

On the global well-posedness for the derivative nonlinear Schrödinger equation on the real line

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Abstract:

In this joint work with Galina Perelman [1], we have been interested in the question of global well-posedness for the derivative nonlinear cubic Schrödinger equation on the real line. This equation known as (DNLS) appeared in the 80's in the study of the one-dimensional compressible magneto-hydrodynamic equation in the presence of the Hall effect and the propagation of circular polarized nonlinear Alfvén waves in magnetized plasma. The local existence issue for this equation is well understood in the scale of Sobolev spaces for about twenty years. However, the problem of global existence is more challenging: the central difficulty of the DNLS equation as compared to other integrable equations like the cubic nonlinear Schrödinger equation (NLS) is its defect of coercivity and new ideas were needed to show that the solutions were global. In this work, by combining profile decomposition techniques with the integrable structure of the equation, we were able to establish a global existence result for (DNLS) in H^s , $s \geq 1/2$.

Acknowledgment: this is a joint work with Galina Perelman (Université Paris-Est Créteil, galina.perelman@u-pec.fr).

References

- [1] H. Bahouri and G. Perelman, Global well-posedness for the derivative nonlinear Schrödinger equation, *Inventiones Mathematicae*, 229, pages 639–688, 2022.