

Oberseminar Nichtlineare Differentialgleichungen

Jun.-Prof. Christina Lienstromberg - Prof. Guido Schneider - Prof. Wolf-Patrick Düll

Luis Österle B.Sc.

Universität Stuttgart

Validity of the Nonlinear Schrödinger Approximation for a One-dimensional Quasilinear Dispersive equation with Periodic Coefficients

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Abstract: Approximation solutions are of key importance in systems exhibiting multi-scale character. For them to be relevant, the smallness of their error and thus their validity has to be shown on suiting time intervals. This work considers one particular quasilinear dispersive equation in one dimension with periodic coefficients. A non-linear Schrödinger approximation is derived in periodic Bloch space modeling the envelope of underlying oscillations. The main result is a theorem guaranteeing a small approximation error in Sobolev space on a long time scale relative to the time scale of the approximation. The proof employs energy estimates and Gronwall's inequality to bound the error. While the theorem holds for a cubic nonlinearity, the quadratic case is also discussed.

Gemeinsame Veranstaltungsreihe des Lehrstuhls Analysis und Modellierung
und der Abteilung für Differentialgleichungen

Institut für Analysis, Dynamik und Modellierung IADM
Pfaffenwaldring 57, 70569 Stuttgart