

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
2 February 2012 (02.02.2012)

(10) International Publication Number
WO 2012/013665 A1

PCT

(51) International Patent Classification:
G01V 1/00 (2006.01)

(21) International Application Number:
PCT/EP2011/062815

(22) International Filing Date:
26 July 2011 (26.07.2011)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
61/368,456 28 July 2010 (28.07.2010) US

(71) Applicant (for all designated States except US): **CG-GVERITAS SERVICES SA** [FR/FR]; 1, rue Léon Migaux, F-91300 Massy (FR).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SOUBARAS, Robert** [FR/FR]; c/o CGGVeritas Services SA, 1 rue Leon Migaux, F-91300 Massy (FR). **ZHANG, Yu** [CN/US]; 10300 Town Park Drive, Houston, Texas 77072 (US).

(74) Agent: **CALLON DE LAMARCK, Jean-Robert**; Cabinet Regimbeau, 20, rue de Chazelles, F-75847 Paris Cedex 17 (FR).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

— of inventorship (Rule 4.17(iv))

Published:

— with international search report (Art. 21(3))

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(54) Title: 3-D HARMONIC-SOURCE REVERSE TIME MIGRATION SYSTEMS AND METHODS FOR SEISMIC DATA ANALYSIS

(57) Abstract: Computing device and method for processing seismic traces to produce an image of a subsurface area. The method includes receiving a series of seismic traces related to the subsurface area and recorded by one or more seismic receivers, wherein the one or more seismic sources are originally generated by a source; applying a phase encoding function to the series of seismic traces, at least a portion of said seismic traces comprise signals reflected by geological interfaces of the subsurface area; applying a 3 dimensional (3D) harmonic-source reverse time migration of the series of seismic traces encoded with the phase encoding function; computing a forward wavefield by solving a first wave equation; computing a backward wavefield by solving a second wave equation; and cross-correlating the forward wavefield with the backward wavefield to generate an image of the subsurface.



WO 2012/013665 A1