On the asymptotic regime of a model framework for friction mediated by transient elastic protein linkages.

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In this work we study a system of an integral equation of Volterra type coupled to a renewal equation. This model arises in the context of cell motility. The integral equation describes the trajectory of a binding site which is connected via transiently remodelling linkages to the substrate and which evolves driven by a given force. The renewal model accounts for the remodelling process of linkages which attach and break with given probabilities.

In the present work we analyze existence and uniqueness issues for the coupled system of interest and provide a rigorous justification of the asymptotic limit of infinitesimally rapid turnover of linkages.

The renewal model for the age distribution of linkages differs from classical ones in that it describes competition between population size and birth and because it admits a new and specific Lyapunov functional. On the other side, using a comparison principle which applies to non-convolution linear Volterra kernels and the peculiar transport properties of the linkages, one establishes a convergence result when the turnover parameter tends to zero.