The seismic data recorded by the receivers may then be used to create an image or profile of the corresponding subsurface region.

[0005] Over time, as hydrocarbons are being extracted from the subsurface region of the Earth, the location, saturation, and other characteristics of the hydrocarbon reservoir and (e.g., overburden) within the subsurface region may change. As such, it may be useful to determine how the image or map of the subsurface region changes over time, such that the operations related to extracting the hydrocarbons may be modified to more efficiently extract the hydrocarbons from the subsurface region of the Earth.

SUMMARY

[0006] A summary of certain embodiments disclosed herein is set forth below. It may be understood that these aspects are presented merely to provide the reader with a brief summary of these certain embodiments and that these aspects are not intended to limit the scope of this disclosure. Indeed, this disclosure may encompass a variety of aspects that may not be set forth below.

[0006a] According to a first aspect of the present disclosure, there is provided a method, including: 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 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 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.

[0006b] According to a second of the present disclosure, there is provided a tangible, non-transitory, machine-readable media, including 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 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 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.

[0006c] According to a third aspect of the present disclosure, there is provided a device, including: a processor configured 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 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 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.

[0007] Seismic imaging generally includes generation of a seismic image from seismic data (e.g., seismic waves transmitted from a source, through the ground, and received and recorded at a receiver). Seismic data may be recorded for a seismic survey of a particular geological region and may include individual seismic traces (e.g., a time series for each signal received by the receiver). The traces may be transformed to generate a seismic image of the subsurface, resulting from stacking or integrating the seismic data. One step in the transformation is migration of the data, which includes rearrangement of the data with respect to a model (e.g., a map of propagation velocity of the seismic waves) to convert the data to features in