Core Summary

April 20th
The Chuck* and David segment
of the Keith Burrell show

*But you should not blame him

Statistics

- 25 talks - 1 NS in 5 sessions
- 59 posters - 6 NS
  - Theory/Modeling 34 posters and 16 talks
  - Experiment 21 posters and 8 talks (2 overlap posters and one overlap talk)
  - 6 non tokamak presentations
- 2 discussion sessions

Comments

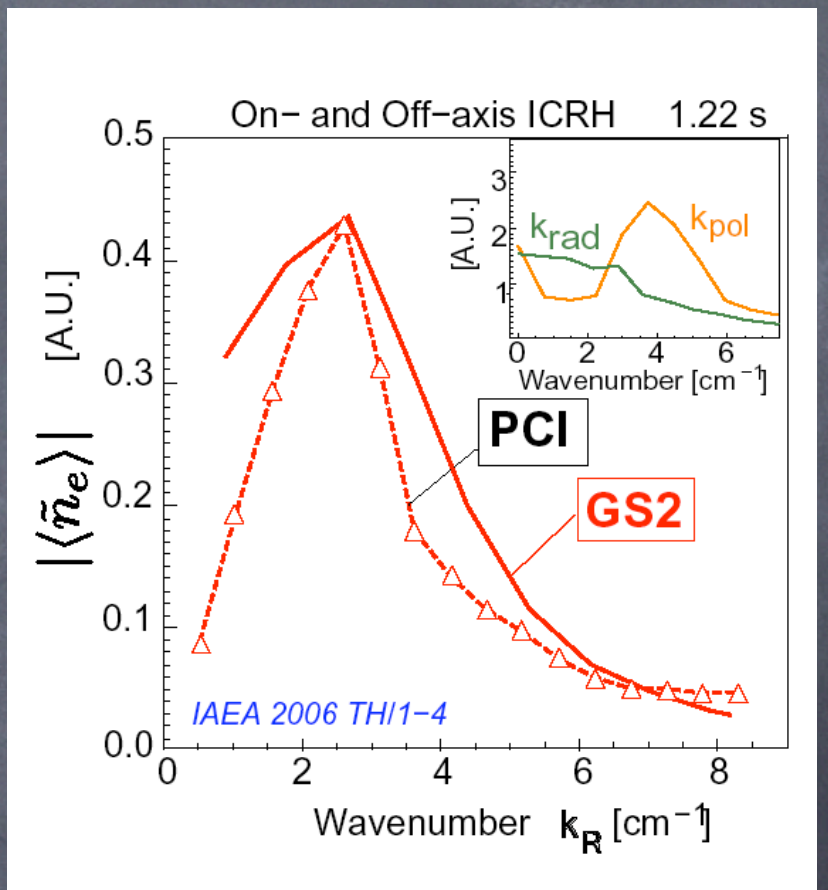
- Balance of theory - experiment
  - must stress inter-species communication
- Much better assimilation of non-tokamak presentations (actual 2 way interactions)
- Excellent posters...we will not discuss these since they were not parallel and there were many
- Real progress on previous focus areas
  - High k diagnostics, electron channel modeling, momentum transport, the search for zonal flows, Bohm/gyro-bohm scaling

Preview Talks

- X. Garbet - Towards a predictive understanding of particle transport
- M. Farge - The role of coherent structures for transport in fully-developed fluid turbulence
- T.S. Hahm - Plasma Rotation and Momentum Transport
- S.E. Sharapov - Fast particle transport: from present-day experiment and modeling towards control of burning plasmas
- A.W. Leonard - A Development Path for a Validated Pedestal Model

Electron transport I

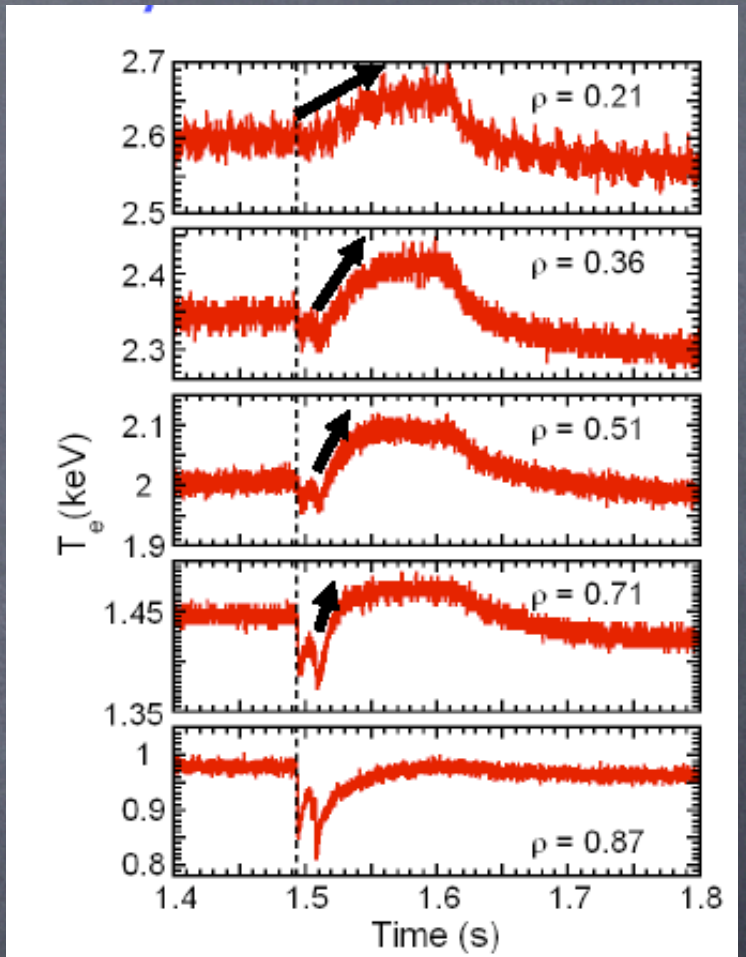
- D.R. Ernst - Direct Observation of TEM Turbulence and Nonlinear Upshift of TEM Critical Density Gradient
  - Directly observed TEM with phase contrast imaging and consistent with results from synthetic PCI diagnostic on GS2



- F. Merz - The physics of trapped electron mode turbulence
  - QL transport model consistent with simulations on NL Gyro kinetic Vlasov code (GENE)

Electron transport II

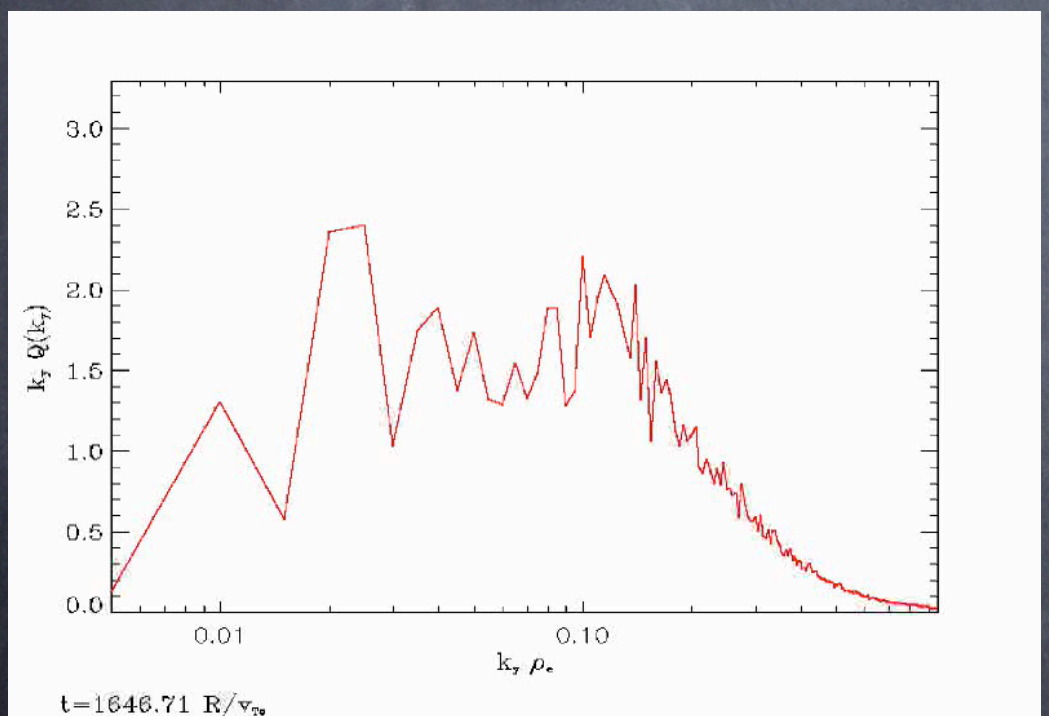
- N. Tamura - Experimental study on nonlocal electron heat transport in LHD
  - Cold pulse=> core temperature rise found in LHD, propagation time core collisionality dependent



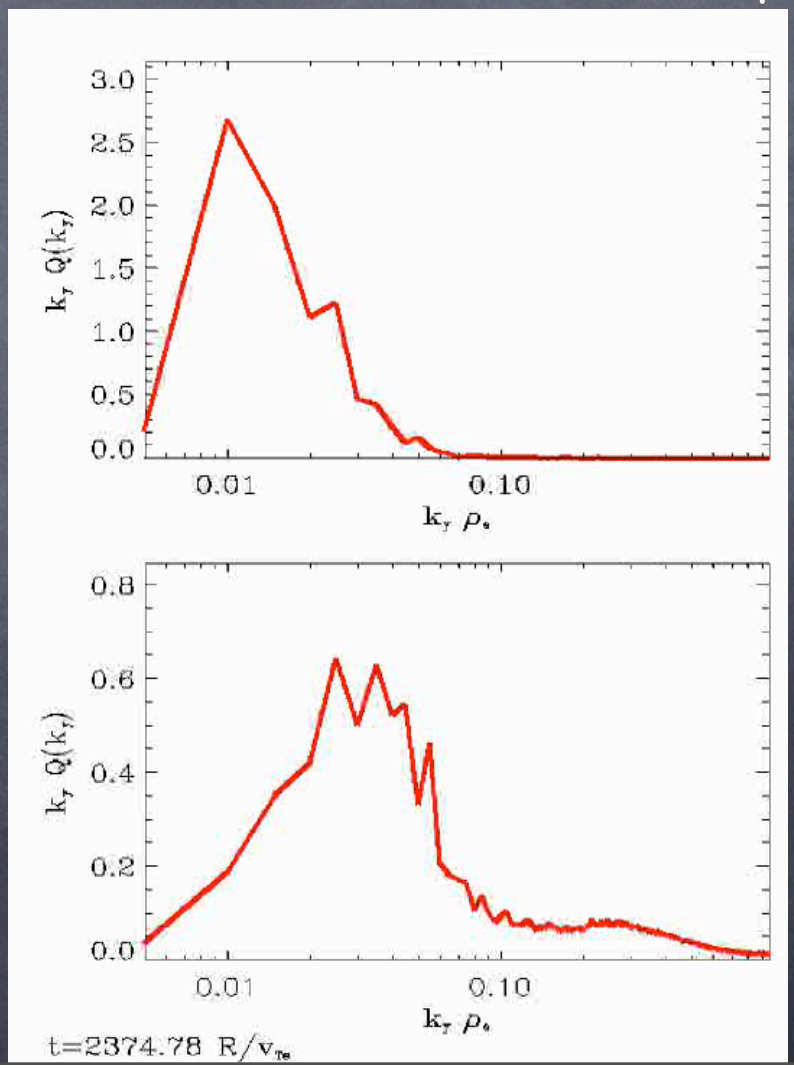
- W. Guttenfelder - Theory Based Transport Modeling of ECRH Plasmas in HSX
  - Weiland model used "successfully" for, profiles and profile changes when changed from QHS to mirror configuration

Turbulence Simulation codes I

- F. Jenko - Scale-separation between ion and electron heat transport
  Large difference between saturated state, transport channels and magnitudes with multiscale interaction(ITG/TEM - ETG). ITG prevents ETG "streamer" formation and reduces electron channel transport



electron (no ITG)



ion

electron

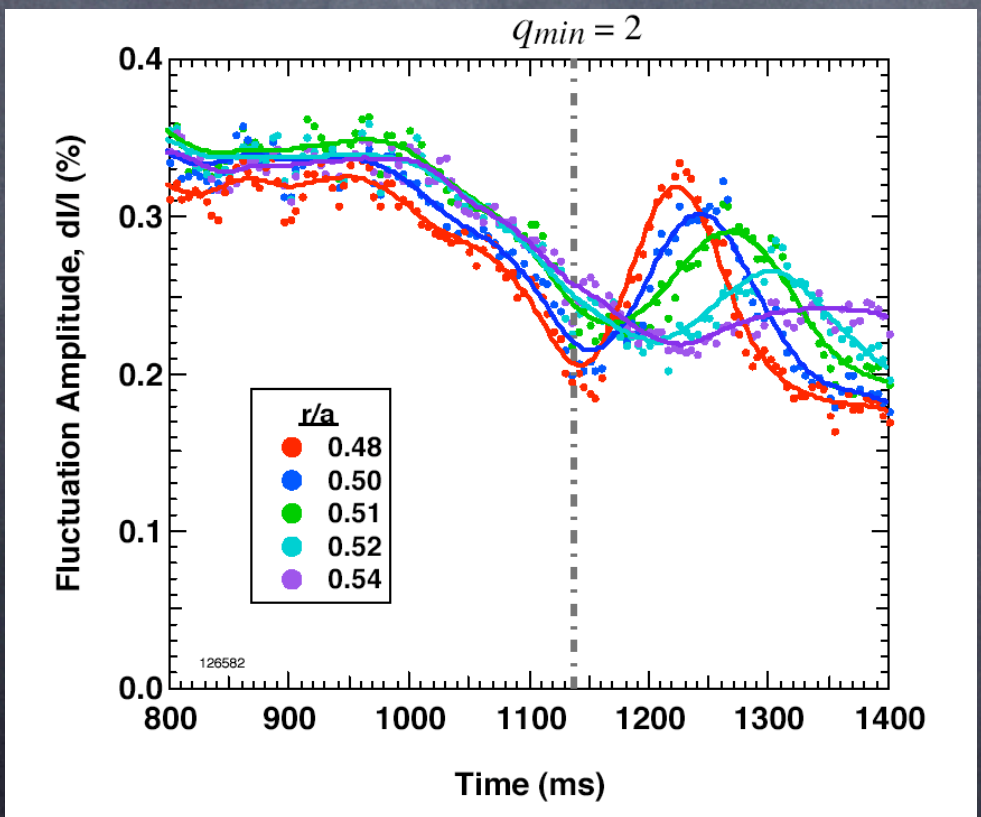
Turbulence Simulation codes II

- Y. Sarazin - Gyrokinetic simulations of ITG turbulence with GYSELA 5D
  - New Full F global semi-Lagrangian gyro-kinetic code developed and benchmarked. Finds bohm scaling at large $\rho*$
- Z. Lin - Turbulent transport via wave-particle decorrelation in collisionless plasmas
  - ETG transport dominated by wave particle decorrelation, other standard mechanisms sub-dominant
- I. Holod - Discrete particle noise in particle-in-cell simulations of plasma turbulence
  - Demonstrated calculated noise contribution to transport can be found and in case shown was much less than calculated ETG flux
- W.W. Lee - Issues Associated with Steady State Turbulence Simulations
  - Noise issue can be addressed by sufficiently large number of particles
  - "Physics alone dictates what kind of codes we should use for turbulent transport simulation"

Flows and Barriers I

- M.E. Austin - Role of ExB shear zonal flow and rational q in ITB formation
- M.W. Shafer - Local Core Turbulence Dynamics During q_min-Triggered Internal Transport Barriers on DIII-D

  Low order rational surfaces trigger transient barrier with no rotation and barrier sustains with rotation present. BES finds reduction in fluctuations moves with qmin



BES measurements indicate turbulence reduction moves outward with q=2 surface in high rotation case

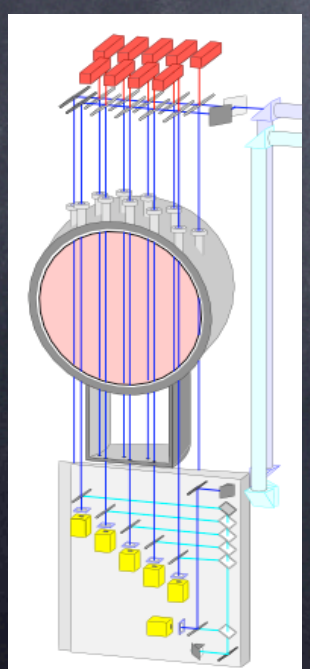
Flows and Barriers II

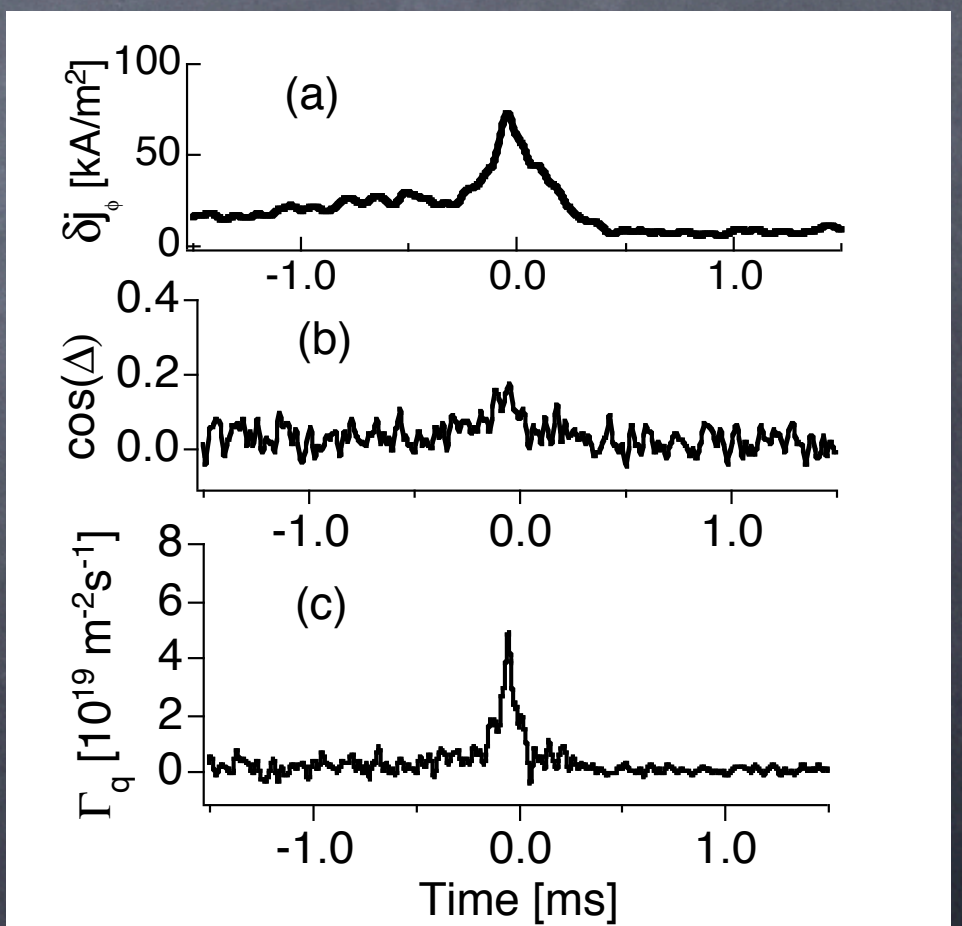
- C.J. McDevitt - Low-q resonances, transport barriers, and secondary electrostatic convective cells
  - Importance of low (but not 0) m flows (convective cells) must be taken into account can be easier to drive and less damped
- F. Hinton - Nonlinear excitation and damping of Zonal Flows using a renormalized polarization response
  - Fluctuation spectrum is in nonlinear state even below (but close to) stability boundary, calculating turbulent damping effects requires care.

Flows and Barriers III

- W.X. Ding - Core Measurements of Magnetic Fluctuation-Induced Particle and Momentum Flux in MST
  Convective particle due to stochastic magnetic field has been measured and can account for density and momentum change in core

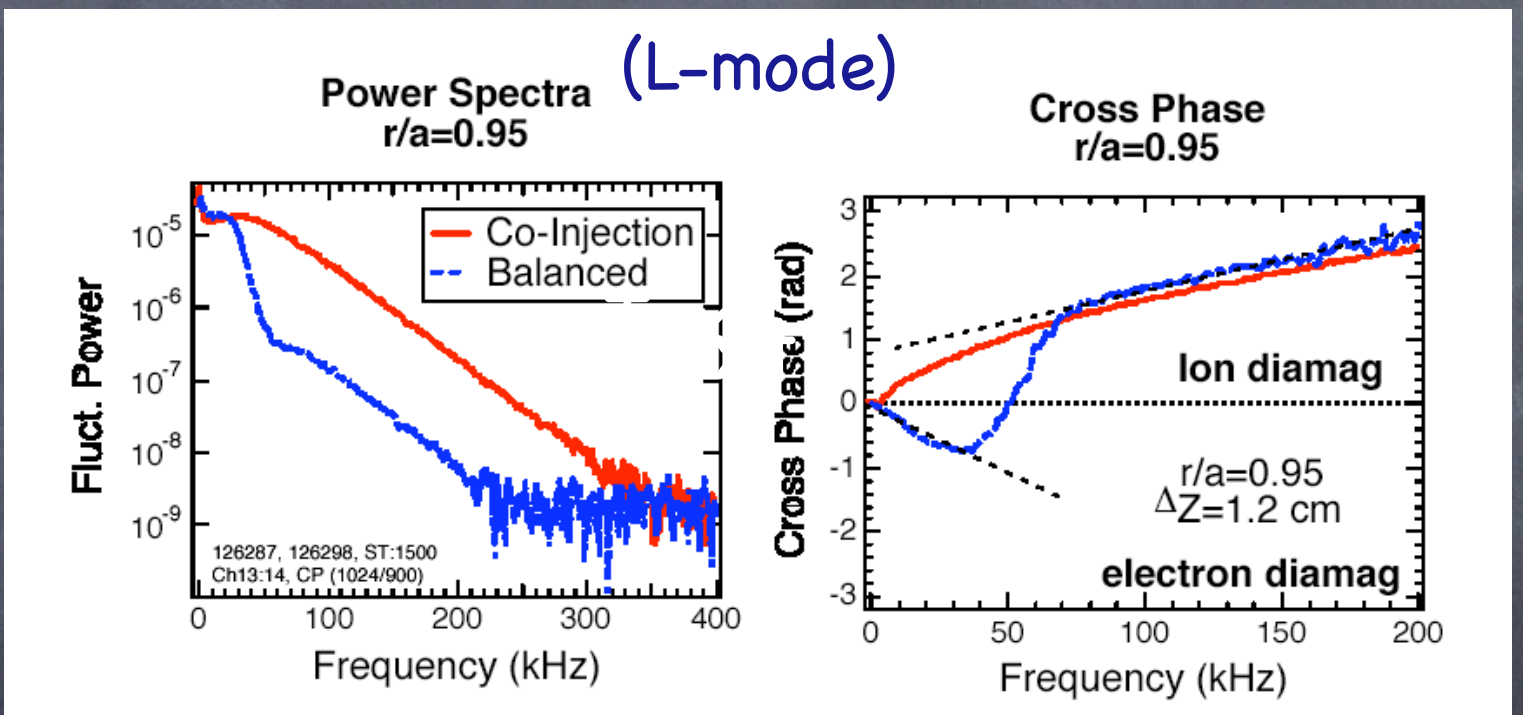
- D.L. Brower - Magnetic Fluctuation-Induced Charge Transport and Zonal Flow Generation in MST
  Magnetic reynolds stress measured with fast polarimeter (though fluctuating J and B) and found to be source for zonal flows [note importance of both forms of reynolds stress]





Flows and Barriers IV

- G.R. McKee - Scaling of Turbulence and Transport with Toroidal Mach Number
  Confinement not effected by rotation in L-mode but improves with rotation in H-mode (change in edge mode characteristics also found)



- P.A. Politzer - Effects of Toroidal Rotation on Hybrid Scenario Plasmas
  At low rotation, Hybrid performance is reduced.
  Still projects to Q≥10 in ITER
  Comparison with GLF23: E×B shear only important in high rotation case,
  Recommend training in use of clicker

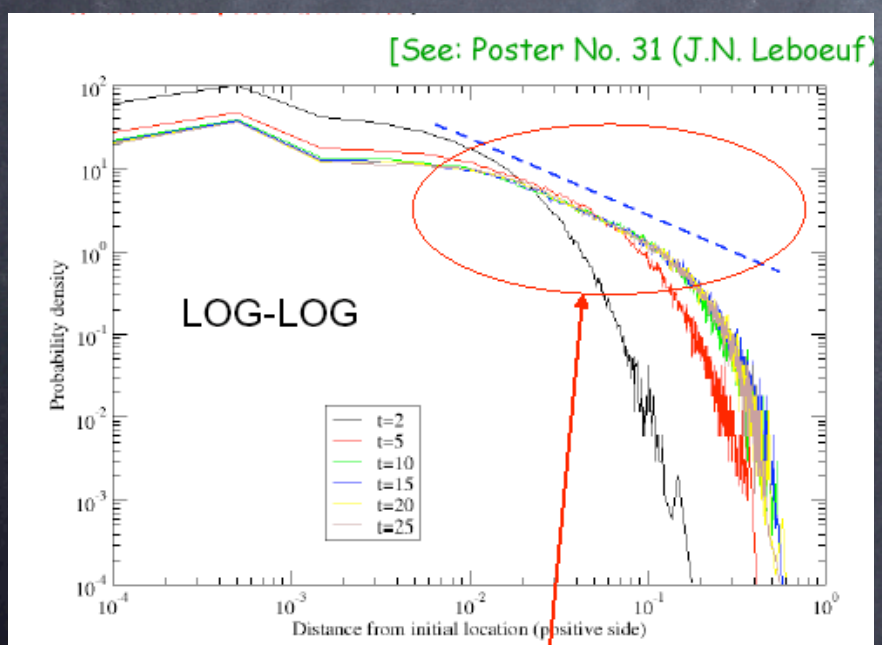
Basic turbulent transport

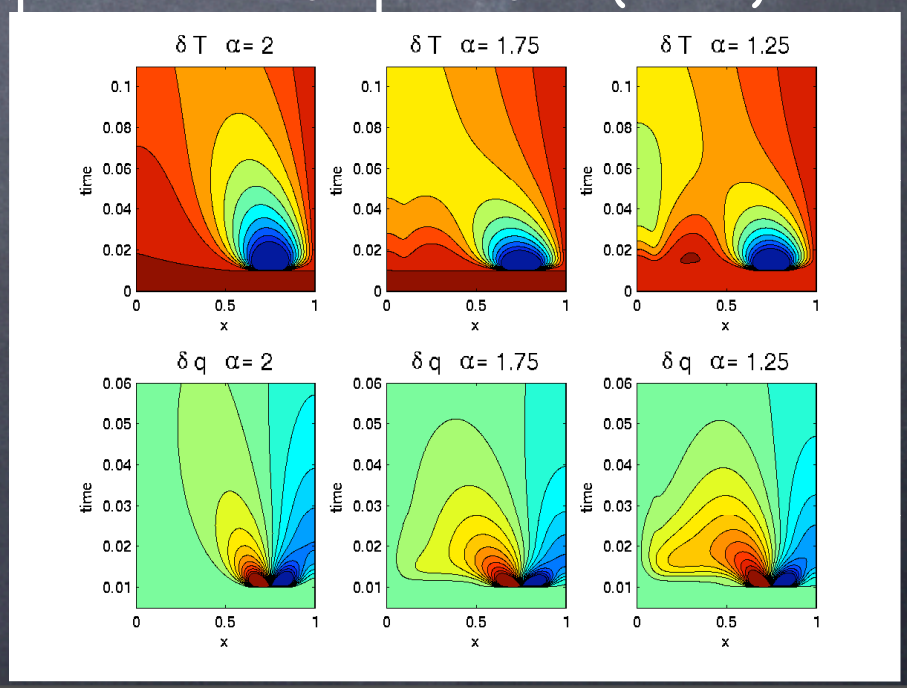
- K.W. Gentle - Magnetic Fluctuations Associated with Electrostatic Drift-Wave Turbulence
  - Magnetic fluctuations correlate to electrostatic density fluctuations in Helimak, magnetic fluctuations could open new window for investigating drift wave dynamics
- N. Vianello - Energy balance including turbulence effects in Reversed Field Pinch Plasmas
  - Presented full set of energy balance equations and actually measured all of the inputs and outputs for the kinetic energy balance equation.

Non-Diffusive Transport

- D. del-Castillo-Negrete Nonlocal transport and fast pulse propagation
- R. Sanchez Overview of recent results regarding the appearance of non-diffusive behavior in fluid and gyrokinetic turbulence codes

  - In order to identify the physical mechanisms responsible for the observed transport (fast pulse etc), build more physical transport models and to provide additional tools for code - code comparisons as well as code experiment comparisons (V&V)





Code Development and V&V

- A.H. Kritz - Plans for the PTRANSP Project
  TRANSP gets "enhanced". New modules, upgrades on existing modules and uniform module interface.
- J.A. Carlsson - Block quasi-Newton solver for transport equations
  New efficient solver being developed for generic transport modeling.
- R.V. Bravenec - Developing Experimentally Relevant Benchmarks for Gyrokinetic Microstability Codes
  Needs dedicated "analyst(s)" to work on serious code V&V, systematic hierarchical approach. For example, inputs must be carefully evaluated as supposed "same" parameters may not be....need for standard/uniform input tools

Discussion

- V&V: We are in favor
  - First presentation, then last presentation in core...synthetic diagnostics
- Parallel sessions: We are opposed
  - Fewer would be better
- Suggested topical areas for next year
  - Transition phenomena
  - Edge-core interface/interactions
  - Energetic particles and core transport
  - Non-diffusive transport
  - MHD and transport
  - Fluctuations

Posters

- P1 Angelino Benchmark of a semi-Lagrangian and a Lagrangian code for gyrokinetic simulations
- P3 Callen Paleoclassical Model: Minimum Transport Levels
- P5 Candy Progress on a Fully Gyrokinetic Transport Code
- P7 DeBoo Design of an Experiment to Discriminate Between ITG and TEM Turbulence
- P9 Doyle Turbulence Measurement Possibilities for ITER
- P11 Fahey Status on the computational aspects of developing a fully gyrokinetic transport code
- P13 Fiore ITB Transport Studies in Alcator C-Mod
- P15 Greenwald Density Peaking And Particle Transport At Low Collisionality On Alcator C-Mod
- P17 Hamada Change of Zonal Flow Spectra in the JIPP T-IIU Tokamak Plasmas
- P19 Holland Comparison of Gyrokinetic Simulation Against Core Turbulence Fluctuation Measurements via Virtual Diagnostics
- P21 Ishizawa Multi-scale interactions among macro-MHD, micro-turbulence, and zonal flows
- P23 Kaye Confinement, transport and turbulence properties of NSTX plasmas
- P25 Kim Electron tranport analysis in NSTX
- P27 Kinsey Plasma Shaping Effects on Driftwave Transport and ExB Shear Quenching in GYRO Simulations
- P29 Kruger Overview of Framework Application for Core-Edge Transport Simulations (FACETS)
- P31 Leboeuf Particle characterization of transport in global gyrokinetic calculations of ion channel turbulence in tokamak plasmas
- P33 Lin, L. Experimental Studies of Turbulence with the Phase Contrast Imaging Diagnostic in the Alcator C-Mod Tokamak
- P35 Mier Non-diffusive features of near-critical DTEM-turbulence in the presence of a subdominant diffusive transport channel
- P37 Newman Role of polarization and ExB nonlinearities in setting tracer transport features in dissipative-trapped-electron-mode turbulence
- P39 Pace Energy Transport Driven by Electron Temperature Gradients
- P41 Plunk Gyrokinetic Secondary Instability Theory for Electron and Ion Temperature Gradient Driven Turbulence
- P43 Pratt Control of Fluctuations in the GAMMA-10 by Sheared Flow
- P45 Rhodes ETG Scale Turbulence and Plasma Transport in the DIII-D Tokamak
- P47 Romanelli Two fluid global simulations of internal and external transport barrier formation and relaxation phenomena in tokamaks
- P49 Rowan Impurity Transport for r/a < 1 in the Alcator C-Mod Tokamak
- P51 Samaddar Noise in transport models
- P53 Schmitz First Doppler Reflectometry Results from the DIII-D Tokamak
- P55 Staebler Saturation Rule for the TGLF Transport Model Fit to Shaped Geometry GYRO Simulations
- P57 Stutman Dependence of the perturbed electron transport on heat flux and q-profile in NSTX
- P59 Terry Nonlinear Refractive Suppression of Turbulence and Transport by Strong Magnetic Shear
- P61 Vermare Studies of the beta dependence of transport in ASDEX Upgrade
- P63 Wang, W. Gyrokinetic Simulation Studies of Plasma Transport in NSTX Experiments

Posters

- P65 White Study of Electron Temperature Fluctuations in DIII-D using a Correlation ECE Diagnostic
- P67 Wong Microtearing instabilities and electron transport in NSTX
- P69 Zakharov Equilibrium Spline Interface (ESI) for magnetic confinement codes
- P71 Ernst Direct Observation of TEM Turbulence and Nonlinear Upshift of TEM Critical Density Gradient
- P73 Gentle Magnetic Fluctuations Associated with Electrostatic Drift-Wave Turbulence
- P75 Hinton Nonlinear excitation and damping of Zonal Flows using a renormalized polarization response
- P77 Holod Discrete particle noise in particle-in-cell simulations of plasma turbulence
- P79 Merz The physics of trapped electron mode turbulence
- P81 Lin, Z. Turbulent transport via wave-particle decorrelation in collisionless plasmas
- P83 McKee Scaling of Turbulence and Transport with Toroidal Mach Number
- P85 Politzer Effects of Toroidal Rotation on Hybrid Scenario Plasmas
- P87 Tamura Experimental study on nonlocal electron heat transport in LHD
- P89 Nevins Time Scales in Plasma Microturbulence
- P91 Sarazin Gyrokinetic simulations of ITG turbulence with GYSELA 5D
- P94 Jenko Scale-separation between ion and electron heat transport
- P95 Lee Issues Associated with Steady State Turbulence Simulations
- P96 Guttenfelder Theory Based Transport Modeling of ECRH Plasmas in HSX
- P97 Austin Role of ExB shear zonal flow and rational q in ITB formation
- P98 Shafer Local Core Turbulence Dynamics During q_min-Triggered Internal Transport Barriers on DIII-D
- P99 McDevitt Low-q resonances, transport barriers, and secondary electrostatic convective cells
- P100 Brower Magnetic Fluctuation-Induced Charge Transport and Zonal Flow Generation in MST
- P101 Kritz Plans for the PTRANSP Project
- P102 Carlsson Block quasi-Newton solver for transport equations
- P103 del-Castillo-Negrete Nonlocal transport and fast pulse propagation
- P104 Vianello Energy balance including turbulence effects in Reversed Field Pinch Plasmas
- P105 Sanchez Overview of recent results regarding the appearance of non-diffusive behaviour in fluid and gyrokinetic turbulence codes
- P106 Bravenec Developing Experimentally Relevant Benchmarks for Gyrokinetic Microstability Codes

Wednesday (April 18 2007)

- 10:30 - 12:00 Core I: Fundamentals (Newman)
- D.R. Ernst Direct Observation of TEM Turbulence and Nonlinear Upshift of TEM Critical Density Gradient
- K.W. Gentle Magnetic Fluctuations Associated with Electrostatic Drift-Wave Turbulence
- F. Hinton Nonlinear excitation and damping of Zonal Flows using a renormalized polarization response
- I. Holod Discrete particle noise in particle-in-cell simulations of plasma turbulence
- F. Merz The physics of trapped electron mode turbulence
- 3:30 - 5:00 Core II: Transport (Greenwald)
- W.X. Ding Core Measurements of Magnetic Fluctuation-Induced Particle and Momentum Flux in MST
- Z. Lin Turbulent transport via wave-particle decorrelation in collisionless plasmas
- G.R. McKee Scaling of Turbulence and Transport with Toroidal Mach Number
- P.A. Politzer Effects of Toroidal Rotation on Hybrid Scenario Plasmas
- N. Tamura Experimental study on nonlocal electron heat transport in LHD

Thursday (April 19 2007)

- 8:30 - 10:00 Core III: Transport and Fundamentals 1 (Chuck)
- R. Sanchez Overview of recent results regarding the appearance of non-diffusive behaviour in fluid and gyrokinetic turbulence codes
- Y. Sarazin Gyrokinetic simulations of ITG turbulence with GYSELA 5D
- F. Jenko Scale-separation between ion and electron heat transport
- W.W. Lee Issues Associated with Steady State Turbulence Simulations
- W. Guttenfelder Theory Based Transport Modeling of ECRH Plasmas in HSX
- 10:30 - 12:00 Core IV: Barriers etc (Terry)
- M.E. Austin Role of ExB shear zonal flow and rational q in ITB formation
- M.W. ShaferLocal Core Turbulence Dynamics During q_min-Triggered Internal Transport Barriers on DIII-D
- C.J. McDevitt Low-q resonances, transport barriers, and secondary electrostatic convective cells
- D.L. Brower Magnetic Fluctuation-Induced Charge Transport and Zonal Flow Generation in MST
- A.H. Kritz Plans for the PTRANSP Project
- 3:30 - 5:00 Core V: Transport and Fundamentals 2 (Newman)
- J.A. Carlsson Block quasi-Newton solver for transport equations
- D. del-Castillo-Negrete Nonlocal transport and fast pulse propagation
- N. Vianello Energy balance including turbulence effects in Reversed Field Pinch Plasmas
- R.V. Bravenec Developing Experimentally Relevant Benchmarks for Gyrokinetic Microstability Codes
- 5:00 - 6:00 Discussion