反应扩散方程最新进展研讨会

Workshop on Recent Progress in Reaction Diffusion Equations

Organizers :

杜一宏 Du Yihong (Professor,University of New England)

王克磊 Wang Kelei (Professor,Wuhan University)

郭改慧 Guo Gaihui (Professor,Shaanxi University of Science & Technology)

Oct 12, 2025 - Oct 18, 2025

Tianyuan Mathematicsl Research Center

会议日程（Conference Schedule）

2025.10.13 星期一 (Monday）			
08:30-08:45	开幕式&合影 (Opening and conference photo)		
时间 (time)	报告人(Speaker)	题目 (Title of talk)	主持人 (Chair)
08:45-09:25	Hiroshi Matano	Propagation of fronts through a perforated wall	杜一宏 (Yihong Du)
09:30-10:10	梁兴 (Xing Liang)	Asymptotic behavior of principal eigenvalues and spreading speeds in two-scale almost periodic media	杜一宏 (Yihong Du)
10:15-10:45	茶歇 (Tea break)		
10:45-11:25	向昭银 (Zhaoyin Xiang)	Stabilization in a 3D chemotaxis-Stokes system with quadratic degradation and Dirichlet boundary-value for signal	郭改慧 (Gaihui Guo)
11:30-12:10	金祝成 (Zhucheng Jin)	Spreading speeds of a prey-predator system in a shifting environment	郭改慧 (Gaihui Guo)
12:15-14:00	中午休息 (Lunch break)		
14:00-14:40	赵晓强 (Xiao-Qiang Zhao)	Global Dynamics of Nonlocal Dispersal Systems with Time-Varying Domains	王克磊 (Kelei Wang)
14:45-15:25	方健 (Jian Fang)	Population dynamics on periodically evolving domain with periodic growth mechanisms	王克磊 (Kelei Wang)
15:30-16:00	茶歇 (Tea break)		
16:00-16:40	刘胜强 (Shengqiang Liu)	Transmission dynamics of a vector-borne disease with cognition-dependent mobility	王治国 (Zhiguo Wang)
16:45-17:25	自由讨论 (Free discussion)		

2025.10.14 星期二 (Tuesday)			
时间 (Time)	报告人 (Speaker)	题目(Title of talk)	主持人 (Chair)
08:45-09:25	魏军城 (Juncheng Wei)	Uniqueness and Multiplicity for Elliptic Problems in Unbounded Domains	Hiroshi Matano
09:30-10:10	王克磊 (Kelei Wang)	F-functional and entropy for Fujita equation	Hiroshi Matano
10:15-10:45	茶歇 (Tea break)		
10:45-11:25	郭宏骏 (Hongjun Guo)	Reaction-diffusion equations in periodic media: convergence to pulsating fronts	娄本东 (Bendong Lou)
11:30-12:10	聂华 (Hua Nie)	Dynamics and asymptotic profiles of the benthic-drift population model in both open and closed advective environments	娄本东 (Bendong Lou)
12:15-14:00	中午休息 (Lunch break)		
14:00-14:40	娄本东 (Bendong Lou)	Convergence Results in 1D Porous Medium Equations with Reactions	方健 (Jian Fang)
14:45-15:25	倪文杰 (Wenjie Ni)	A competition model with nonlocal diffusion and free boundaries	方健 (Jian Fang)
15:30-16:00	茶歇 (Tea break)		
16:00-16:40	孙宁奎 (Ningkui Sun)	Free boundary problems with time delay	张晓燕 (Xiaoyan Zhang)
16:45-17:25	自由讨论 (free discussion)		

2025.10.15 星期三 (Wednesday）			
时间 (Time)	报告人 (Speaker)	题目 (Title of talk)	主持人 (Chair)
08:45-09:25	Michael Winkler	Facets of complexity in chemotactic aggregation	Daniel Hauer
09:30-10:10	Fernando Quiros	Traveling wave behavior for Fisher-KPP equations in the hyperbolic space	Daniel Hauer
10:15-10:45	茶歇 (Tea break)		
10:45-11:25	张磊 (Lei Zhang)	Approximation of the generalized principal eigenvalue of cooperative nonlocal dispersal systems and applications	梁兴 (Xing Liang)
11:30-12:10	丁维维 (Weiwei Ding)	Average speed of time almost periodic traveling waves for rapidly/ slowly oscillating reaction-diffusion equations	梁兴 (Xing Liang)
12:15-14:00	中午休息 (Lunch break)		
14:00-14:40	王明新 (Mingxin Wang)	A triple-layered angiogenic tumor model	林支桂 (Zhigui Lin)
14:45-15:25	吴元泽 (Yuanze Wu)	Bubbling solutions of the Brezis-Nirenberg problems in low dimensional general bounded domains	林支桂 (Zhigui Lin)
15:30-16:00	茶歇 (Tea break)		
16:00-16:40	王佳兵 (Jiabing Wang)	On the periodic nonlocal dispersal competition systems in heterogeneous shifting environments	周韬 (Tao Zhou)
16:45-17:25	自由讨论 (Free discussion)		

2025.10.16 星期四 (Thursday）			
时间 (Time)	报告人 (Speaker)	题目 (Title of talk)	主持人 (Chair)
08:45-09:25	Michel Chipot	Uniqueness results for operators with a p-Laplacian structure	魏军城 (Juncheng Wei)
09:30-10:10	陶有山	Suppression of blow-up by local anisotropy of signal production in the Keller-Segel system	魏军城 (Juncheng Wei)
10:15-10:45	茶歇 (Tea break)		
10:45-11:25	Daniel Hauer	New regularity estimates on a nonlocal gradient	Fernando Quiros
11:30-12:10	梅林锋 (Linfeng Mei)	Concentration on (n-1)-d spheres for singlarly perturbed Gierer-Meinhardt systems on the n-d unit sphere	Fernando Quiros
12:15-14:00	中午休息 (Lunch break)		
14:00-14:40	林支桂 (Zhigui Lin)	WNv diffusive models with climate warming and seasonal succession	王明新 (Mingxin Wang)
14:45-15:25	王蓉 (Rong Wang)	Long time dynamics of some diffusive epidemic models with a new free boundary condition	王明新 (Mingxin Wang)
15:30-16:00	茶歇 (Tea break)		
16:00-16:40	顾光泽 (Guangze Gu)	On nonlinear elliptic problems with Hardy-Littlewood-Sobolev critical exponent and Hardy potential	薄伟健 (Jianwei Bo)
16:45-17:25	自由讨论 (Free discussion)		

2025.10.17 星期五 (Friday）	
时间 (Time)	内容 (Activity)
08:45-09:25	自由讨论 (Free discussion)
09:30-10:10	自由讨论 (Free discussion)
10:15-10:45	茶歇 (Tea break)
10:45-11:25	自由讨论 (Free discussion)
11:30-12:10	自由讨论 (Free discussion)
12:15-14:00	中午休息 (Lunch break)
14:00-14:40	自由讨论 (Free discussion)
14:45-15:25	自由讨论 (Free discussion)
15:30-16:00	茶歇 (Tea break)
16:00-16:40	自由讨论 (Free discussion)
16:45-17:25	自由讨论 (Free discussion)

附件 1　　报告信息（按姓氏拼音首字母排序）

Report information (Sort by phonetic initials of last names)

Uniqueness results for operators with a p-Laplacian structure

Michel Chipot, University of Zurich

Abstract: The goal of this talk is to present different uniqueness results for problems associated with pseudo-monotone operators having the structure of the p-Laplace operator. The results are quite different when the equations at hand have a strictly monotone lower order term. The topic uses different test functions depending on the assumptions of the coefficients of the operators. Some of them were used in the past but most of the time we simplify them and compare their strength. At the end of the talk we introduce some new type of such operators for which uniqueness can be proved roughly speaking the same way.

New regularity estimates on a nonlocal gradient

Daniel Hauer, Brandenburg University of Technology

Abstract: In this talk, I will start by presenting new integrability properties and regularity estimates of distributional solutions in L^1 to the fractional Poisson problem with (nonlocal) homogeneous Dirichlet boundary conditions. By using these regularity inequalities and tools from interpolation theory, we can establish new regularity propertys of the nonlocal gradient of weak solutions to the Poisson problem. These results were obtained in joint work with Barbara Brandolini (University of Palermo, Italy) and Vincenzo Ferone (University of Naples Federico II, Italy).

Propagation of fronts through a perforated wall

Hiroshi Matano, Meiji University

Abstract: In recent years, the behavior of solution fronts of reaction-diffusion equations in the presence of obstacles has attracted attention among many researchers. Of particular interest is the case where the equation has a bistable nonlinearity. In this talk, I will consider the case where the obstacle is a wall of infinite span with many holes and discuss whether the front can pass through the wall and continue to propagate ("propagation") or is blocked by the wall ("blocking"). The answer depends largely on the size and the geometric configuration of the holes. This problem has led to a variety of interesting mathematical questions that are far richer than we had originally anticipated, including Liouville type lemma, removable singularities and the capacity theory. Many questions still remain open. This is joint work with Henri Berestycki and François Hamel.

Traveling wave behavior for Fisher-KPP equations in the hyperbolic space

Fernando Quiros, Universidad Autónoma de Madrid

Abstract: We study the Cauchy problem in the hyperbolic space for the heat equation with a Fisher-KPP type forcing term. Depending on the relative strength of diffusion, measured by the infimum of the spectrum of the Laplace-Beltrami operator (considered as a positive operator), as compared to the growth due to the forcing term, solutions may propagate or vanish as time goes by. We prove new results concerning this dichotomy that include the critical case where diffusion and reaction are of the same order. In the case of propagation, we prove that if the initial datum possesses some symmetry (invariance under a cohomogeneity one subgroup of the group of isometries in the hyperbolic space), the solution converges asymptotically to a traveling wave of minimal speed in a moving frame. The choice of this frame depends on the invariance of the initial datum in terms of the chosen subgroup of isometries, which can be classified into elliptic, hyperbolic and parabolic.

Facets of complexity in chemotactic aggregation

Michael Winkler, Universitat Paderborn

Abstract: Keller-Segel type cross-diffusion systems have been playing an outstanding role in the understanding of various patterning phenomena in biology. Concentrating on issues of predominant application relevance, the description of taxis-driven explosions has been among the most challenging topics in their analysis, and a natural focus of the literature in this regard is on the characterization of solution behavior near collapse. The presentation aims at reporting both on classical and on some recent developments, with a particular focus on the identification of circumstances under which solutions either must blow up at single points only, or alternatively may form singularities throughout larger regions in space.

Average speed of time almost periodic traveling waves for rapidly/ slowly oscillating reaction-diffusion equations

丁维维，华南师范大学

(Weiwei Ding, South China Normal University)

Abstract: This talk is concerned with the wave propagation dynamics of time almost periodic reaction-diffusion equations. Assuming the existence of a time almost periodic traveling wave connecting two stable steady states, we focus on the asymptotic behavior of wave speeds in both rapidly and slowly oscillating environments. We prove that, in the rapidly oscillating case, the average speed of the time almost periodic wave converges to the constant wave speed of the homogenized equation. On the other hand, in the slowly oscillating case, the average speed converges to the arithmetic mean of the wave speeds for a family of equations with frozen coefficients. These explicit formulas for the limits of speeds also show the significant influences of temporal variations on wave propagation phenomena. Even in the periodic environment, it can alter the sign of bistable wave speeds.

Population dynamics on periodically evolving domain with periodic growth mechanisms

方健，哈尔滨工业大学

(Jian Fang, Harbin Institute of Technology)

Abstract: In this talk, I will present a reaction-diffusion model on a periodically evolving domain subject to the no-flux boundary condition, with a novel feature that the growth mechanism of populations also periodically varies. For this model we identify key factors to determine the long-term behavior of populations when the growth is of KPP type, strong Allee type and weak Allee type, respectively. In particular, when a bistability structure appears, by appealing to a recently developed dynamical system theory we obtain a sharp convergence to periodic solution. It turns out that there exist critical distributions distinguishing population survival and extinction when we continuously vary a family of ordered initial distributions. Further, numerical simulations indicate that such critical distributions may depend on the connectivity of the varying domain; the loss of connectivity may suppress population survival although there is no loss in the emerging boundaries.

On nonlinear elliptic problems with Hardy-Littlewood-Sobolev critical exponent and Hardy potential

顾光泽，云南师范大学

(Guangze Gu, Yunnan Normal University)

Abstract: In this talk, we focuses on the existence of solutions for a class of nonlinear elliptic problems involving a combined convolution-type and Hardy nonlinearity. Moreover, we obtain the symmetry and monotonicity properties of the singular solutions for Choquard equation.

Reaction-diffusion equations in periodic media: convergence to pulsating fronts

郭宏骏，同济大学

(Hongjun Guo, Tongji University)

Abstract: This talk is concerned with reaction-diffusion-advection equations in spatially periodic media. Under an assumption of weak stability of the constant states 0 and 1, and of existence of pulsating traveling fronts connecting them, we show that fronts profiles appear, along sequences of times and points, in the large-time dynamics of the solutions of the Cauchy problem, whether their initial supports are bounded or unbounded. The types of equations that fit into our assumptions are the combustion and the bistable ones. We also show a generalized Freidlin-Gartner formula and other geometrical properties of the asymptotic invasion shapes, or spreading sets, of invading solutions, and we relate these sets to the upper level sets of the solutions. This talk is based on the joint work with F. Hamel and L. Rossi.

Spreading speeds of a prey-predator system in a shifting environment

金祝成，中国科学技术大学

(Zhucheng Jin, University of Science and Technology of China)

Abstract: In this talk, we investigate the spreading properties of a diffusive prey-predator system influenced by climate change, where the conversion rate of predator exhibits spatiotemporal heterogeneity depending on a moving variable. A main difficulty arises from the lack of comparison principle for such system. To overcome this, we derive a pointwise estimate which enables us to compare the solutions of the system with those of scalar Fisher-KPP equations. Thanks to the recent advances by Giletti, Girardin, and Matano (2024) and by Lam, Nadin and Yu (2024) for scalar KPP equations in shifting environments, we provide the exact formula for the spreading speed of the predator species. Notably, we demonstrate that the system can occur intriguing phenomena such as locking and nonlocal pulling under certain parameter regimes. To some extent, for certain prey–predator systems, our approach establishes a connection between the spreading of the predator and that of a scalar KPP equation. This work originated from discussions at the Tianyuan Mathematical center (Yunnan) conference in 2024.

Asymptotic behavior of principal eigenvalues and spreading speeds in two-scale almost periodic media

梁兴，中国科学技术大学

(Xing Liang, University of Science and Technology of China)

Abstract: This work is concerned with the asymptotic behavior of the principal eigenvalues of elliptic operators and spreading speeds of Fisher-KPP equations in two-scale almost periodic media where one scale is fixed and another scale change to zero or infinity. Thanks to the variational formula for the spreading speeds involving generalized principal eigenvalue, we are able to concentrate on the homogenization problem of certain Hamilton-Jacobi equations. We will present also the limits and the convergence rate. At last, we will consider the effects on the spreading speeds of the advection and the heterogeneity of media.

WNv diffusive models with climate warming and seasonal succession

林支桂，扬州大学

（Zhigui Lin, Yangzhou University)

Abstract: This talk deals with mathematical models describing the diffusive dynamic of West Nile virus. For the spatially-independent WNv model, the usual basic reproduction number R_0 is given and for the diffusive WNv model in a bounded domain, the basic reproduction numbers R_0^N, R_0^D are defined. To model and explore the expanding front of the infective region, a reaction-diffusion problem with free boundaries is proposed.The spatial-temporal risk index $R_0^{F(t)}$, which involves regional characteristic and time, is defined. Sufficient conditions for the virus to vanish or spread are given. Our results suggest that the spreading or vanishing of the virus depends on the initial number of infected individuals, the area of the infected region, the diffusion rate, and other factors. Moreover, we establish new WNv models to describe the impart of climate warming and seasonal succession.

Transmission dynamics of a vector-borne disease with cognition-dependent mobility

刘胜强，天津工业大学

(Shengqiang Liu, Tiangong University)

Abstract: We propose a spatial model for vector-borne diseases incorporating cognition-driven host mobility via Fokker-Planck type diffusion. Susceptible hosts disperse more in high-risk areas, while infected hosts reduce movement near high-recovery regions. The basic reproduction number R_0 is derived and serves as a sharp threshold: the disease-free equilibrium is globally stable if $R_0 \le 1$, whereas the system persists if $R_0 > 1$. We analytically establish how R_0 depends on cognitive parameters: it increases with infected cognition c_I if $R_0 > \overline{r}$, and decreases with susceptible cognition c_S under suitable spatial heterogeneity conditions. Numerical simulations for dengue transmission confirm these theoretical insights, demonstrating how cognitive movement shapes outbreak patterns and informing targeted control strategies.

Convergence Results in 1D Porous Medium Equations with Reactions

娄本东，上海师范大学

(Bendong Lou, Shanghai Normal University)

Abstract: We consider the long time behavior for solutions of porous medium equations (degenerate diffusion equations) with reactions, in both homogenous and spatially periodic environments. For any bounded solution starting from compactly supported initial datum, we show its locally uniform convergence to a steady state by using the zero number argument. For any spreading solution which converges to some positive steady state, we specify its asymptotic profile on the free boundaries by using the corresponding sharp wave.

Concentration on (n-1)-d spheres for singlarly perturbed Gierer-Meinhardt systems on the n-d unit sphere

梅林锋，浙江师范大学

(Linfeng Mei, Zhejiang Normal University)

Abstract: We study the concentration phenomena for singulary perturbed Gierer-Meinhardt systems on the n-dimensional unit sphere. Solutions concentrating on (n-1)-dimensional spheres were constructed. This work is part of a project toward understanding the influence of terrestrial inhomogeneity on Turing pattern formation.

A competition model with nonlocal diffusion and free boundaries

倪文杰(Wenjie Ni), University of New England

Abstract: We investigate the long-time dynamics of a two-species competition model of Lotka–Volterra type with nonlocal diffusions. In this setting, a native species occupies the whole environment, while an invading species spreads with two moving fronts, forming a habitat that expands over time. The system is modeled by a reaction–diffusion equation with free boundaries, and the key question is whether the invaded region eventually remains bounded or grows without limit.

Dynamics and asymptotic profiles of the benthic-drift population model in both open and closed advective environments

聂华，陕西师范大学

(Hua Nie, Shaanxi Normal University)

Abstract: In this talk, we will primarily present our recent research progress on the dynamics and asymptotic profiles of the reaction-diffusion-advection benthic-drift model. We explore the threshold dynamics of a single-species benthic-drift model in both open and closed advective environments. A quantitative analysis of the principal eigenvalue for a non-self-adjoint eigenvalue problem is conducted to examine how the diffusion rate, advection rate, and population release rates influence the system's dynamics. We investigate the

asymptotic behavior of positive solutions as the diffusion and advection rates approach zero or infinity. In regimes of large advection or small diffusion, a clear dichotomy emerges in the spatial distribution of the species. We analyze the global dynamics of a two-species competition benthic-drift model in open advective environments.Our results suggest that the diffusion and advection rates have distinct effects on benthic-drift population dynamics, which depend on the transfer rates between the benthic and drift zones. Additionally, we highlight the crucial role of diffusion and advection rates in shaping the spatial distributions of species in advective environments.

Free boundary problems with time delay

孙宁奎，山东师范大学

(Ningkui Sun, Shandong Normal University)

Abstract: We consider a time delayed free boundary problem with a nonlocal impulsive growth by modeling the seasonal invasion of age-structured populations. We first examine that there is a spreading-vanishing dichotomy for the long-time behavior of solutions. Then we show that the range of the evolving domain, if spreading occurs, expands with an asymptotic speed, which is uniquely determined by a time periodic nonlocal parabolic problem in half line.

Suppression of blow-up by local anisotropy of signal production in the Keller-Segel system

陶有山，上海交通大学

(Youshan Tao, Shanghai Jiao Tong University)

Abstract: In a smoothly bounded domain with spatial dimension less than 6, we consider the Neumann initial-boundary problem for a Keller-Segel type system with certain anisotropic signal production mechanisms. Markedly distinguishing from classical Keller-Segel systems for which some solutions are known to blow up in finite time, this new problem is shown to admit a unique global bounded classical solution whenever the difference of two diffusion coefficients of the populations and the chemical is appropriately small. This is a very recent joint work with Prof. Michael Winkler (Paderborn).

On the periodic nonlocal dispersal competition systems in heterogeneous shifting environments

王佳兵，中国地质大学

(Jiabing Wang, China University of Geosciences)

Abstract: In this talk, we are committed to discuss the joint influences of seasonal succession, climate change, interspecific competition and long-distance free diffusion on the population dynamics. We consider two biological scenarios in which the resource functions of two competing species shift in opposite/same trends with a periodically fluctuating speed. [Based on joint works with Prof. Wan-Tong Li and Dr. Shao-Xia Qiao.]

F-functional and entropy for Fujita equation

王克磊，武汉大学

(Kelei Wang, Wuhan University)

Abstract: In 2013, in their work on mean curvature flow, Colding and Minicozzi introduced a quantity, now called Colding-Minicozzi entropy. This entropy plays an important role in many subsequent works on MCF. In a recent joint work with Juncheng Wei and Ke Wu, we introduce a similar entropy for Fujita equation. In this talk, I'll discuss this notion and some applications of it to the blow up problem for Fujita equation.

A triple-layered angiogenic tumor model

王明新，山西大学

(Mingxin Wang, Shanxi University)

Abstract: In this talk, we concern a free boundary problem for a reaction-diffusion system modeling the growth of a triple-layered angiogenic tumor. First, we establish the global existence of a flat solution by employing an approximation method and the Schauder fixed point theorem. Then, we investigate the existence of flat stationary solutions in various parameter regimes of the problem.

Long time dynamics of some diffusive epidemic models with a new free boundary condition

王蓉，兰州大学

(Rong Wang, Lanzhou University)

Abstract: We will present the long-time dynamics of some diffusive epidemic models with a new free boundary condition. By replacing the integral involving the kernel function in the previous free boundary condition with a weighted function, this condition means that the movement of the range boundary depends only on the weighted total population within the range, independent of the species' diffusion strategy. We first establish the global existence and uniqueness of solutions, and then study their long-time behavior which turns out having a spreading-vanishing dichotomy. When spreading occurs, we investigate the asymptotic spreading speed of the moving fronts. We obtain that if weight function satisfy an additional condition, then the spreading speed is finite; if not, the speed is determined by the kernel functions. For thin-tailed kernels, the spreading speed is no less than the minimal traveling wave speed, while for heavy-tailed kernels the spreading speed is infinite, we say accelerated spreading happens. Finally, in cases of accelerated spreading, we discuss the precise spreading speeds of the moving fronts for some typical weighted functions. This talk is based on joint works with Professor Yihong Du and Dr Xin Long.

Uniqueness and Multiplicity for Elliptic Problems in Unbounded Domains

魏军城，香港中文大学

(Juncheng Wei, The Chinese University of Hong Kong)

Abstract: We study the influence of geometry on semilinear elliptic equations of bistable or nonlinear-field type in unbounded domains. We discover a surprising dichotomy between epigraphs that are bounded from below and those that contain a cone of aperture greater than π : the former admit at most one positive bounded solution, while the latter support infinitely many. Nonetheless, we show that every epigraph admits at most one strictly stable solution. To prove uniqueness, we strengthen the method of moving planes by decomposing the domain into one region where solutions are stable and another where they enjoy a form of compactness. Our construction of many solutions exploits a connection with Delaunay surfaces in differential geometry, and extends to all domains containing a suitably wide cone, including exterior domains. (Joint work with Henri Berestycki and Cole Graham.)

Bubbling solutions of the Brezis-Nirenberg problems in low dimensional general bounded domains

吴元泽，云南师范大学

(Yuanze Wu, Yunnan Normal University)

Abstract: In this talk, I will report our recent results on the low dimensional Brezis-Nirenberg problem in general bounded domains. We construct bubbling solutions of it with precisely asymptotic profiles via the Liapunov-Schmidt reduction arguments for the 4D, 5D and 6D cases. Our results suggest that the bubbling phenomenon of the Brezis-Nirenberg problem is heavely dependent on the dimensions. Moreover, d=5 is a critical dimension in the sense that the govern function is full coupled in 4D and is decoupled for 5D and 6D.

Stabilization in a 3D chemotaxis-Stokes system with quadratic degradation and Dirichlet boundary-value for signal

向昭银，电子科技大学

(Zhaoyin Xiang, University of Electronic Science and Technology of China)

Abstract: In this talk, we investigate a coupled chemotaxis-Stokes system with logistic source $an-bn^2$ posed in a 3D bounded domain Ω, subject to regular initial data and the boundary conditions

$$\left(\nabla n - n\nabla c\right)\cdot \nu = 0, \quad c = c^*(x,t), \quad u = 0, \qquad x \in \partial\Omega, t > 0,$$

for population density n, chemical signal concentration c and the velocity field u, where c^* is a prescribed nonnegative function. By identifying an explicit threshold $b_0 \geq 0$, depending on the initial data $c(x,0)$ and the boundary value c^*, we establish that for all logistic damping parameters $b \geq b_0$, the system admits a global classical solution which remains uniformly bounded in time. Moreover, under additional integrability conditions on c^*, the solution exhibits stabilization as $t \to \infty$. Furthermore, if c^* decays exponentially in time, the convergence is exponential for $a \neq 0$, and algebraic for $a = 0$. All these results remain valid for arbitrary $b > 0$ in the 2D case, even when the Navier-Stokes fluid coupling is considered.

Approximation of the generalized principal eigenvalue of cooperative nonlocal dispersal systems and applications

张磊，陕西师范大学

(Lei Zhang, Shaanxi Normal University)

Abstract: It is well known that, in the study of the dynamical properties of nonlinear evolution system with nonlocal dispersals, the principal eigenvalue of linearized system play an important role. However, due to lack of compactness, in order to obtain the existence of principal eigenvalue, certain additional conditions must be attached to the coefficients. In this paper, we approximate the generalized principal eigenvalue of nonlocal dispersal cooperative and irreducible system, which admits the Collatz-Wielandt characterization, by constructing the monotonic upper and lower control systems with principal eigenvalues; and show that the generalized principal eigenvalue plays the same role as the usual principal eigenvalue.

Global Dynamics of Nonlocal Dispersal Systems with Time-Varying Domains

赵晓强(Xiaoqiang Zhao), Memorial University of Newfoundland

Abstract: In this talk, I will report our recent research on the asymptotic behaviour of a class of nonlocal dispersal systems with time-varying domains. We first establish the comparison principle for generalized sub- and super-solutions of nonautonomous nonlocal dispersal systems defined on the space of bounded measurable functions. We then develop a comprehensive framework to determine the threshold dynamics of the original system with asymptotically fixed and time-periodic domains. In the case of asymptotically unbounded domain, we introduce an auxiliary function to overcome the difficulties caused by the asymptotically vanishing viscosity and the time-dependent coupling structure in the nonlocal kernels. This enables us to construct generalized sub-solutions and derive the global threshold dynamics via the comparison arguments. Our findings may be of independent interest and the developed techniques are expected to find further applications in the related nonlocal dispersal problems. We also conduct numerical simulations for a nonlocal spatial model of West Nile virus to illustrate the obtained analytical results.