ASYMPTOTIC INTEGRABILITY OF WATER WAVES

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It was established 100 years ago by Korteweg and de Vries that unidirectional idealized water waves are asymptotically integrable to $0(\epsilon)$, where $\epsilon = \frac{a}{h_0} = \frac{h_0^2}{\ell^2}$, a and ℓ are typical values of the amplitude and of the wavelength of the waves, and h_0 is the undisturbed depth of the water. Kodama has extended the asymptotic integrability of this system to $0(\epsilon^2)$: He has found an explicit transformation which maps this system to the integrable equation describing the next commuting flow of the kdV hierarchy. We have recently [1]:

1. Presented a generalization of Kodama's transformation which maps this system to KdV equation itself. Furthermore, we have shown that this system can be mapped to certain other integrable equations. These equations are integrable generalizations of the KdV and of the Gardner equations. These new integrable equations were found by using the formalism of [2] and are given in [3].

2. Established the asymptotic integrability of the idealized water waves to $0(\epsilon^2)$ without the unidirectionality asymption.

The concept of the mastersymmetry [4] plays a crucial role in the derivation of the above results.

References

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