CLAIMS

1. A method, comprising:

updating, by a machine, a velocity model of a subsurface, including:

suppressing high wavenumber components of the velocity model provided by reflected energy with a decomposed full waveform inversion gradient, wherein low wavenumber components are preserved in the velocity model and updated beyond a penetration depth of refracted energy in recorded seismic data; and

inserting dynamic weights in a velocity sensitivity kernel parameterized from a misfit function between modeled seismic data and the recorded seismic data.

2. The method of claim 1, wherein inserting the dynamic weights causes the suppression of the high wave number components of the velocity model provided by the reflected energy, wherein the high wavenumber components comprise migration isochrones.

3. The method of claim 1, wherein the method includes parameterizing the misfit function for velocity and impedance to yield the velocity sensitivity kernel.

4. The method of claim 1, wherein the method includes decomposing a full waveform inversion gradient into separate wavenumber components to yield the decomposed full waveform inversion gradient.

5. The method of claim 1, wherein the method includes determining a property of the subsurface based on the updated velocity model.

6. A system, comprising:

modeled seismic data;

recorded seismic data;

a high wavenumber engine, comprising hardware, configured to suppress high wavenumber components of a velocity model with a decomposed full waveform inversion gradient based on a dynamically weighted velocity sensitivity kernel; and

a low wavenumber engine, comprising hardware, configured to update low wavenumber components of the velocity model beyond a penetration depth of refracted energy in the recorded seismic data to produce a more accurate velocity model;

wherein the velocity sensitivity kernel comprises a parameterization of a misfit function between the modeled seismic data and the recorded seismic data.

7. The system of claim 6, wherein the high wavenumber engine is configured to suppress migration isochrones, provided by the reflected energy, in the full waveform inversion gradient used to update the velocity model.

8. The system of claim 6, wherein the recorded seismic data comprises data recorded with offsets shorter than long offsets.

9. The system of claim 8, wherein the recorded seismic data comprises data recorded from deep water.

10. The system of claim 6, wherein the system further includes a subsurface property engine configured to determine a property of the subsurface based on the more accurate velocity model.

11. A method, comprising:

updating, by a machine, a velocity model of a subsurface, wherein updating the velocity model includes:

using modeled seismic data and recorded seismic data from a marine survey comprising reflected energy and refracted energy in gradient-based full waveform inversion;

inserting dynamic weights in a velocity sensitivity kernel parameterized from a misfit function between the modeled seismic data and the recorded seismic data;

updating low wavenumber components of the velocity model at a depth greater than a penetration depth of the recorded refracted energy; and

producing a higher resolution velocity model.

12. The method of claim 11, wherein updating the velocity model further comprises suppressing high wavenumber components of the velocity model.

13. The method of claim 11, wherein the gradient-based full waveform inversion

further comprises using separate low and high wavenumber components of a decomposed full waveform inversion gradient.

14. The method of claim 11, wherein updating the low wavenumber components of the velocity model comprises updating using reflected energy; and wherein the method further includes determining a property of the subsurface based on the updated velocity model.

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

obtaining geophysical data; and

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

updating, by a machine, a velocity model of a subsurface, including:

suppressing high wavenumber components of the velocity model with a decomposed full waveform inversion gradient, wherein low wavenumber components of the velocity model are preserved and updated beyond a penetration depth of refracted energy in recorded seismic data; and

inserting dynamic weights in a velocity sensitivity kernel parameterized from a misfit function between modeled seismic data and recorded seismic data; and

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

16. The method of claim 15, wherein processing the geophysical data comprises processing the geophysical data offshore or onshore.