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Title: Stochastic Soliton Scattering

Abstract: We develop a variational method of deriving stochastic partial differential equations whose solutions follow the flow of a stochastic vector field. As an example in one spatial dimension, we numerically simulate singular solutions (peakons) of the stochastically perturbed Camassa-Holm (CH) equation derived using this method. These numerical simulations show that peakon soliton solutions of the stochastically perturbed CH equation persist and provide an interesting laboratory for investigating the sensitivity and accuracy of adding stochasticity to stochastic partial differential equations (SPDE). In particular, some choices of stochastic perturbations of the peakon dynamics by Wiener noise allow peakons to interpenetrate and exchange order on the real line in overtaking collisions, although this behaviour does not occur for other choices of stochastic perturbations which preserve the Euler-Poincar\'e structure of the CH equation, and it also does not occur for the original peakon solutions of the unperturbed deterministic CH equation. The discussion raises issues about the science of stochastic deformations of evolutionary PDE and the sensitivity of the resulting solutions of the SPDE to the choices made in stochastic modelling.