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Consider the initial-boundary value problem on a half-line for the nonlinear evolution equations with a fractional derivative

$$\begin{cases} u_t + \lambda |u|^\sigma u + |\partial_x|^\alpha u = 0, & t > 0, x > 0, \\ u(x, 0) = u_0(x), & x > 0, \end{cases}$$

where the $|\partial_x|^\alpha$ operator on a half-line is defined as follows for $\alpha \in (1, 2)$

$$|\partial_x|^\alpha u = \theta(x) \int_{-i\infty}^{i\infty} e^{px} |p|^\alpha \left(\widehat{u}(p, t) - \frac{u(0, t)}{p} \right) dp.$$

Here the function θ is defined as

$$\theta(x) = \begin{cases} 1, & x \geq 0 \\ 0, & x < 0. \end{cases}$$

We study traditionally important problems of a theory of nonlinear partial differential equations, such as global in time existence of solutions to the initial-boundary value problem and the asymptotic behavior of solutions for large time. (Received January 25, 2010)