

CLAIMS

1. A method, comprising:
separating, by a machine, recorded seismic data indicative of a subterranean
5 formation into a residual portion and a quantity of portions that are coherent in a data
domain, each portion attributed to a respective one of a quantity of sources actuated as
part of a marine survey designed to generate the seismic data,
wherein the quantity of portions is equal in number to the quantity of sources;
performing, by the machine, seismic interference attenuation on the residual
10 portion to remove seismic interference from the residual portion; and
subtracting the seismic interference from the recorded seismic data to yield
seismic interference attenuated recorded seismic data better indicative of the
subterranean formation.
- 15 2. The method of claim 1, wherein performing seismic interference
attenuation comprises removing noise from the residual portion.
3. The method of claim 2, wherein removing noise comprises removing
noise that is coherent in a shot domain and incoherent in a domain where the recorded
20 seismic data was separated.
4. The method of claim 1, further comprising separating the residual
portion, after removal of the seismic interference, into an updated residual portion and a
quantity of second portions, each of the second portions attributed to a respective one of
25 the quantity of sources.
5. The method of claim 1, wherein the recorded seismic data is recorded
with a temporal overlap between actuation of the quantity of sources, comprising a
plurality of sources, and

wherein the recorded seismic data is recorded from the plurality of sources having dithered actuation.

6. The method of claim 1, wherein separating the data comprises:
5 applying source separation to the recorded seismic data, wherein the recorded seismic data was recorded with a temporal overlap between actuation of a plurality of source elements or source units comprising the quantity of sources; and
separating data that is not attributed to one of the plurality of source elements or source units, according to the source separation, to the residual portion.

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7. The method of claim 1, wherein separating the recorded seismic data comprises separating through minimization of a cost function that describes the residual portion.

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8. A system, comprising:
a source separation engine configured to separate recorded seismic data indicative of a subterranean formation into a first respective portion for each of a plurality of sources actuated as part of a marine survey designed to generate the seismic data and a residual portion; and

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an interference attenuation engine configured to remove seismic interference from the residual portion to yield a seismic interference attenuated residual portion;

wherein the source separation engine is configured to:

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separate the seismic interference attenuated residual portion into a second respective portion for each of the plurality of sources and an updated seismic interference attenuated residual portion; and

add the first respective portion for each of the plurality of sources and the second respective portion for each of the plurality of sources to yield a total separated portion for each of the plurality of sources; and

wherein the interference attenuation engine is further configured to subtract the seismic interference from the recorded seismic data to yield seismic interference attenuated recorded seismic data better indicative of the subterranean formation.

5 9. The system of claim 8, wherein the source separation engine is configured to separate the recorded seismic data more conservatively than the seismic interference attenuated data.

10 10. The system of claim 8, wherein the source separation engine is configured to separate the recorded seismic data without using data comprising a location or actuation time of a source contributing to the seismic interference.

15 11. The system of claim 8, wherein the source separation engine is configured to add the updated seismic interference attenuated residual portion to the total separated portion for each of the plurality of sources.

20 12. The system of claim 8, wherein the interference attenuation engine is configured not to perform seismic interference attenuation on the respective portion for each of a plurality of sources.

25 13. A non-transitory machine-readable medium storing instructions executable by a processing resource to cause a computing system to:

separate recorded seismic data indicative of a subterranean formation into a portion attributed to a source actuated as part of a marine survey designed to generate the seismic data and a residual portion not attributed to a source actuated as part of the marine survey,

wherein the portion attributed to the source corresponds to one source element or one source unit; and

wherein the residual portion is determined based on the recorded seismic data, a blending operator, and separated data for individual actuations of the one source element or the one source unit;

perform a seismic interference attenuation on the residual portion to identify
5 seismic interference in the residual portion; and

subtract the seismic interference from the recorded seismic data to yield seismic interference attenuated recorded seismic data better indicative of the subterranean formation.

10 14. The medium of claim 13, wherein the residual portion represents at least one of: residual primary energy, residual noise, seismic interference energy, and cross talk.

15 15. The medium of claim 13, wherein the seismic data is recorded from the one source element or the one source unit having dithered actuation.

16. The medium of claim 13, wherein the instructions to separate the recorded seismic data comprise instructions to iteratively minimize a cost function that describes the residual portion.

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17. The medium of claim 13, wherein the instructions to subtract the seismic interference from the recorded seismic data yield seismic interference attenuated recorded seismic data; and

further including instructions to separate the seismic interference attenuated
25 recorded seismic data to yield a separated signal for the source and an updated residual.

18. The medium of claim 17, further including instructions to add the updated residual to the separated signal for the source.

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

obtaining geophysical data;

processing the geophysical data to generate the geophysical data product,

5 wherein processing the geophysical data comprises:

separating, by a machine, recorded seismic data indicative of a subterranean formation into a residual portion and quantity of portions that are coherent in a data domain, each portion attributed to a respective one of a quantity of sources actuated as part of a marine survey designed to generate the seismic data,

10 wherein the quantity of portions is equal in number to the quantity of sources;

performing, by the machine, seismic interference attenuation on the residual portion to remove seismic interference from the residual portion; and

15 subtracting the seismic interference from the recorded seismic data to yield seismic interference attenuated recorded seismic data better indicative of the subterranean formation.

20 20. The method of claim 19, further comprising recording the geophysical data product on a non-transitory machine-readable medium suitable for importing onshore.

21. The method of claim 19, wherein processing the geophysical data comprises processing the geophysical data offshore or onshore.

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22. The method of claim 4, further comprising adding the updated residual portion to each of the quantity of second portions.