavefields in the approximately stationary-receiver locations from the wavenumber-time domain to pressure and particle motion wavefields in the wavenumber-frequency domain;

computing an estimated particle motion wavefield over a low-frequency range based on pressure wavefield over the low-frequency range;

combining the estimated particle motion wavefield over the low-frequency range with the particle motion wavefields above to the low-frequency to generate a combined near-continuous particle motion wavefield in approximately stationary-receiver locations; and

computing the up-going pressure or particle motion wavefield based on the near-continuous pressure wavefield in the approximately stationary-receiver locations and

the combined near-continuous particle motion wavefield in approximately stationary-receiver locations.

7. The process of claim 1 executed on a programmable computer programmed to execute the method.

8. The process of claim 1 further comprises storing one of the up-going distance-corrected pressure or particle motion wavefield in one or more data-storage devices.

9. The process of claim 1, wherein at least one of the one of the up-going distance-corrected pressure or particle motion wavefield form a geophysical data product, further comprising recording the geophysical data product on a physical, non-volatile computer-readable medium suitable for importing onshore.

10. The process of claim 9, further comprising performing geophysical analysis onshore on the geophysical data product.

11. A computer system for generating an image of a subterranean formation, the system comprising:

one or more processors;

one or more data-storage devices; and

a routine stored in one or more of data-storage devices and executed by the one or more processors, the routine preforms the operations comprising:

computing a near-continuous pressure wavefield in approximately stationary-receiver locations from a recorded near-continuous pressure wavefield recorded by pressure sensors and distances the pressure sensors moved since starting near-continuous recording of the near-continuous pressure wavefield;

computing a near-continuous particle motion wavefield in the approximately stationary-receiver locations from a recorded near-continuous

particle motion wavefield recorded by particle motion sensors and distances the particle motion sensors moved since starting near-continuous recording of the near-continuous particle motion wavefield;

computing one of an up-going near-continuous pressure or particle motion wavefield in approximately stationary-receiver locations based on the recorded near-continuous pressure and particle motion wavefields in the approximately stationary-receiver locations; and

using one of the up-going pressure or particle motion wavefields to generate an image of the subterranean formation, thereby avoiding contamination of the image from ghost effects created by down-going near-continuous pressure and particle motion wavefields in the recorded pressure and particle motion wavefields.

12. The computer system of claim 11 wherein computing the near-continuous pressure wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous pressure wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous pressure wavefield, and for each time sample of a trace of the recorded near-continuous pressure wavefield, computing the distance a pressure sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a pressure amplitude at the time sample by the distance-correction operator.

13. The computer system of claim 11 wherein computing the near-continuous pressure wavefield in the approximately stationary-receiver locations comprises:

for each component pressure wavefield of the recorded near-continuous pressure wavefield in the approximately stationary-receiver locations, transforming the component pressure wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous pressure wavefield, and for each time sample of a trace of the recorded near-continuous pressure wavefield, computing the distance a pressure sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a pressure amplitude at the time sample by the distance-correction operator.

14. The computer system of claim 11 wherein computing the near-continuous particle motion wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous particle motion wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous particle motion wavefield, and for each time sample of a trace of the recorded near-continuous particle motion wavefield, computing the distance a particle motion sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a vertical-particle-velocity amplitude at the time sample by the distance-correction operator.

15. The computer system of claim 11 wherein computing the near-continuous particle motion wavefield in the approximately stationary-receiver locations comprises:

for each component pressure wavefield of the recorded near-continuous particle motion wavefield in the approximately stationary-receiver locations, transforming the component particle motion wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous particle motion wavefield, and for each time sample of a trace of the recorded near-continuous particle motion wavefield, computing the distance a particle motion sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a vertical-particle-velocity amplitude at the time sample by the distance-correction operator.

16. The computer system of claim 11 wherein computing one of the up-going pressure or particle motion wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous pressure and particle motion wavefields in the approximately stationary-receiver locations from the wavenumber-time domain to pressure and particle motion wavefields in the wavenumber-frequency domain;

computing an estimated particle motion wavefield over a low-frequency range based on pressure wavefield over the low-frequency range;

combining the estimated particle motion wavefield over the low-frequency range with the particle motion wavefields above to the low-frequency to generate a combined near-continuous particle motion wavefield in approximately stationary-receiver locations; and

computing the up-going pressure or particle motion wavefield based on the near-continuous pressure wavefield in the approximately stationary-receiver locations and the combined near-continuous particle motion wavefield in approximately stationary-receiver locations.

17. A non-transitory computer-readable medium having machine-readable instructions encoded thereon for enabling one or more processors of a computer system to generate an image of a subterranean formation by performing the operations comprising:

computing a near-continuous pressure wavefield in approximately stationary-receiver locations from a recorded near-continuous pressure wavefield recorded by pressure sensors and distances the pressure sensors moved since starting near-continuous recording of the near-continuous pressure wavefield;

computing a near-continuous particle motion wavefield in the approximately stationary-receiver locations from a recorded near-continuous particle motion wavefield recorded by particle motion sensors and distances the particle motion sensors moved since starting near-continuous recording of the near-continuous particle motion wavefield;

computing one of an up-going near-continuous pressure or particle motion wavefield in approximately stationary-receiver locations based on the recorded near-continuous pressure and particle motion wavefields in the approximately stationary-receiver locations; and

using one of the up-going pressure or particle motion wavefields to generate an image of the subterranean formation, thereby avoiding contamination of the image from ghost effects created by down-going near-continuous pressure and particle motion wavefields in the recorded pressure and particle motion wavefields.

18. The medium of claim 17 wherein computing the near-continuous pressure wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous pressure wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous pressure wavefield, and for each time sample of a trace of the recorded near-continuous pressure wavefield, computing the distance a pressure sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a pressure amplitude at the time sample by the distance-correction operator.

19. The medium of claim 17 wherein computing the near-continuous pressure wavefield in the approximately stationary-receiver locations further comprises:

for each component pressure wavefield of the recorded near-continuous pressure wavefield in the approximately stationary-receiver locations, transforming the

component pressure wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous pressure wavefield, and for each time sample of a trace of the recorded near-continuous pressure wavefield, computing a distance a pressure sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a pressure amplitude at the time sample by the distance-correction operator.

20. The medium of claim 17 wherein computing the near-continuous particle motion wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous particle motion wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous particle motion wavefield, and for each time sample of a trace of the recorded near-continuous particle motion wavefield, computing the distance a particle motion sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a vertical-particle-velocity amplitude at the time sample by the distance-correction operator.

21. The medium of claim 17 wherein computing the near-continuous particle motion wavefield in the approximately stationary-receiver locations comprises:

for each component pressure wavefield of the recorded near-continuous particle motion wavefield in the approximately stationary-receiver locations, transforming the component particle motion wavefield from a space-time domain to a wavenumber-time domain;

for each wavenumber sample of the recorded near-continuous particle motion wavefield, and for each time sample of a trace of the recorded near-continuous particle

motion wavefield, computing the distance a particle motion sensor moved along the vessel track with respect to an initial pressure sensor location;

computing a distance-correction operator based on the distance; and

multiplying a vertical-particle-velocity amplitude at the time sample by the distance-correction operator.

22. The medium of claim 17 wherein computing one of the up-going pressure or particle motion wavefield in the approximately stationary-receiver locations comprises:

transforming the recorded near-continuous pressure and particle motion wavefields in the approximately stationary-receiver locations from the wavenumber-time domain to pressure and particle motion wavefields in the wavenumber-frequency domain;

computing an estimated particle motion wavefield over a low-frequency range based on pressure wavefield over the low-frequency range;

combining the estimated particle motion wavefield over the low-frequency range with the particle motion wavefields above to the low-frequency to generate a combined near-continuous particle motion wavefield in approximately stationary-receiver locations; and

computing the up-going pressure or particle motion wavefield based on the near-continuous pressure wavefield in the approximately stationary-receiver locations and the combined near-continuous particle motion wavefield in approximately stationary-receiver locations.