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Gevrey asymptotics for logarithmic type solutions to singularly perturbed problems with nonlocal nonlinearities

We investigate a family of nonlinear partial differential equations which are singularly perturbed in a complex parameter and singular in a complex time variable at the origin. These equations combine differential operators of Fuchsian type in time and space derivatives on horizontal strips in the complex plane with a nonlocal operator acting on the perturbation parameter known as the formal monodromy around 0. Their coefficients and forcing terms comprise polynomial and logarithmic type functions in time and are bounded holomorphic in space. A set of logarithmic type solutions are shaped by means of Laplace transforms relatively to time and the perturbation parameter and Fourier integrals in space. Furthermore, a formal logarithmic type solution is modeled which represents the common asymptotic expansion of Gevrey type of the genuine solutions with respect to the perturbation parameter on bounded sectors at the origin.