the subsurface region of the Earth. 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 (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

[0005a] According to a first aspect of the present disclosure, there is provided a method, including: receiving seismic data inclusive of data that corresponds to reflections from a target below a distorting velocity feature in a subsurface, wherein the presence of the distorting velocity feature results in distortion to a seismic image; adding a velocity perturbation to a current velocity model that represents a portion of the subsurface responsible for the distortion to the seismic image, in order to generate a perturbed velocity model; generating an image via seismic migration of the seismic data and the perturbed velocity model; generating and assigning a measure of quality to the image; determining whether the measure of quality assigned to the image is an optimal measure of quality at a particular location of the current velocity model that corresponds to the portion of the subsurface responsible for the distortion to the seismic image; and updating the current velocity model utilized to generate the seismic image to generate a revised velocity model utilizing the measure of quality assigned to the image when the measure of quality assigned to the image is determined to be the optimal measure of quality at the particular location of the current velocity model that corresponds to the portion of the subsurface responsible for the distortion to the seismic image.

[0005b] According to a second aspect of the present disclosure, there is provided a tangible, non-transitory, machine-readable media, including instructions that when executed cause a processor to: receive seismic data inclusive of data that corresponds to reflections from a target below a distorting velocity feature in a subsurface, wherein the presence of the distorting velocity feature results in distortion to a seismic image; add a velocity perturbation to a current velocity model that represents a portion of the subsurface responsible for the distortion to the seismic image, in order to generate a perturbed velocity model; generate an image via seismic migration of the seismic data and the perturbed velocity model; generate and assign a measure of quality to the image; determine whether the measure of quality assigned to the image is an optimal measure of quality at a particular location of the current velocity model that corresponds to the portion of the subsurface responsible for the distortion

to the seismic image; and update the current velocity model utilized to generate the seismic image to generate a revised velocity model utilizing the measure of quality assigned to the image when the measure of quality assigned to the image is determined to be the optimal measure of quality at the particular location of the current velocity model that corresponds to the portion of the subsurface responsible for the distortion to the seismic image.

[0005c] According to a third aspect of the present disclosure, there is provided a device, including: a processor that when in operation: receives seismic data inclusive of data that corresponds to reflections from a target below a distorting velocity feature in a subsurface, wherein the presence of the distorting velocity feature results in distortion to a seismic image; adds a velocity perturbation to a current velocity model that represents a portion of the subsurface responsible for the distortion to the seismic image, in order to generate a perturbed velocity model; generates an image via seismic migration of the seismic data and the perturbed velocity model; generates and assign a measure of quality to the image; determines whether the measure of quality assigned to the image is an optimal measure of quality at a particular location of the current velocity model that corresponds to the portion of the subsurface responsible for the distortion to the seismic image; and updates the current velocity model utilized to generate the seismic image to generate a revised velocity model utilizing the measure of quality assigned to the image when the measure of quality assigned to the image is determined to be the optimal measure of quality at the particular location of the current velocity model that corresponds to the portion of the subsurface responsible for the distortion to the seismic image.

[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. The construction of a seismic image depends on a model of the speed of seismic wave propagation in the subsurface (e.g., a velocity model). A velocity model can be a representation of the subsurface geological formation that can be used in the analysis of seismic data. One technique (or family of techniques) to model the speed of a seismic wave, referred to as “tomography,” relies on analyzing migrated images that are generated with an initial estimate of the model and subsequent updating of the model. The updating of the model can be based on tomographic back-projection of measures of an error of a kinematic consistency of a seismic image, usually reflected by depth or time differences of pre-stack migrated images partitioned as a function of offset or angle. Utilizing received data (i.e., time series recorded data or traces) having variable surface offsets (i.e., the distance between the transmitting sources and the receivers) when generating a seismic image, the seismic data