

CLAIMS

What is claimed is:

1. A method, comprising:
 - 5 receiving, via a processor, input data based upon received seismic data;
migrating, via the processor, the input data via a pre-stack depth migration
technique to generate migrated input data;
encoding, via the processor, the input data via an encoding function as a
migration attribute to generate encoded input data having a migration function that is
10 non-monotonic versus an attribute related to the input data;
migrating, via the processor, the encoded input data via the pre-stack depth
migration technique to generate migrated encoded input data;
generating, via the processor, an estimated common image gather based upon
the migrated input data and the migrated encoded input data; and
15 generating, via the processor, a seismic image utilizing the estimated common
image gather, wherein the seismic image represents hydrocarbons in a subsurface
region of Earth or subsurface drilling hazards.
2. The method of claim 1, wherein the pre-stack depth migration technique
20 comprises a reverse time migration technique.
3. The method of claim 1, wherein the attribute related to the input data is an
offset as a distance between a source and a receiver utilized to generate the input data.

4. The method of claim 3, wherein the encoding function is dependent on time and varies with the offset.
5. The method of claim 3, wherein the encoding function is dependent on time.
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6. The method of claim 1, comprising:
- receiving, via the processor, second input data based upon second received seismic data;
- migrating, via the processor, the second input data via the pre-stack depth
- 10 migration technique to generate second migrated input data;
- encoding, via the processor, the second input data via a second encoding function as a second migration attribute to generate second encoded input data having a second migration function that is non-monotonic versus a second attribute related to the second input data;
- 15 migrating, via the processor, the second encoded input data via the pre-stack depth migration technique to generate second migrated encoded input data; and
- generating, via the processor, a second estimated common image gather based upon the second migrated input data and the second migrated encoded input data.
- 20 7. The method of claim 6, comprising generating the seismic image utilizing the second estimated common image gather in conjunction with the estimated common image gather.
8. The method of claim 6, comprising determining, via the processor, whether
- 25 the second input data is above a threshold relative to the input data.

9. The method of claim 8, comprising encoding, via the processor, the second input data via the second encoding function only when the processor determines that the second input data is above the threshold relative to the input data.
- 5 10. A tangible, non-transitory, machine-readable media, comprising instructions configured to cause a processor to:
- migrate input data via a pre-stack depth migration technique to generate migrated input data;
- encode the input data via an encoding function as a migration attribute to
- 10 generate encoded input data having a migration function that is non-monotonic versus an attribute related to the input data;
- migrate the encoded input data via the pre-stack depth migration technique to generate migrated encoded input data; and
- generate an estimated common image gather based upon the migrated input
- 15 data and the migrated encoded input data; and
- generate a seismic image utilizing the estimated common image gather,
- wherein the seismic image represents hydrocarbons in a subsurface region of Earth or subsurface drilling hazards.
- 20 11. The tangible, non-transitory, machine-readable media of claim 10, comprising instructions configured to cause the processor to utilize a reverse time migration technique as the pre-stack depth migration technique.

12. The tangible, non-transitory, machine-readable media of claim 10, wherein the attribute related to the input data is an offset as a distance between a source and a receiver utilized to generate the input data.

5 13. The tangible, non-transitory, machine-readable media of claim 12, wherein the encoding function is dependent on time and varies with the offset.

14. The tangible, non-transitory, machine-readable media of claim 12, wherein the encoding function is dependent on time.

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15. The tangible, non-transitory, machine-readable media of claim 10, comprising instructions configured to cause the processor to:

migrate second input data via the pre-stack depth migration technique to generate second migrated input data;

15 encode the second input data via a second encoding function as a second migration attribute to generate second encoded input data having a second migration function that is non-monotonic versus a second attribute related to the second input data;

20 migrate the second encoded input data via the pre-stack depth migration technique to generate second migrated encoded input data; and

generate a second estimated common image gather based upon the second migrated input data and the second migrated encoded input data.

16. The tangible, non-transitory, machine-readable media of claim 15, comprising
25 instructions configured to cause the processor to generate the seismic image utilizing

the second estimated common image gather in conjunction with the estimated common image gather.

17. The tangible, non-transitory, machine-readable media of claim 15, comprising
5 instructions configured to cause the processor to determine whether the second input data is above a threshold relative to the input data.

18. The tangible, non-transitory, machine-readable media of claim 17, comprising
instructions configured to cause the processor to encode the second input data via the
10 second encoding function only when the processor determines that the second input data is above the threshold relative to the input data.

19. A device, comprising:
a processor configured to:
15 migrate input data via a pre-stack depth migration technique to generate migrated input data;
encode the input data via an encoding function as a migration attribute to generate encoded input data having a migration function that is non-monotonic versus an attribute related to the input data;
20 migrate the encoded input data via the pre-stack depth migration technique to generate migrated encoded input data; and
generate an estimated common image gather based upon the migrated input data and the migrated encoded input data; and

generate a seismic image utilizing the estimated common image gather,
wherein the seismic image represents hydrocarbons in a subsurface region of
Earth or subsurface drilling hazards.

- 5 20. The device of claim 19, wherein the processor is configured to:
- migrate second input data via the pre-stack depth migration technique to
 generate second migrated input data;
- encode the second input data via a second encoding function as a second
 migration attribute to generate second encoded input data having a second migration
10 function that is non-monotonic versus a second attribute related to the second input
 data;
- migrate the second encoded input data via the pre-stack depth migration
 technique to generate second migrated encoded input data;
- generate a second estimated common image gather based upon the second
15 migrated input data and the second migrated encoded input data; and
- generate the seismic image utilizing the second estimated common image
 gather in conjunction with the estimated common image gather.