

Accepted Manuscript

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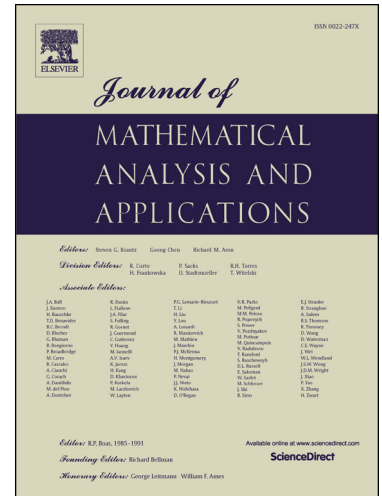
PII: S0022-247X(18)30041-6
DOI: <https://doi.org/10.1016/j.jmaa.2018.01.021>
Reference: YJMAA 21954

To appear in: *Journal of Mathematical Analysis and Applications*

Received date: 5 August 2017

Please cite this article in press as: P.R. Gordoa, A. Pickering, On a sequence of higher-order wave equations, *J. Math. Anal. Appl.* (2018), <https://doi.org/10.1016/j.jmaa.2018.01.021>

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On a sequence of higher-order wave equations

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5 August 2017

Short title: On a sequence of higher-order wave equations

Keywords: Higher-order wave equations, Korteweg-de Vries, Kuramoto-Sivashinsky, “Korteweg-de Vries of fifth order” (FKdV), similarity reductions, asymptotic analysis

MSC2010 classification scheme numbers: 35G20, 35Qxx, 76M60, 34M30

Abstract

We undertake a symmetry analysis of a sequence of evolution equations of orders $n = 3, 4, 5, 6, \dots$ which includes at lower orders partial differential equations having important applications. For $n = 3, 4$ and 5 the equations in this sequence are the Korteweg-de Vries equation, the dissipative Kuramoto-Sivashinsky equation and the so-called Korteweg-de Vries equation of fifth order. We give a detailed discussion of both classical and nonclassical symmetries for this sequence of equations. It is in this latter case, using an approach based on the compatibility of the members of this sequence of equations with a first order differential equation and in the case where the infinitesimal $\tau = 0$, that we make our main new insights. Further results are also given for two of the obtained reductions of this sequence of evolution equations to ordinary differential equations. In addition, a generalization of the approach to reductions based on compatibility is also considered, and is found to provide much promise for future work.

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