# The Integrability and Global Dynamics of Kolmogorov Polynomial Differential Systems

*Dongmei Xiao*
*Shanghai Jiaotong University, China*

In this talk, we first introduce background of planar polynomial differential systems, then provide a link between the integrability of planar polynomial Kolmogorov differential systems and the intersection number of planar algebraic curves, and obtain algebraic and computational conditions for ruling out the existence of limit cycles. To answer if global dynamics of an integrable system can be completely determined by its local dynamics of all equilibrium points in Poincaré disc, we study the Kolmogorov systems with degree $n \leq 3$. It is proved that the Kolmogorov systems with degree $n \leq 3$ are integrable if the number of center-type equilibria or weak saddles of these systems in the interior of quadrants of real plane $R^2$ reaches the maximum. For these integrable Kolmogorov systems, we give all topological classifications of its global dynamics, which is shown that the local dynamics of the integrable Kolmogorov systems with degree $n = 2$ can completely determine its global dynamics, but the local dynamics of the integrable Kolmogorov systems with degree $n = 3$ cannot completely determine its global dynamics.

This is based on a joint work with Dr. Hongjin He.