

# Large parametric asymptotic of the multi-rogue waves solutions of the NLS equation and extreme rogue wave solutions of the KP-I equation.

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## Abstract:

In this talk, we present some new results [1] concerning the behavior of the multi-rogue waves solutions of the focusing NLS and KP-I equation. These results are based on explicit polynomial formulas obtained from the determinant representations for these solutions found in my works with Philippe Dubard [2]–[3]. In these works the concept of the multiple rogue waves solutions both for focusing NLS equation and KP-I equation was first introduced. These works provided an explanation of the fact that the so called higher Peregrine breathers (we'll call them for brevity  $P_n$  breathers) with  $n \geq 2$  are not isolated and correspond to particular choice of parameters for the rank  $n$  multi-rogue wave solution depending on  $2n$  free real parameters. In 2010 only genuine Peregrine breather (i.e.  $P_1$  breather),  $P_2$ -breather (found in 1995 by Akhmediev, Eleonski and Kulagin) and  $P_3$  breather (found in 2009 by Akhmediev, Ankiewicz and Soto-Crespo) were known explicitly. The discovery of the multiple rogue-waves solutions stimulated the study of their particular cases corresponding to the different choices of parameters revealing quite different symmetric and asymmetric configurations. It seems that a rigorous study of the large parametric behavior of the multi-rogue wave solutions made in [1] was never performed before. In particular, we will show that (at least for small ranks) that all multiple rogue wave solutions of the rank  $m \leq n - 2$  can be obtained as an appropriately chosen large parametric limits of the rank  $n$  solutions.

## References:

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3. P. Dubard and V. Matveev, Multi-rogue waves solutions to the focusing NLS equation and the KP-I equation, *Nat. Hazards Earth Syst. Sci.*, **11**, 667–672 (2011).