Abulwafa, EM DEC 2012

Time-fractional study of electron acoustic solitary waves in plasma of cold electron and two isothermal ions

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Source: JOURNAL OF PLASMA PHYSICS Volume: 78 Pages: 641-649 DOI: 10.1017/S0022377812000530 Part: Part 6 Published: DEC 2012
Times Cited: **0** (from Web of Science)

Abstract:
In this paper, a homogeneous system of unmagnetized collisionless plasma consisting of a cold electron fluid, low-temperature ion obeying Boltzmann-type distribution and high-temperature ion obeying non-thermal distribution is considered. The perturbation method with two different forms of stretching will be considered to drive the KdV and modified KdV (mKdV) equations. The Agrawal's method is applied to formulate the time-fractional KdV and mKdV equations. A variational iteration method is used to solve these equations. The results show that the fractional order of the differential equations can be used to modify the shape of the solitary pulse instead of adding higher order dissipation terms to the equations. This study may be useful to construct the compressive and rarefactive electrostatic potential pulses associated with the broadband electrostatic noise type emissions.
Accession Number: WOS:000311401600009
Document Type: Article
Language: English
KeyWords Plus: VARIATIONAL-PRINCIPLES; EARTHS MAGNETOTAIL; SHEET BOUNDARY; DERIVATIVES; EQUATIONS; AMPLITUDE; CALCULUS; SOLITONS; REGION
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Publisher: CAMBRIDGE UNIV PRESS, 32 AVENUE OF THE AMERICAS, NEW YORK, NY 10013-2473 USA
Web of Science Categories: Physics, Fluids & Plasmas
Research Areas: Physics
IDS Number: 041KV
ISSN: 0022-3778

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Abulwafa, EM JUN 2012

Ion-acoustic waves in unmagnetized collisionless weakly relativistic plasma of warm-ion and isothermal-electron using time-fractional KdV equation

Author(s): El-Wakil, SA (El-Wakil, Sayed A.)[1]; Abulwafa, EM (Abulwafa, Essam M.)[1]; El-Shewy, EK (El-Shewy, Emad K.)[1]; Mahmoud, AA (Mahmoud, Abeer A.)[1]

Source: ADVANCES IN SPACE RESEARCH Volume: 49 Issue: 12 Pages: 1721-1727 DOI: 10.1016/j.asr.2012.02.018 Published: JUN 15 2012

Abstract:

Collisionless unmagnetized plasma consisting of a mixture of warm ion-fluid and isothermal-electron is considered, assuming that the ion flow velocity has a weak relativistic effect. The reductive perturbation method has been employed to derive the Korteweg-de Vries (KdV) equation for small - but finite-amplitude electrostatic ion-acoustic waves in this plasma. The semi-inverse method and Agrawal's method lead to the Euler-Lagrange equation that leads to the time fractional KdV equation. The variational-iteration method given by He is used to solve the derived time fractional KdV equation. The calculations show that the fractional order may play the same rule of higher order dissipation in KdV equation to modulate the soliton wave amplitude in the plasma system. The results of the present investigation may be applicable to some plasma environments, such as space-plasmas, laser-plasma interaction, plasma sheet boundary layer of the earth's magnetosphere, solar atmosphere and interplanetary space. (C) 2012 COSPA R. Published by Elsevier Ltd. All rights reserved.

Accession Number: WOS:000304787900009

Document Type: Article

Language: English

Author Keywords: Ion-acoustic waves; Riemann-Liouville fractional derivative; Fractional KdV equation; He's variational-iteration method

KeyWords Plus: VARIATIONAL-ITERATION METHOD; HIGHER-ORDER NONLINEARITY; SOLITARY WAVES; DIFFERENTIAL-EQUATIONS; PROPAGATION; DERIVATIVES; PRINCIPLES; AMPLITUDE

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Publisher: ELSEVIER SCI LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

Web of Science Categories: Astronomy & Astrophysics; Geosciences, Multidisciplinary; Meteorology & Atmospheric Sciences

Research Areas: Astronomy & Astrophysics; Geology; Meteorology & Atmospheric Sciences

IDS Number: 952JD

ISSN: 0273-1177

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Author(s): ELLABANY, SK
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Author(s): ElLabany, SK; Nafie, HO; ElSheikh, A
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Author(s): Podlubny, I.
Source: <IT>Fractional Differential Equations</IT> Published: 1999
Publisher: Academic Press, New York

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Author(s): Sabatier, J.; Agrawal, O. P.; Tenreiro Machado, J. A.
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Author(s): Sanchez, R.; Carreras, B. A.; Newman, D. E.; et al.
Source: PHYSICAL REVIEW E Volume: 74 Issue: 1 Article Number: 016305 DOI: 10.1103/PhysRevE.74.016305 Part: Part 2 Published: JUL 2006

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Author(s): Vette, J.I.
Book Editor(s): McCormac, B.M.
Conference: Particles and fields in the magnetosphere Location: Santa Barbara, CA, USADate: 4-15 Aug. 1969 Sponsor(s): Army Research Office; Defence Atomic Support Agency; Lockheed Palo Alto Research Laboratory; Office of Naval Research; University of California, Berkeley, Space Science Laboratory; University of California, San Diego, Department of Applied Electrophysics
Source: Particles and fields in the magnetosphere Pages: 305-18 Abstract Number: A1970-059623 Published: 1970

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Author(s): WASHIMI, H; TANIUTI, T
Source: PHYSICAL REVIEW LETTERS Volume: 17 Issue: 19 Pages: 996-& DOI: 10.1103/PhysRevLett.17.996 Abstract Number: A1967-04244 Published: 1966

El-Wakil, SA SEP 2011

Time-fractional KdV equation for plasma of two different temperature electrons and stationary ion

Author(s): El-Wakil, SA (El-Wakil, S. A.)[1]; Abulwafa, EM (Abulwafa, Essam M.)[1]; El-Shewy, EK (El-Shewy, E. K.)[1]; Mahmoud, AA (Mahmoud, Abeer A.)[1]

Source: PHYSICS OF PLASMAS Volume: 18 Issue: 9 Article Number: 092116 DOI: 10.1063/1.3640533 Published: SEP 2011

Abstract:

Using the time-fractional KdV equation, the nonlinear properties of small but finite amplitude electron-acoustic solitary waves are studied in a homogeneous system of unmagnetized collisionless plasma. This plasma consists of cold electrons fluid, non-thermal hot electrons, and stationary ions. Employing the reductive perturbation technique and the Euler-Lagrange equation, the time-fractional KdV equation is derived and it is solved using variational method. It is found that the time-fractional parameter significantly changes the soliton amplitude of the electron-acoustic solitary waves. The results are compared with the structures of the broadband electrostatic noise observed in the dayside auroral zone. (C) 2011 American Institute of Physics. [doi:10.1063/1.3640533]

Accession Number: WOS:000295621300016

Document Type: Article

Language: English

KeyWords Plus: ACOUSTIC SOLITARY WAVES; BAND ELECTROSTATIC NOISE; DOUBLE-LAYERS; VARIATIONAL-PRINCIPLES; PROPAGATION; GENERATION; AMPLITUDE; SOLITONS

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Publisher: AMER INST PHYSICS, CIRCULATION & FULFILLMENT DIV, 2 HUNTINGTON QUADRANGLE, STE 1 N O 1, MELVILLE, NY 11747-4501 USA

Web of Science Categories: Physics, Fluids & Plasmas

Research Areas: Physics

IDS Number: 829XY

ISSN: 1070-664X

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Author(s): Agrawal, OP
Source: JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS Volume: 272 Issue: 1 Pages: 368-379 Article Number: PII S0022-247X(02)00180-4 DOI: 10.1016/S0022-247X(02)00180-4 Abstract Number: A2003-01-0230-015 Published: AUG 1 2002

2. Title: Fractional variational calculus in terms of Riesz fractional derivatives Author(s): Agrawal, O. P.
Source: JOURNAL OF PHYSICS A-MATHEMATICAL AND THEORETICAL Volume: 40 Issue: 24 Pages: 6287-6303 DOI: 10.1088/1751-8113/40/24/003 Published: JUN 15 2007

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Editor(s): Baleanu, D.; Guvenc, Z. B.; Tenreiro Machado, J. A.

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Publisher: Springer

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Author(s): Baleanu, Dumitru; Machado, J. A. Tenreiro
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Author(s): BOSTROM, R; GUSTAFSSON, G; HOLBACK, B; et al.
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Author(s): Bounds, SR; Pfaff, RF; Knowlton, SF; et al.
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Author(s): CAIRNS, RA; MAMUM, AA; BINGHAM, R; et al.
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Author(s): del-Castillo-Negrete, D; Carreras, BA; Lynch, VE
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Author(s): DUBOULOZ, N; POTTELETTE, R; MALINGRE, M; et al.
Source: GEOPHYSICAL RESEARCH LETTERS Volume: 18 Issue: 2 Pages: 155-158 DOI: 10.1029/90GL02677 Abstract Number: A1991-105373 Published: FEB 1991

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Author(s): DUBOULOZ, N; TREUMANN, RA; POTTELETTE, R; et al.
Source: JOURNAL OF GEOPHYSICAL RESEARCH-SPACE PHYSICS Volume: 98 Issue: A10 Pages: 17415-17422 DOI: 10.1029/93JA01611 Abstract Number: A1994-01-9420-023 Published: OCT 1 1993

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Author(s): DUBOULOZ, N; POTTELETTE, R; MALINGRE, M; et al.
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Author(s): El-Shewy, E. K.
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Author(s): El-Shewy, EK
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Author(s): El-Wakil, S. A.; Abulwafa, E. M.; Zahran, M. A.; et al.

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Author(s): Ergun, RE; Carlson, CW; McFadden, JP; et al.

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Author(s): Gustafson, K.; del-Castillo-Negrete, D.; Dorland, W.
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Author(s): He, JH
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Author(s): He, J.H.
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Author(s): HENRY, D; TREGUIER, JP
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Author(s): Mamun, AA; Shukla, PK
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Author(s): Momani, Shaher; Odibat, Zaid; Alawneh, Ahmed
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Author(s): Pottelette, R; Ergun, RE; Treumann, RA; et al.

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Author(s): Sabatier, J.; Agrawal, O. P.; Tenreiro Machado, J. A.
Source: ADV FRACTIONAL CALCU Published: 2007
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Author(s): Sahu, Biswajit
Source: PHYSICS OF PLASMAS Volume: 17 Issue: 12 Article Number: 122305 DOI: 10.1063/1.3527988 Published: DEC 2010

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Author(s): Sahu, B; Roychoudhury, R
Source: PHYSICS OF PLASMAS Volume: 11 Issue: 5 Pages: 1947-1954 DOI: 10.1063/1.1695558 Abstract Number: A2004-12-5235-035 Published: MAY 2004

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Author(s): SAMKO SG
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Author(s): Sanchez, R.; Carreras, B. A.; Newman, D. E.; et al.
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Author(s): Singh, SV; Reddy, RV; Lakhina, GS
Book Editor(s): Malingre, M
Conference: D3 2 Symposium of COSPAR Scientific Commission D held at the 33rd COSPAR Scientific Assembly Location: WARSAW, POLANDDate: JUL, 2000
Sponsor(s): Amer Geophys Union; Ctr Natl Etud Spatiales; Int Union Radio Sci; Int Union Geodesy & Geophys; Int Assoc Geomagnet Aeronom; Comm Space Res
Source: ADVANCES IN AURORAL PHYSICS Book Series: ADVANCES IN SPACE RESEARCH Volume: 28 Issue: 11 Pages: 1643-1648 DOI: 10.1016/S0273-1177(01)00479-3 Published: 2001

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Author(s): Singh, SV; Lakhina, GS
Conference: 5th International Workshops on Nonlinear Waves and Chaos in Space Plasmas Location: Mumbai, INDIADate: MAR 02-07, 2003
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Author(s): Singh, SV; Lakhina, GS
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Author(s): TEMERIN, M; CERNY, K; LOTKO, W; et al.
Source: PHYSICAL REVIEW LETTERS Volume: 48 Issue: 17 Pages: 1175-1179 DOI: 10.1103/PhysRevLett.48.1175 Abstract Number: A1982-071191 Published: 1982

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Author(s): Tribeche, Mouloud; Djebarni, Lyes
Source: PHYSICS OF PLASMAS Volume: 17 Issue: 12 Article Number: 124502 DOI: 10.1063/1.3522777 Published: DEC 2010

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Author(s): WASHIMI, H; TANIUTI, T
Source: PHYSICAL REVIEW LETTERS Volume: 17 Issue: 19 Pages: 996-& DOI: 10.1103/PhysRevLett.17.996 Abstract Number: A1967-04244 Published: 1966

El-Wakil,SA JUL 2011

Time-fractional KdV equation: formulation and solution using variational methods

Author(s): El-Wakil, SA (El-Wakil, S. A.)[1]; Abulwafa, EM (Abulwafa, E. M.)[1]; Zahran, MA (Zahran, M. A.)[1]; Mahmoud, AA (Mahmoud, A. A.)[1]

Source: NONLINEAR DYNAMICS Volume: 65 Issue: 1-2 Pages: 55-63 DOI: 10.1007/s11071-010-9873-5
Published: JUL 2011

Abstract:
In this work, the semi-inverse method has been used to derive the Lagrangian of the Korteweg-de Vries (KdV) equation. Then the time operator of the Lagrangian of the KdV equation has been transformed into fractional domain in terms of the left-Riemann-Liouville fractional differential operator. The variational of the functional of this Lagrangian leads neatly to Euler-Lagrange equation. Via Agrawal's method, one can easily derive the time-fractional KdV equation from this Euler-Lagrange equation. Remarkably, the time-fractional term in the resulting KdV equation is obtained in Riesz fractional derivative in a direct manner. As a second step, the derived time-fractional KdV equation is solved using He's variational-iteration method. The calculations are carried out using initial condition depends on the nonlinear and dispersion coefficients of the KdV equation. We remark that more pronounced effects and deeper insight into the formation and properties of the resulting solitary wave by additionally considering the fractional order derivative beside the nonlinearity and dispersion terms.

Accession Number: WOS:000291923500004

Document Type: Article

Language: English

Author Keywords: Riemann-Liouville fractional differential operator; Euler-Lagrange equation; Riesz fractional derivative; Fractional KdV equation; He's variational-iteration method; Solitary wave

KeyWords Plus: DIFFERENTIAL-EQUATIONS; CLASSICAL FIELDS; DERIVATIVES; CALCULUS; PRINCIPLES; MECHANICS; EXISTENCE; MEDIA; ORDER

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Publisher: SPRINGER, VAN GODEWIJCKSTRAAT 30, 3311 GZ DORDRECHT, NETHERLANDS

Web of Science Categories: Engineering, Mechanical; Mechanics

Research Areas: Engineering; Mechanics

IDS Number: 781IG

ISSN: 0924-090X

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Author(s): Agrawal, OP
Source: JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS Volume: 272 Issue: 1 Pages: 368-379 Article Number: PII S0022-247X(02)00180-4 DOI: 10.1016/S0022-247X(02)00180-4 Abstract Number: A2003-01-0230-015 Published: AUG 1 2002

2. Title: Fractional variational calculus and the transversality conditions
Author(s): Agrawal, O. P.
Source: JOURNAL OF PHYSICS A-MATHEMATICAL AND GENERAL Volume: 39 Issue: 33 Pages: 10375-10384 DOI: 10.1088/0305-4470/39/33/008 Published: AUG 18 2006

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4. Title: [not available]
Author(s): AGRAWAL OP
Source: NONLINEAR DYN Volume: 38 Published: 2004

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Author(s): Agrawal, OP
Source: NONLINEAR DYNAMICS Volume: 38 Issue: 1-4 Pages: 323-337 DOI: 10.1007/s11071-004-3764-6 Abstract Number: A2005-14-0230-031; C2005-07-1330-062 Published: DEC 2004

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Author(s): Attari, Mina; Haeri, Mohammad; Tavazoei, Mohammad Saleh
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Author(s): Babakhani, A; Daftardar-Gejji, V
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Author(s): Baleanu, Dumitru; Trujillo, Juan I.
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Author(s): Baleanu, D; Avkar, T
Source: NUOVO CIMENTO DELLA SOCIETA ITALIANA DI FISICA B-GENERAL PHYSICS RELATIVITY ASTRONOMY AND MATHEMATICAL PHYSICS AND METHODS Volume: 119 Issue: 1 Pages: 73-79 DOI: 10.1393/ncb/i2003-10062-y Abstract Number: A2005-06-0230-018 Published: JAN 2004

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Author(s): BALEANU D
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Author(s): Baleanu, D; Muslih, SI
Source: PHYSICA SCRIPTA Volume: 72 Issue: 2-3 Pages: 119-121 DOI: 10.1238/Physica.Regular.072a00119 Published: AUG-SEP 2005

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Author(s): Baleanu, Dumitru
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Author(s): Bateman, H
Source: PHYSICAL REVIEW Volume: 38 Issue: 4 Pages: 815-819 DOI: 10.1103/PhysRev.38.815
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Author(s): DELBOSCO D
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Author(s): Frederico, Gastao S. F.; Torres, Delfim F. M.
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Author(s): Fung, MK
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Author(s): He, JH
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Author(s): He, J.H.

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Author(s): He, JH
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Author(s): He, JH
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Author(s): He, JH
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Author(s): Herzallah, Mohamed A. E.; Baleanu, Dumitru
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Author(s): Heymans, N
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Author(s): Inokuti, M.; Sekine, H.; Mura, T.
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Author(s): Korteweg, DJ; de Vries, G.
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Author(s): LUCHKO, YF; SRIVASTAVA, HM
Source: COMPUTERS & MATHEMATICS WITH APPLICATIONS Volume: 29 Issue: 8 Pages: 73-85 DOI: 10.1016/0898-1221(95)00031-S Published: APR 1995

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Author(s): Tenreiro Machado, J. A.
Source: NONLINEAR DYNAMICS Volume: 57 Issue: 1-2 Pages: 253-260 DOI: 10.1007/s11071-008-9436-1 Published: JUL 2009

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Author(s): Vilela Mendes, R.
Source: NONLINEAR DYNAMICS Volume: 55 Issue: 4 Pages: 395-399 DOI: 10.1007/s11071-008-9372-0 Published: MAR 2009

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Author(s): Molliq, RY; Molliq, MSM; Noorani, MSM; et al.
Source: Nonlinear Anal RWA Volume: 10 Pages: 1854-69 Published: 2009

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Author(s): MOMANI S
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Author(s): Muslih, SI; Baleanu, D; Rabei, E
Source: PHYSICA SCRIPTA Volume: 73 Issue: 5 Pages: 436-438 DOI: 10.1088/0031-8949/73/5/003 Published: MAY 2006

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Author(s): Rabei, Eqab M.; Altarazi, Ibrahim M. A.; Muslih, Sami I.; et al.
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Author(s): Ray, SS; Bera, RK
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Author(s): Riewe, F
Source: PHYSICAL REVIEW E Volume: 53 Issue: 2 Pages: 1890-1899 DOI: 10.1103/PhysRevE.53.1890 Abstract Number: A1996-09-0320-006 Published: FEB 1996

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Author(s): Riewe, F
Source: PHYSICAL REVIEW E Volume: 55 Issue: 3 Pages: 3581-3592 DOI: 10.1103/PhysRevE.55.3581 Part: Part b Abstract Number: A1997-12-0320-004 Published: MAR 1997

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Author(s): Sabatier, J.; Agrawal, O. P.; Tenreiro Machado, J. A.

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Publisher: Springer, New York, NY, USA

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40.Title: Nonholonomic constraints with fractional derivatives
Author(s): Tarasov, Vasily E.; Zaslavsky, George M.
Source: JOURNAL OF PHYSICS A-MATHEMATICAL AND GENERAL Volume: 39 Issue: 31 Pages: 9797-9815 DOI: 10.1088/0305-4470/39/31/010 Published: AUG 4 2006

41.Title: Fractional Ginzburg-Landau equation for fractal media
Author(s): Tarasov, VE; Zaslavsky, GM
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Author(s): Tavazoei, Mohammad Saleh; Haeri, Mohammad
Source: NONLINEAR DYNAMICS Volume: 57 Issue: 3 Pages: 363-373 DOI: 10.1007/s11071-008-9447-y Published: AUG 2009

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Author(s): Zhang, SQ
Source: JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS Volume: 278 Issue: 1 Pages: 136-148 DOI: 10.1016/S0022-247X(02)00583-8 Published: FEB 1 2003

Abulwafa, EM MAY 2011

Time-fractional KdV equation for electron-acoustic waves in plasma of cold electron and two different temperature isothermal ions

Author(s): El-Wakil, SA (El-Wakil, Sayed A.)[1]; Abulwafa, EM (Abulwafa, Essam M.)[1]; El-shewy, EK (El-shewy, Emad K.)[1]; Mahmoud, AA (Mahmoud, Abeer A.)[1]

Source: ASTROPHYSICS AND SPACE SCIENCE Volume: 333 Issue: 1 Pages: 269-276 DOI: 10.1007/s10509-011-0629-6 Published: MAY 2011

Abstract:
The time fractional KdV equation is derived for small but finite amplitude electron-acoustic solitary waves in plasma of cold electron fluid with two different temperature isothermal ions. The effects of the time fractional parameter on the electrostatic solitary structures are presented. It is shown that the effect of time fractional parameter can be used to modify the amplitude of the electrostatic waves (viz. the amplitude, width and electric field) of the electron-acoustic solitary waves. The model may provide a possible explanation for the low-frequency component of the broadband electrostatic noise in the plasma sheet boundary layer of the Earth's magnetotail where the electron beams are not present.

Accession Number: WOS:000289000600032

Document Type: Article

Language: English

Author Keywords: Electron-acoustic waves; Euler-Lagrange equation; Riemann-Liouvulle fractional derivative; Fractional KdV equation; He's variational-iteration method

KeyWords Plus: SOLITARY WAVES; NONTHERMAL ELECTRONS; EARTHS MAGNETOTAIL; DERIVATIVES; MECHANICS; AMPLITUDE; SOLITONS

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Publisher: SPRINGER, VAN GODEWIJCKSTRAAT 30, 3311 GZ DORDRECHT, NETHERLANDS

Web of Science Categories: Astronomy & Astrophysics

Research Areas: Astronomy & Astrophysics

ISSN: 0004-640X

IDS Number: 743EP

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Author(s): Agrawal, OP
Source: JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS Volume: 272 Issue: 1 Pages: 368-379 Article Number: PII S0022-247X(02)00180-4 DOI: 10.1016/S0022-247X(02)00180-4 Abstract Number: A2003-01-0230-015 Published: AUG 1 2002

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Author(s): Baleanu, Dumitru; Golmankhaneh, Alireza K.; Nigmatullin, Raoul; et al.
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Author(s): Elwakil, S. A.; Zahran, M. A.; El-Shewy, E. K.
Source: PHYSICA SCRIPTA Volume: 75 Issue: 6 Pages: 803-808 DOI: 10.1088/0031-8949/75/6/010
Published: JUN 2007

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Author(s): Huang, Feng-hui; Guo, Bo-ling
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Author(s): Kakad, A. P.; Singh, S. V.; Reddy, R. V.; et al.
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Author(s): Omura, Y; Kojima, H; Umeda, T; et al.
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Author(s): Pakzad, Hamid Reza; Tribeche, Mouloud
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Author(s): Sahu, Biswajit
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Author(s): Tagare, SG; Singh, SV; Reddy, RV; et al.
Conference: 5th International Workshops on Nonlinear Waves and Chaos in Space Plasmas Location:
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Author(s): Tan, Baolin
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Author(s): Tarasov, Vasily E.; Zaslavsky, George M.
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Author(s): Tarasov, VE; Zaslavsky, GM
Source: PHYSICA A-STATISTICAL MECHANICS AND ITS APPLICATIONS Volume: 354 Pages: 249-261
DOI: 10.1016/j.physa.2005.02.047 Published: AUG 15 2005

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Author(s): WASHIMI, H; TANIUTI, T
Source: PHYSICAL REVIEW LETTERS Volume: 17 Issue: 19 Pages: 996-& DOI:
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Author(s): Wu, G.C.; He, J.H.
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Author(s): Younsi, Smain; Tribeche, Mouloud
Source: ASTROPHYSICS AND SPACE SCIENCE Volume: 330 Issue: 2 Pages: 295-300 DOI:
10.1007/s10509-010-0404-0 Published: DEC 2010

Abulwafa, EM APR 2011

Ion-acoustic waves in plasma of warm ions and isothermal electrons using time-fractional KdV equation

Author(s): El-Wakil, SA (El-Wakil, Sayed A.)[1]; Abulwafa, EM (Abulwafa, Essam M.)[1]; El-Shewy, EK (El-Shewy, Emad K.)[1]; Mahmoud, AA (Mahmoud, Abeer A.)[1]

Source: CHINESE PHYSICS B Volume: 20 Issue: 4 Article Number: 040508 DOI: 10.1088/1674-1056/20/4/040508 Published: APR 2011

Abstract: The ion-acoustic solitary wave in collisionless unmagnetized plasma consisting of warm ions-fluid and isothermal electrons is studied using the time fractional KdV equation. The reductive perturbation method has been employed to derive the Korteweg-de Vries equation for small but finite amplitude ion-acoustic wave in warm plasma. The Lagrangian of the time fractional KdV equation is used in a similar form to the Lagrangian of the regular KdV equation with fractional derivative for the time differentiation. The variation of the functional of this Lagrangian leads to the Euler-Lagrange equation that gives the time fractional KdV equation. The variational-iteration method is used to solve the derived time fractional KdV equation. The calculations of the solution are carried out for different values of the time fractional order. These calculations show that the time fractional can be used to modulate the electrostatic potential wave instead of adding a higher order dissipation term to the KdV equation. The results of the present investigation may be applicable to some plasma environments, such as the ionosphere plasma.

Accession Number: WOS:000289941500024

Document Type: Article

Language: English

Author Keywords: ion-acoustic waves; Euler-Lagrange equation; Riemann-Liouville fractional derivative; fractional KdV equation; variational-iteration method

KeyWords Plus: VARIATIONAL-ITERATION METHOD; DIFFERENTIAL-EQUATIONS; CLASSICAL FIELDS; SOLITARY WAVES; DERIVATIVES; FORMULATION; MECHANICS; PROPAGATION; PRINCIPLES; MEDIA

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Publisher: IOP PUBLISHING LTD, TEMPLE CIRCUS, TEMPLE WAY, BRISTOL BS1 6BE, ENGLAND

Web of Science Categories: Physics, Multidisciplinary

Research Areas: Physics

IDS Number: 755OD

ISSN: 1674-1056

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Author(s): Abulwafa, Essam M.; Abdou, Mohammed A.; Mahmoud, Aber H.
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Author(s): Agrawal, OP
Source: JOURNAL OF MATHEMATICAL ANALYSIS AND APPLICATIONS Volume: 272 Issue: 1 Pages: 368-379 Article Number: PII S0022-247X(02)00180-4 DOI: 10.1016/S0022-247X(02)00180-4 Abstract Number: A2003-01-0230-015 Published: AUG 1 2002

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Author(s): Agrawal, O. P.
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Author(s): Babakhani, A; Daftardar-Gejji, V
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Author(s): ELLABANY, SK; ELHANBALY, AM
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Author(s): He, JH; Wu, XH
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Author(s): Muslih, SI; Baleanu, D; Rabei, E
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Author(s): Podlubny, I.
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Part: Part b Abstract Number: A1997-12-0320-004 Published: MAR 1997

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Author(s): Sweilam, N. H.; Khader, M. M.; Al-Bar, R. F.
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Author(s): Tarasov, Vasily E.; Zaslavsky, George M.
Source: JOURNAL OF PHYSICS A-MATHEMATICAL AND GENERAL Volume: 39 Issue: 31 Pages: 9797-9815 DOI: 10.1088/0305-4470/39/31/010 Published: AUG 4 2006

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DOI: 10.1016/j.physa.2005.02.047 Published: AUG 15 2005

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Author(s): WASHIMI, H; TANIUTI, T
Source: PHYSICAL REVIEW LETTERS Volume: 17 Issue: 19 Pages: 996-& DOI:
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Published: 1966

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Author(s): Wu, G.C.; He, J.H.
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Author(s): Wu, Guo-cheng; Lee, E. W. M.
Source: PHYSICS LETTERS A Volume: 374 Issue: 25 Pages: 2506-2509 DOI: 10.1016/j.physleta.2010.04.034 Published: MAY 31 2010

Abulwafa, EM NOV 2011

Solitary, explosive and periodic solutions for electron acoustic solitary waves with non-thermal hot ions

Author(s): Elwakil, SA (Elwakil, S. A.)[1]; Abulwafa, EM (Abulwafa, E. M.)[1]; El-Shewy, EK (El-Shewy, E. K.)[1]; Abd-El-Hamid, HM (Abd-El-Hamid, H. M.)[1]

Source: ADVANCES IN SPACE RESEARCH Volume: 48 Issue: 10 Pages: 1578-1590 DOI: 10.1016/j.asr.2011.07.005 Published: NOV 15 2011

Abstract: A theoretical investigation has been made for electron acoustic waves propagating in a system of unmagnetized collisionless plasma consists of a cold electron fluid and ions with two different temperatures in which the hot ions obey the non-thermal distribution. The reductive perturbation method has been employed to derive the Korteweg-de Vries equation for small but finite amplitude electrostatic waves. It is found that the presence of the energetic population of non-thermal hot ions delta, initial normalized equilibrium density of low temperature ions mu and the ratio of temperatures of low temperature ions to high temperature ions beta do not only significantly modify the basic properties of solitary structure, but also change the polarity of the solitary profiles. At the critical hot ions density, the KdV equation is not appropriate for describing the system. Hence, a new set of stretched coordinates is considered to derive the modified KdV equation. In the vicinity of the critical hot ions density, neither KdV nor modified KdV equation is appropriate for describing the electron acoustic waves. Therefore, a further modified KdV equation is derived. An algebraic method with computerized symbolic computation, which greatly exceeds the applicability of the existing tanh, extended tanh methods in obtaining a series of exact solutions of the various KdV-type equations, is used here. Numerical studies have been reveals different solutions e.g., bell-shaped solitary pulses, singular solitary "blowup" solutions, Jacobi elliptic doubly periodic wave, Weierstrass elliptic doubly periodic type solutions, in addition to explosive pulses. The results of the present investigation may be applicable to some plasma environments, such as Earth's magnetotail region.

Accession Number: WOS:000295994200003

Document Type: Article

Language: English

Author Keywords: Electron acoustic waves; Non-thermal hot ions; KdV-type equations; Explosive pulses

KeyWords Plus: PLASMA SHEET BOUNDARY; EARTHS MAGNETOTAIL; AURORAL-ZONE; NOISE; GENERATION; SOLITONS; REGION; SYSTEM

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Publisher: ELSEVIER SCI LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

Web of Science Categories: Astronomy & Astrophysics; Geosciences, Multidisciplinary; Meteorology & Atmospheric Sciences

Research Areas: Astronomy & Astrophysics; Geology; Meteorology & Atmospheric Sciences

IDS Number: 834WC

ISSN: 0273-1177

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Author(s): WATANABE, S
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Abulwafa, EM MAR 2010

New Exact Travelling Wave Solutions of Nonlinear Coagulation Problem with Mass Loss

Author(s): El-Wakil, ESA (El-Wakil, El-Said A.)[1]; Abulwafa, EM (Abulwafa, Essam M.)[1]; Abdou, MA (Abdou, Mohammed A.)[1,2]

Source: ZEITSCHRIFT FUR NATURFORSCHUNG SECTION A-A JOURNAL OF PHYSICAL SCIENCES Volume: 65 Issue: 3 Pages: 209-214 Published: MAR 2010

Abstract:

This paper suggests a generalized F-expansion method for constructing new exact travelling wave solutions of a nonlinear coagulation problem with mass loss. This method can be used as an alternative to obtain analytical and approximate solutions of different types of kernel which are applied in physics. The nonlinear kinetic equation, which is an integro differential equation, is transformed into a differential equation using Laplace's transformation. The inverse Laplace transformation of the solution gives the size distribution function of the system.

As a result, many exact travelling wave solutions are obtained which include new periodic wave solutions, trigonometric function solutions, and rational solutions. The method is straightforward and concise,and it can also be applied to other nonlinear evolution equations arising in mathematical physics.

Accession Number: WOS:000277889000009

Document Type: Article

Language: English

Author Keywords: Nonlinear Coagulation Problem; Mass Loss; New Exact Travelling Solutions; Laplace Transform

KeyWords Plus: EXP-FUNCTION METHOD; EVOLUTION-EQUATIONS

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Publisher: VERLAG Z NATURFORSCH, POSTFACH 2645, 72016 TUBINGEN, GERMANY

Web of Science Categories: Chemistry, Physical; Physics, Multidisciplinary

Research Areas: Chemistry; Physics

IDS Number: 599CY

ISSN: 0932-0784

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Author(s): Abdou, M. A.; Elhanbaly, A.
Source: COMMUNICATIONS IN NONLINEAR SCIENCE AND NUMERICAL SIMULATION Volume: 12 Issue: 7 Pages: 1229-1241 DOI: 10.1016/j.cnsns.2006.01.013
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Author(s): Abdou, Mohamed A.; Abulwafa, Essam M.
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Author(s): El-Wakil, S.A.; Abdou, M.A.
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Author(s): ZHANG H
Source: COMMUN NONLINEAR SCI Volume: 14 Pages: 220 Published: 2009

Abulwafa, EM FEB 2009

An improved variational iteration method for solving coupled KdV and Boussinesq-like B(m, n) equations

Author(s): El-Wakil, SA (El-Wakil, S. A.)[1]; Abulwafa, EM (Abulwafa, Essam M.)[1]; Abdou, MA (Abdou, M. A.)[1,2]

Source: CHAOS SOLITONS & FRACTALS Volume: 39 Issue: 3 Pages: 1324-1334 DOI: 10.1016/j.chaos.2007.05.020 Published: FEB 15 2009

Abstract:
In this article. we implement a new, analytical technique: He's variational iteration Method for solving the coupled KdV and Boussinesq-like equations. In this method, first general Lagrange multipliers are introduced to construct correction functional for the problems. The multipliers in the functional can be identified optimally via the variational theory. Next the components of obtained iteration formulae defined by partial sum of other sequence, specially constructed according to Adomian's decomposition method (ADM). Also according to ADM We Used a partial sum of Adomian polynomials instead of nonlinear terms in iteration formulae. The initial approximations call be freely, chosen with possible Unknown constants, which can be determined by imposing the initial conditions. The results reveal that the proposed method is very effective and can be applied for other nonlinear problems. (C) 2007 Elsevier Ltd. All rights reserved.

Accession Number: WOS:000265471400039

Document Type: Article

Language: English

KeyWords Plus: ADOMIAN DECOMPOSITION METHOD; DIFFERENTIAL-EQUATIONS; NONLINEAR EQUATIONS; COMPACT SUPPORT; CONSTRUCTION

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Publisher: PERGAMON-ELSEVIER SCIENCE LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, ENGLAND

Web of Science Categories: Mathematics, Interdisciplinary Applications; Physics, Multidisciplinary; Physics, Mathematical

Research Areas: Mathematics; Physics

IDS Number: 437FG

ISSN: 0960-0779

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Author(s): Tari, Hafez; Ganji, D. D.; Rostamian, M.
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Author(s): Yusufoglu, Elcin
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Author(s): Zhu, YG; Chang, QS; Wu, SC
Source: CHAOS SOLITONS & FRACTALS Volume: 26 Issue: 2 Pages: 407-413 DOI: 10.1016/j.chaos.2005.01.005 Published: OCT 2005

Abulwafa, EM OCT-NOV 2009

Application of the Exp-Function Method to the Riccati Equation and New Exact Solutions with Three Arbitrary Functions of Quantum Zakharov Equations

Author(s): Abdou, MA (Abdou, Mohamed A.)[1,2] ; Abulwafa, EM (Abulwafa, Essam M.)[1]

Source: ZEITSCHRIFT FUR NATURFORSCHUNG SECTION A-A JOURNAL OF PHYSICAL SCIENCES Volume: 63 Issue: 10-11 Pages: 646-652 Published: OCT-NOV 2008

Abstract:
The Exp-function method with the aid of the symbolic computational system is used for constructing generalized solitary solutions of the generalized Riccati equation. Based on the Riccati equation and its generalized solitary solutions, new exact solutions with three arbitrary functions of quantum Zakharov equations are obtained. It is shown that the Exp-function method provides a straightforward and important mathematical tool for nonlinear evolution equations in mathematical physics.

Accession Number: WOS:000262357400006

Document Type: Article

Language: English

Author Keywords: Exp-Function Method; Generalized F-Expansion Method; Quantum Zakharov Equations; New Solitary and Periodic Solutions

KeyWords Plus: NONLINEAR EVOLUTION-EQUATIONS; TRAVELING-WAVE SOLUTIONS; VARIATIONAL ITERATION METHOD; ADOMIAN DECOMPOSITION METHOD; EXTENDED MAPPING METHOD; F-EXPANSION METHOD; PERIODIC-SOLUTIONS

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Publisher: VERLAG Z NATURFORSCH, POSTFACH 2645, 72016 TUBINGEN, GERMANY

Web of Science Categories: Chemistry, Physical; Physics, Multidisciplinary

Research Areas: Chemistry; Physics

IDS Number: 393FV

ISSN: 0932-0784

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Author(s): Abdou, M. A.
Source: CHAOS SOLITONS & FRACTALS Volume: 31 Issue: 1 Pages: 95-104 DOI: 10.1016/j.chaos.2005.09.030 Published: JAN 2007

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Author(s): Abdou, M. A.; Elhanbaly, A.
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Author(s): Abdou, M. A.; Zhang, Sheng
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Author(s): ABDOU MA
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Author(s): Abdou, M. A.
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Author(s): ABDOU MA
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Author(s): Abdou, M. A.
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Author(s): El-Wakil, S. A.; Abulwafa, E. M.; Elhanbaly, A.; et al.
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