

Rational degenerations of M -curves, totally positive Grassmannians and KP—solitons

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In this talk I shall connect two areas of mathematics: the theory of totally positive Grassmannians and the rational degenerations of M -curves using the theory of the KP-2 equation. Thanks to recent papers by Kodama and Williams the relation between the class of $(N, M - N)$ -line soliton solutions of KP-2 equation and $\text{Gr}^{TNN}(N, M)$ the totally non-negative part of real finite dimensional Grassmannians is well established. On the other hand such soliton solutions may also be obtained from the limit of regular real finite gap solutions of KP-2. Dubrovin and Natanzon proved in 1988 that the algebro-geometric data of the regular real quasi-periodic solutions are associated to M -curves. We show how to associate to any point in $\text{Gr}^{TP}(N, M)$, the totally positive part of $\text{Gr}(N, M)$, algebro-geometric data à la Krichever for the corresponding soliton solution, i.e. the rational degeneration of a regular M -curve of genus $g = N(M - N)$ and the divisor of poles of the associated KP wave-function.

The results presented are in collaboration with P.G. Grinevich.

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