Riemann-Hilbert problem and long time asymptotics of the shock problem for mKdV equation.

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We present the picture of the asymptotic behavior of the solution of this problem when initial function tends to some constants when $x \to \pm\infty$([1],[2],[3]).
An interesting fact turns out. It is well known ([4]) that the solution of the initial problem fall into a train of asymptotic solitons, when the initial function tends to a postive constant as $x \to -\infty$, and tends to 0 as $x \to$.

We found the first term of the asymptotic expansion of the solution of the initial value problem. It is described by a modulated elliptic wave, which also fall into a train of asymptotic solitons. It is interesting, that the asymptotic solitons for the solution and for its approximation are different.

1. V. Kotlyarov and A. Minakov, Riemann-Hilbert problem to the modified Korteveg-de Vries equation: long-time dynamics of the steplike initial data.— Journal of Mathematical Physics **51/9** (2010), 093506, 31.

2. A. Minakov, Asymptotics of rarefaction wave solution to the mKdV equation. — Journal of mathematical physics, analysis, geometry **7/1** (2011), 59-86.

3. A. Minakov, Long-time behavior of the solution to the mKdV equation with step-like initial data. — J.Phys.A. **44/8** (2011), 085206(31pp).

4. *E.Ya. Khruslov and V.P. Kotlyarov*, Asymptotic solitons of the modified Korteweg-de Vries equation. – Inverse problems **5** (1989), No. 6, 1075-1088.