

WHAT IS CLAIMED IS:

1. A method for deghosting seismic data related to a subsurface of a body of water, the method comprising:

inputting ~~(1100)~~ data recorded by detectors that are towed by a vessel, the data being associated with waves travelling from the subsurface to the detectors;

applying ~~(1102)~~ a migration procedure to the data to determine a first image (d1) of the subsurface;

applying ~~(1104)~~ a mirror migration procedure to the data to determine a second image (d2) of the subsurface;

joint ~~(1106)~~ deconvoluting the first image (d1) and the second image (d2) for deghosting a reflectivity of the subsurface; and

generating ~~(1108)~~ in a processor a final image (d) of the subsurface based on the deghosted reflectivity of the joint deconvoluting step.

2. The method of Claim 1, wherein the deghosting is performed during an imaging phase and not in a preprocessing phase.

3. The method of Claim 1, wherein no datuming step is performed on the data.

4. The method of Claim 1, wherein a travelling angle of the waves propagating from the subsurface to the detectors or from a surface of the water to the detectors is not restricted.

16. The method of Claim 15, wherein a result of the migration procedure is $d_1(x, y, z)$ and a result of the mirror migration procedure is $d_2(x, y, z)$ for hydrophone type receivers and a result of the migration procedure is $d_3(x, y, z)$ and a result of the mirror migration procedure is $d_4(x, y, z)$ for geophones.

17. The method of Claim 16, further comprising:

generating the final image using a joint deconvolution of $d_1(x, y, z)$, $d_2(x, y, z)$, $d_3(x, y, z)$, and $d_4(x, y, z)$ and based on the following equations:

$$d_1(x, y, z) = g_{\min}^h(z) * r(x, y, z);$$

$$d_2(x, y, z) = g_{\max}^h(z) * r(x, y, z);$$

$$d_3(x, y, z) = g_{\min}^g(z) * c(z) * r(x, y, z); \text{ and}$$

$$d_4(x, y, z) = g_{\max}^g(z) * c(z) * r(x, y, z),$$

where $g_{\min}^h$ and $g_{\max}^h$ are minimum phase transfer functions, $g_{\min}^g(z)$ and $g_{\max}^g(z)$ are maximum phase transfer functions, z is a depth of a point relative to the surface of the water, x and y are coordinates of the point in a plane substantially parallel with the surface of the water, and $c(z)$ is a calibration operator.

18. A processing device ~~(1000)~~ for deghosting seismic data related to a subsurface of a body of water, the processing device ~~(1000)~~ comprising:

an interface ~~(1010)~~ configured to receive data recorded by detectors that are towed by a vessel, the data being associated with waves travelling from the subsurface to the detectors; and

a processor ~~(1002)~~ connected to the interface ~~(1010)~~ and configured to,