Random and non-autonomous dynamics of chemostats

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Chemostat refers to a laboratory device used for growing microorganisms in a cultured environment, and has been regarded as an idealization of nature to study competition modeling of mathematical biology. The simple form of chemostat model assumes that the availability of nutrient and its supply rate are both fixed. However, these assumptions largely limit the applicability of chemostat models to realistic competition systems. In this work, we relax these assumptions and study the chemostat models with random and/or non-autonomous nutrient supplying rate or input nutrient concentration. This leads the models to random or non-autonomous dynamical systems and requires the concept of global random or pullback attractors. We will report on the existence of uniformly bounded non-negative solutions, existence of random and pullback attractors and some details of their geometrical structures for different value of parameters.

The content of this talk is mainly based in the following joint works: