华南数学应用与交叉研究中心科研汇报研讨会【2020年7月20日-8月3日】

序号	主持人	报告人	日期	时间	题目	摘要	腾讯会议号
1	辛周平教授	李进开	7月20日	10:00 -11:00 A.M	关于可压缩流体熵的数学研究进展报告	熵作为流体的一个基本物理量，关于它的数学研究在流体动力学中有着根本的重要性。然而，由于熵在真空区域具有奇异性，关于它的数学研究需要克服多方面的困难。本报告中我们将介绍我们在此研究方向取得的进展。	884 216 663
2		钟学秀		15:00 -16:00 P.M	椭圆方程和方程组中规范解问题的研究	本报告主要简单介绍一下规范解问题的一些背景，并综述性介绍近些年来薛定谔方程和系统中关于规范解方面的一些研究进展，以及对本人在这个研究课题方面跟合作者完成的一些成果做一个简单介绍。	325 581 583
3		鲁建	7月22日	10:00 -11:00 A.M	On a class of Monge-Ampere type equations on the unit hypersphere	We will discuss a class of Monge-Ampere type equations defined on the unit hypersphere, which are related to the Orlicz-Brunn-Minkowski theory in modern convex geometry. These equations are fully nonlinear partial differential equations, and could be degenerate or singular in different cases. We will talk about some recent results about the existence and non-uniqueness of solutions to these equations.	381 792 704
4	丁时进教授	王勇		15:00 -16:00 P.M	Analysis on the viscoelastic conductive fluid model	We derive the viscoelastic conductive fluid model by an energetic variational approach. Then we study the global well-posedness of the initial and initial-boundary value problems of that model in dimension three. In particular, the optimal time-decay rates of solutions are obtained. This is a joint work with Zhong Tan, Wenpei Wu and Guochun Wu.	711 926 841
5	王筱平教授	廖仲威	7月23日	10:00 -11:00 A.M	随机系统稳定性的研究及其交叉应用	本报告围绕随机系统展开，讲述其稳定性的研究在经济预测，风险控制，误差估计，非对称博弈等领域的交叉应用。特别的，报告结合我们最近的研究工作，主要讲述概率方法，随机控制等工具在经济最优化中的应用。	698 897 355
6		袁源	7月24日	15:00 -16:00 P.M	Vacuum free boundary problem of nonisentropic fluids & Periodic perturbations of shocks and rarefaction waves	This talk contains on two topics. This first one is the vacuum free boundary problem of the nonisentropic compressible Navier-Stokes equations. The local-in-time existence and uniqueness of strong solutions in three-dimensional space are proved. We will also introduce a class of globally defined large solutions to the free boundary problem of compressible full Navier-Stokes equations with constant shear viscosity, vanishing bulk viscosity and heat conductivity. Such solutions are established with initial data perturbed around the self-similar solutions. For all the solutions above, the vanishing density and temperature condition is imposed on the free boundary, and the entropy could be bounded. The second topic focus on Riemann solutions under initial periodic perturbations for 1-d scalar convex inviscid or viscous conservation laws. It is proved that shock waves or shock profiles are asymptotically stable under initial periodic perturbations up to a constant shift. This shift may be generated by the difference of two different periodic perturbations at two infinities, and in the viscous case even the same periodic perturbations. The rarefaction waves are asymptotically stable without a shift.	256 346 879
7	包维柱教授	卢键方	7月27日	10:00 -11:00 A.M	Recent Studies on DG method for nonlocal diffusion problems and ILW numerical boundary treatments	We have two topics in this talk. One is the discontinuous Galerkin (DG) method for nonlocal diffusion problems. We show the continuity and stability for the DG schemes. In particular, we show the proposed scheme is asymptotically compatible. The other is the inverse Lax-Wendroff (ILW) procedure for numerical boundary treatments of hyperbolic conservation laws. We propose a novel ILW method to treat the changing wind direction on the boundary.	552 149 783
8		解斌强		15:00 -16:00 P.M	Some Studies on the weak solutions for Navier-Stokes and its coupled equations	In this talk, we will first briefly introduce the development of weak solutions of Navier-Stokes equations in recent years. Subsequently, for a class of multicomponent reactive sytem, in the staedy case, we improve the adiabatic index $\gamma>\frac{7}{3}$ in the Zatorska' result to $\gamma>2$. On the other hand, in the evolution case, the cold pressure assumption in the Zatorska' result is removed. Finally, the global existence of weak solutions for a compressible Navier-Stokes-Fourier model will be discussed. The main point is that the pressure is given by P=R\rho \theta without additional cold pressure assumption.	384 184 819
9	丁时进教授	张昌娟	7月28日	10:00 -11:00 A.M	Acceleration of AIIM for 3D Elliptic Interface Problems	A fast algorithm based on the augmented immersed interface method is proposed to solve the 3D elliptic interface problems. Interpolation scheme that couple the augmented variables with the governing equations through the interface conditions is the key to success. We use a weighted least squares interpolation to approximate the normal derivatives on the interface. Numerical experiments show the accuracy and efficiency of the algorithm. This is joint work with Zhilin Li and Xingye Yue.	411 721 367
10		张孝涛		15:00 -16:00 P.M	Regularity of the weak solutions of liquid crystal equations	In this talk，I will introduce some results about regularity of the weak solutions of liquid crystal equations.	735 819 852
11	王筱平教授	汪韬	7月30日	10:00 -11:00 A.M	Numerical analysis of two Galerkin discretizations with graded temporal grids for fractional evolution equation	Two numerical methods with graded temporal grids are analyzed for fractional evolution equations. One is a low-order discontinuous Galerkin (DG) discretization in the case of fractional order $0<\alpha<1$, and the other one is a low-order Petrov Galerkin (PG) discretization in the case of fractional order $1<\alpha<2$. By a new duality technique, pointwise-in-time error estimates of first-order and ${3-\alpha} $-order temporal accuracies are respectively derived for DG and PG, under reasonable regularity assumptions on the initial value. Numerical experiments are performed to verify the theoretical results. This is a joint work with Binjie Li and Xiaoping Xie.	425 839 235
12		韩毅辉		15:00 -16:00 P.M	An interface/boundary-unfitted eXtended HDG method for linear elasticity problems	An interface/boundary-unfitted eXtended hybridizable discontinuous Galerkin (X-HDG) method of arbitrary order is proposed for linear elasticity interface problems on unfitted meshes with respect to the interface and domain boundary. The method uses piecewise polynomials of degrees k(>= 1) and k-1 respectively for the displacement and stress approximations in the interior of elements inside the subdomains separated by the interface, and piecewise polynomials of degree k for the numerical traces of the displacement on the inter-element boundaries inside the subdomains and on the interface/boundary of the domain. Optimal error estimates in L^2-norm for the stress and displacement are derived, which are uniform with respect to the Lamé constant λ. Finally, numerical experiments confirm the theoretical results and show that the method also applies to the case of crack-tip domain.	551 373 232
13	包维柱教授	黄琼敖	7月31日	15:00 -16:00 P.M	Phase-field model and its structure-preserving scheme for solid-state dewetting problems	In this talk, I will introduce some recent work on solid-state dewetting of thin films. We established a phase-field model for simulating solid-state dewetting problems with weakly anisotropic surface energy, and further extended it to the strongly anisotropic case. The morphological evolution is governed by the anisotropic Cahn-Hilliard equation with degenerate mobility and dynamic contact line boundary conditions. Furthermore, based on the invariant energy quadratization approach with the linear stabilization technique, we proposed an unconditionally energy stable numerical scheme. Then, we perform lots of numerical simulations to demonstrate its stability and accuracy, and examine several specific evolution processes for solid-state dewetting of thin films. In the future, we plan to construct a fast algorithm for this phase-field model in 3D, and apply it to solve the solid-state dewetting problems on curved substrates.	116 485 916
14		张根根	8月3日	10:00 -11:00 A.M	Implicit-explicit methods for stiff differential equations	We present two classes of the implicit-explicit methods methods for stiff ODEs, i.e. the stiff and non-stiff terms are discretized by using implicit and explicit methods, respectively. The order conditions and the convergence results of these methods are obtained. Some efficient methods are constructed.	317 612 841
15	丁时进教授	王观发		15:00 -16:00 P.M	Hydrodynamic Limit of the Boltzmann Equation to the Planar Rarefaction Wave in Three Dimensional Space	In this talk, we introduce our result on the Hydrodynamic limit of the Boltzmann solution to the Euler equations. In general, the solution of Euler equations develops sigularities. Therefore, we consider the case where the Boltzmann solution is the planar rarefaction wave where the physicalspace is of dimension three. In this situation, the Boltzmann solution is not integrable. We introduce a localized energyestimate to overcome this difficulty. It is pointed out that the wave strenghth of the rarefaction wave is allowed to be large in our result.	734 466 564