

Seismic Data Processing Including Compensating for Source and Receiver Ghost Effects in Reverse Time Migration

RELATED APPLICATION

[0001] The present application is related to, and claims priority from U.S. Provisional Patent Application No. 61/635,379, filed April 19, 2012, entitled "Compensating for Source and Receiver Ghost Effects in Reverse Time Migration," to Yu Zhang, Graham Roberts and Lian Duan, ~~the disclosure of which is incorporated herein by reference.~~

TECHNICAL FIELD

[0002] Embodiments of the subject matter disclosed herein generally relate to methods and systems for seismic data processing and, more particularly, to mechanisms and techniques for enhancing Reverse Time Migration by compensating for source and receiver ghost effects.

BACKGROUND

[0003] For marine seismic data, the source and receiver ghosts generated by the free surface cause angle dependent frequency and amplitude distortion. For improved interpretation and inversion, these unwanted effects are best corrected in a pre-stack depth image.

[0004] Interpreting subtle geologic features in a marine environment requires the associated seismic data to contain both low and high frequencies necessary for high resolution imaging. In general, high-fidelity, low frequency data provides greater penetration of the underlying strata and an associated better illumination of

SUMMARY

[0009] According to an aspect of the present invention~~exemplary embodiment~~, a method, stored in a memory and executing on a processor, for compensating for ghosts in a computed seismic image based on a reverse time migration (RTM) of a seismic dataset associated with one or more seismic sources and one or more seismic receivers comprises modifying a first boundary condition of a first RTM acoustic wave equation associated with a source wavefield; modifying a second boundary condition of a second RTM acoustic wave equation associated with a recorded wavefield; solving the first RTM acoustic wave equation and the second RTM acoustic wave equation and generating a ghost compensated computed seismic image; and outputting the ghost compensated computed seismic image.

[0010] According to another aspect of the present invention, a node for compensating for ghosts in seismic image data based on a Reverse Time Migration (RTM) comprises a seismic dataset; one or more processors configured to execute computer instructions and a memory configured to store said computer instructions wherein said computer instructions further comprising a boundary condition component for modifying boundary conditions associated with RTM acoustic wave equations; an engine component for solving the RTM acoustic wave equations configured with modified boundary conditions and generating a ghost compensated ~~modeled~~computed seismic image; and an output component for outputting the ghost compensated ~~modeled~~computed seismic image.

WHAT IS CLAIMED IS:

1. A method, stored in a memory and executing on a processor, for compensating for ghosts in a computed seismic image based on a reverse time migration (RTM) of seismic data associated with one or more seismic sources and one or more seismic receivers, said method comprising:

modifying a first boundary condition of a first RTM acoustic wave equation associated with a source wavefield;

modifying a second boundary condition of a second RTM acoustic wave equation associated with a recorded wavefield;

solving said first RTM acoustic wave equation and said second RTM acoustic wave equation and generating a ghost compensated computed seismic image; and

outputting said ghost compensated computed seismic image.

2. The method of claim 1, wherein input data used in the method in a shot domain.

3. The method of claim 1, wherein input data used in the method in a receiver domain

4. The method of claim 1, wherein said first RTM acoustic wave equation is associated with said one or more seismic sources.

5. The method of claim 4, wherein a modified first boundary condition is