SEMINÁRIO DE EQUAÇÕES DIFERENCIAIS

The initial value problem of a periodic generalized Kawahara/KdVm equation

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Resumo: We consider the initial value problem for the following generalized Kawahara/KdVm equation

$$\partial_t u + \sum_{k=1}^{m} \partial_x^{2k+1} u + u \partial_x u = 0, \quad x \in \mathbb{T} \text{ and } t \in \mathbb{R} \tag{0.1}$$

$$u(x,0) = \varphi(x), \quad x \in \mathbb{T}, \tag{0.2}$$

where $\mathbb{T}$ is a circle. We prove that

Theorem 0.1. *Let $\sigma \geq 1$, $\delta > 0$, and $s \geq -m/2$. For initial data φ in the space*

$$G^{\sigma,\delta,s}(\mathbb{T}) = \{f \in D'(\mathbb{T}) : ||f||^2_{G^{\sigma,\delta,s}(\mathbb{T})} = \sum_{n \in \mathbb{Z}} |n|^{2s} e^{2\delta |n|^{1/\sigma}} |\widehat{f}(n)|^2 < \infty\}$$

there exists $T = T(\|\varphi\|_{G^{\sigma,\delta,s}(\mathbb{T})}) > 0$ such that the Cauchy problem (0.1)–(0.2) has a unique solution $u(x,t)$ in $C([-T,T]; G^{\sigma,\delta,s}(\mathbb{T}))$. Furthermore, the data-to-solution map is continuous. Moreover, the regularity of the solution in the time variable is Gevrey of order $(2m+1)\sigma$.