
Hotel Leininger Hof


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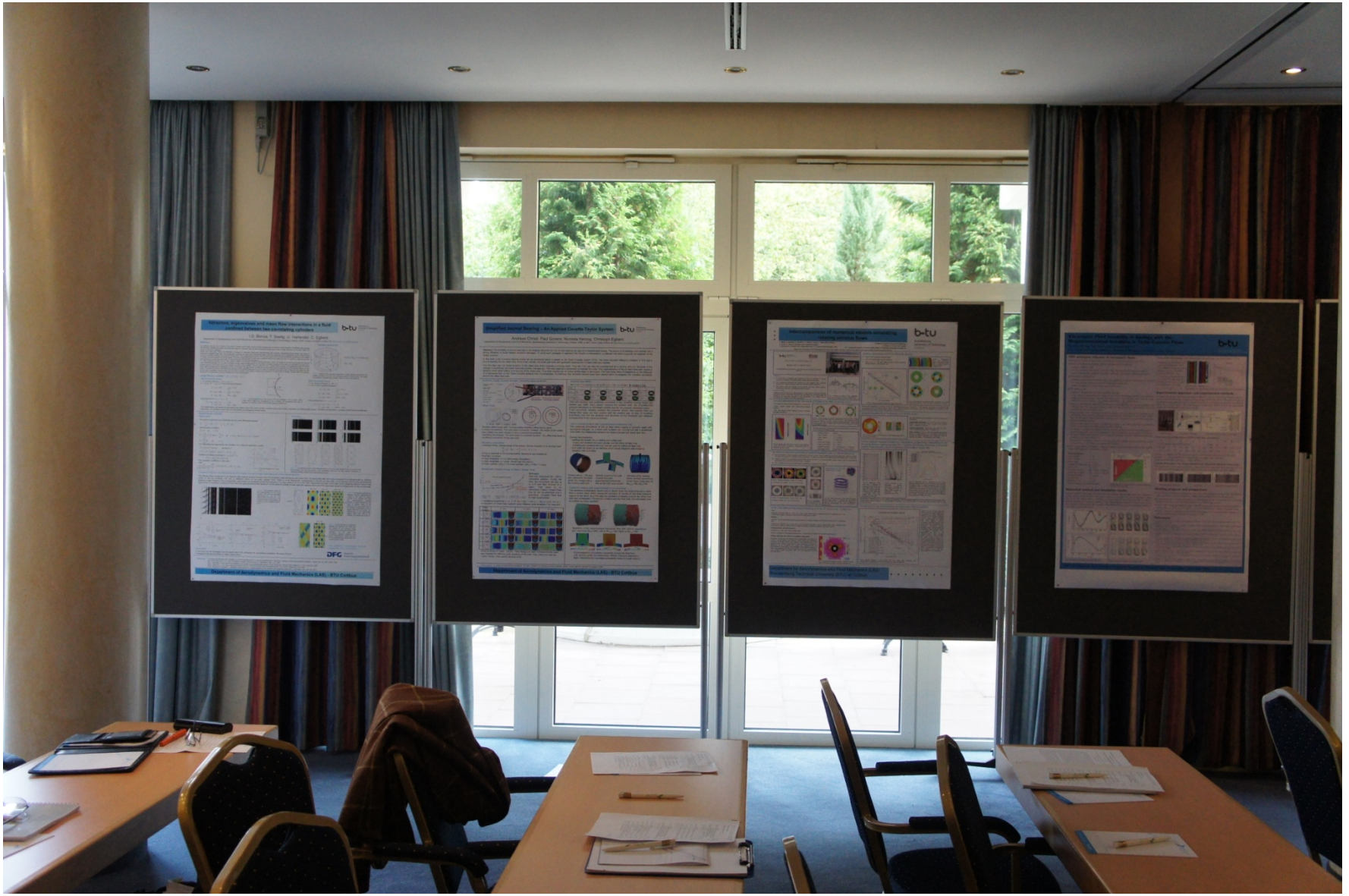
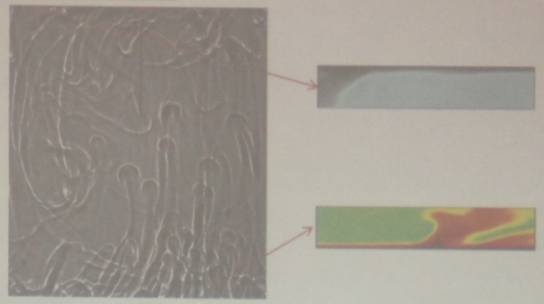
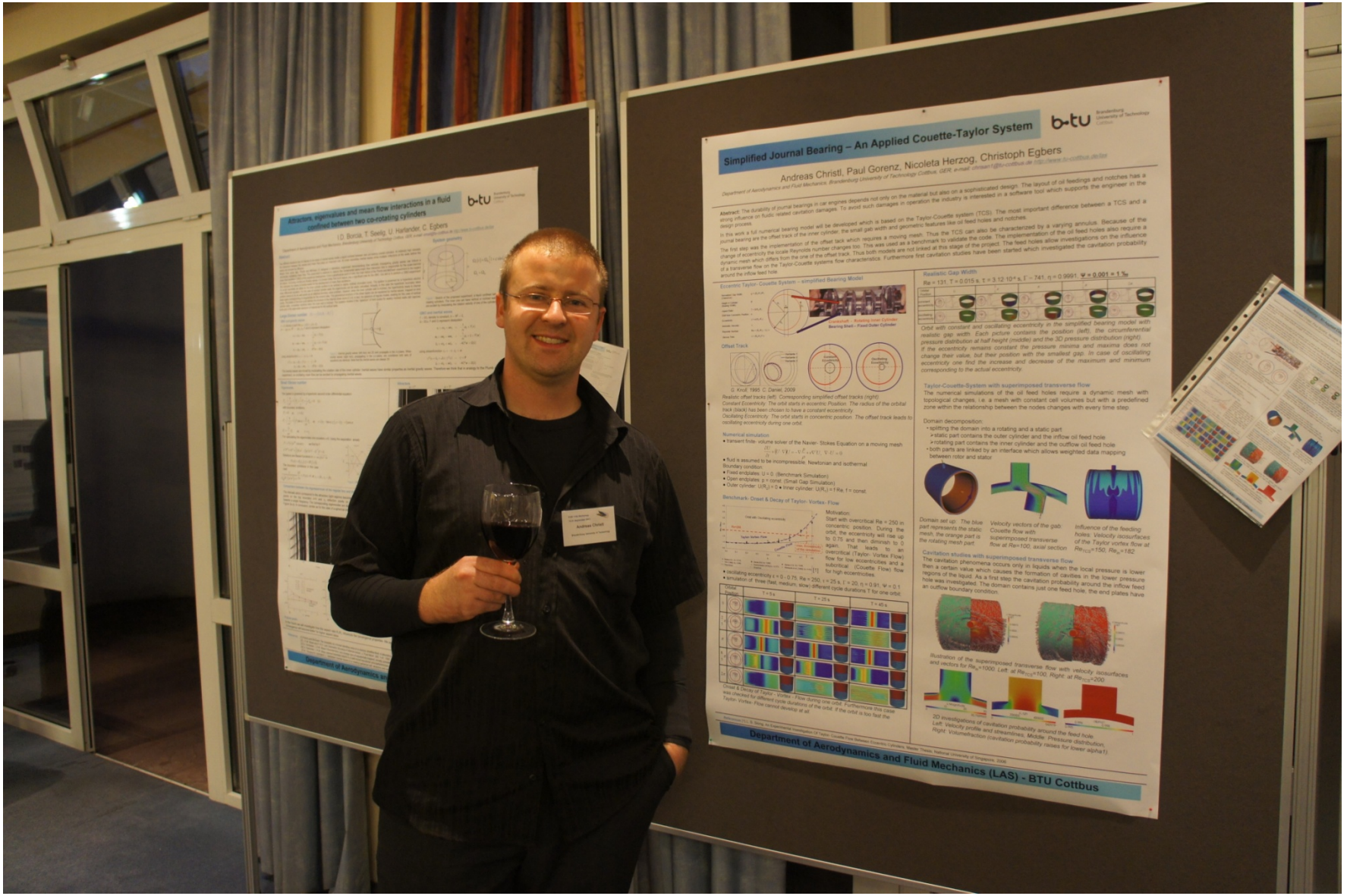


1. Motivation

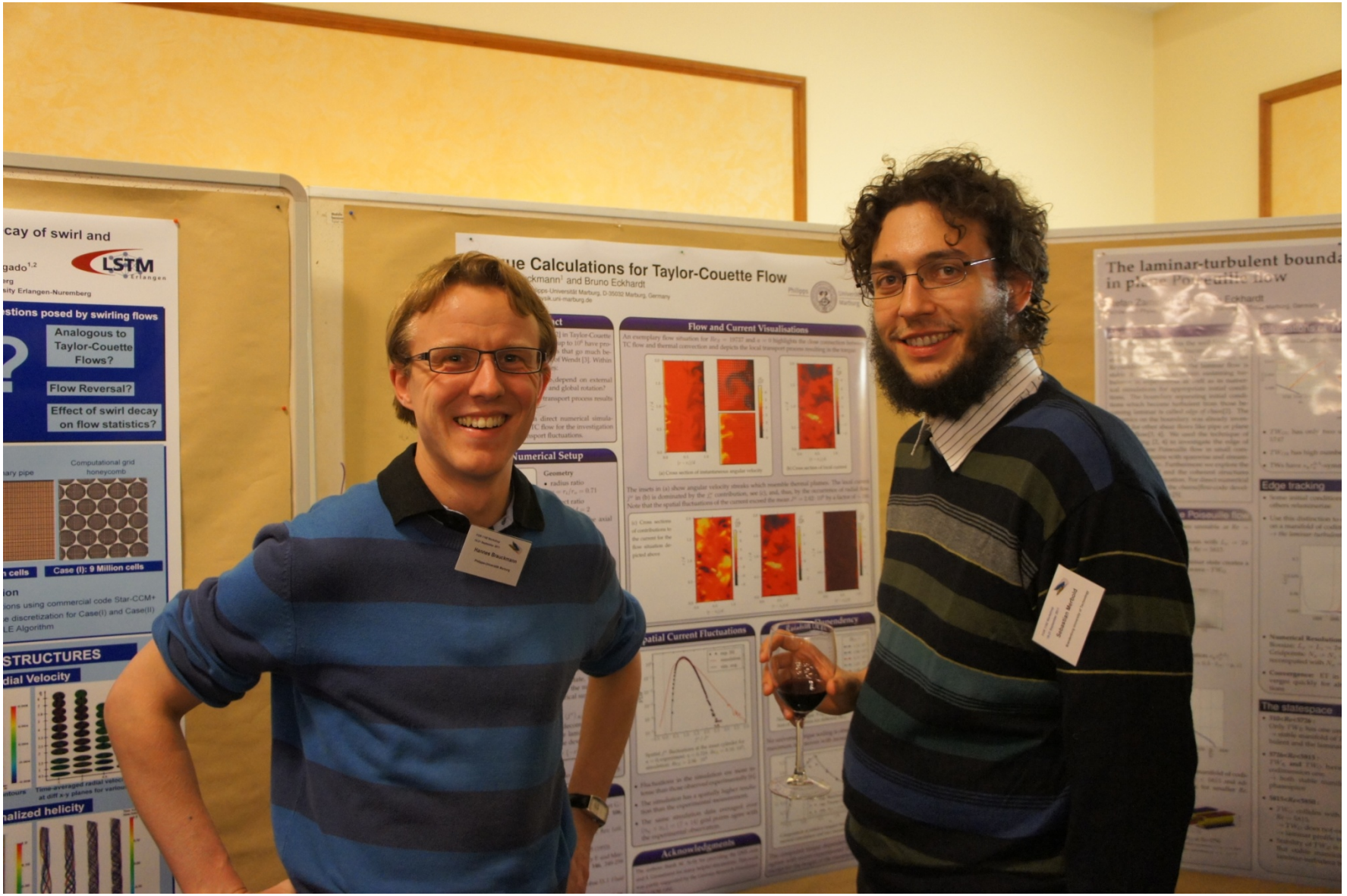


- Thermal convection is a basic and important ingredient for the motion of air or the flow of water
- RB convection is one of the paradigmatic models in the study of details of turbulence
- Boundary layer plays an important role, which determines the global heat flux in the turbulent RB convection
- The direct measured wall-normal velocity and their fluctuations data are still missing

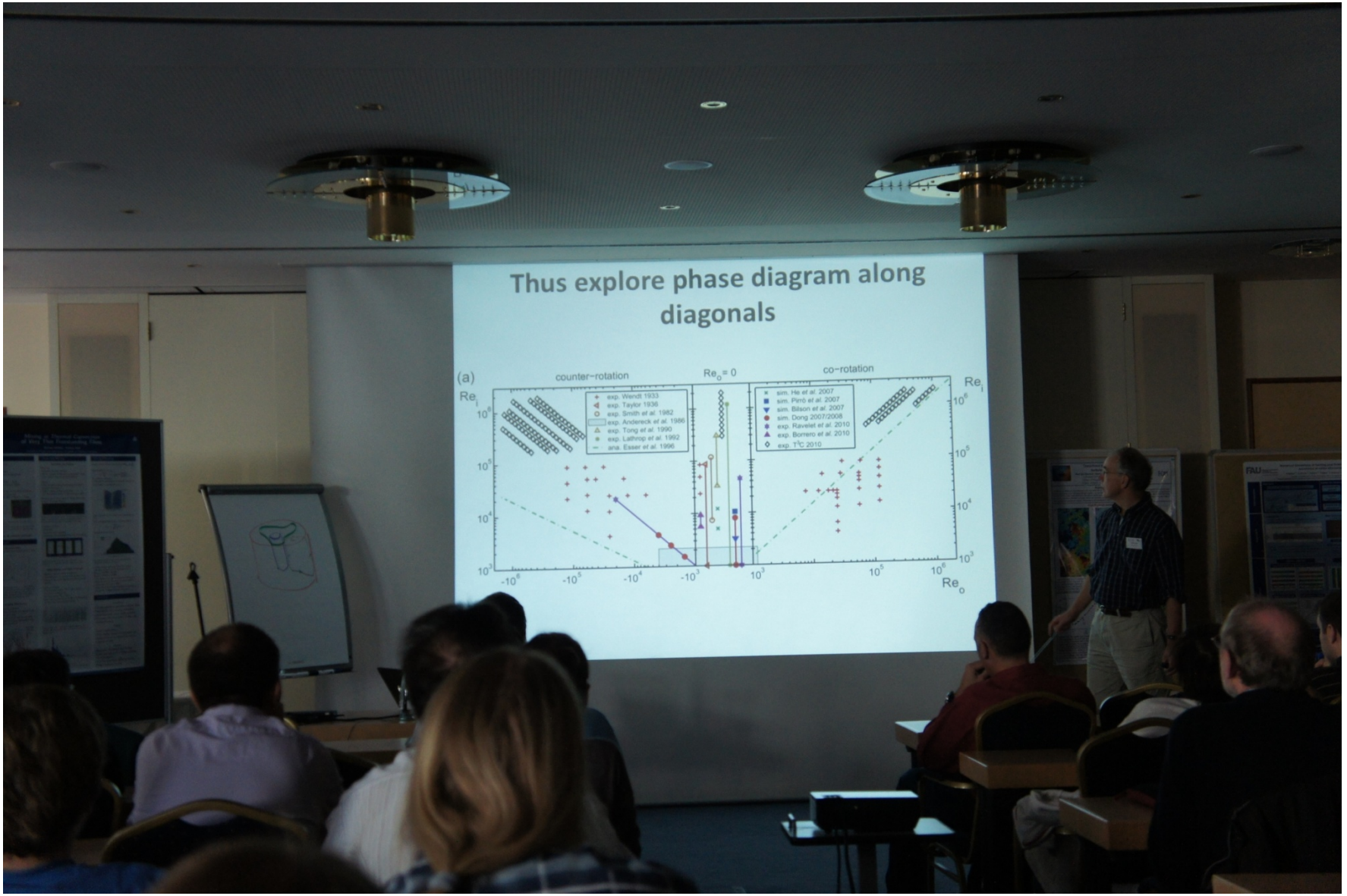

Boussinesq equations for dry convection
Oberbeck, Ann. Phys. Chem. 1879; Boussinesq, Théorie Analytique de la Chaleur, 1903
Mass balance
$\nabla \cdot \vec{u} = 0$
Momentum balance
$\partial_t \vec{u} + (\vec{u} \cdot \nabla)\vec{u} = -\frac{1}{\rho_0}\nabla p + \nu \nabla^2 \vec{u} + \vec{f}$
Energy balance
$\partial_t T + (\vec{u} \cdot \nabla)T = \kappa \nabla^2 T$
$\vec{f} = g\left[\frac{T - T_0}{T_0}\right]\vec{e}_z$
plus b.c.
Direct numerical simulation with 2nd order finite difference scheme
Verzicco & Camussi, JFM (2003)


Simplified Journal Bearing – An Applied Couette-Taylor System
Andreas Christl, Paul Gorenz, Nicoleta Herzog, Christoph Egbers
Department of Aerodynamics and Fluid Mechanics (LAS) - BTU Cottbus


Torque Calculations for Taylor-Couette Flow
Motion of Inertial Particles in a Cellular Flow Field
DLR

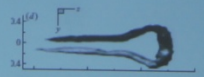

cay of swirl and
LSTM
Erlangen
stions posed by swirling flows
Analogous to Taylor-Couette Flows?
Flow Reversal?
Effect of swirl decay on flow statistics?
Computational grid
honeycomb
Case (I): 9 Million cells
STRUCTURES
dial Velocity
alized helicity
ue Calculations for Taylor-Couette Flow
Flow and Current Visualisations
Numerical Setup
Geometry
Spatial Current Fluctuations
Acknowledgments
The laminar-turbulent bounda
Edge tracking
The statespace


UNIVERSITY OF LEEDS
Theory of liquid metal experiment
in rotating cylinders and spheres
Rainer Hollerbach
Department of Earth Sciences
Swiss Federal Institute of Technology, Zurich
(supported by an ERC grant to Prof. A. Jackson)

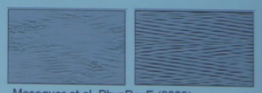

Thus explore phase diagram along diagonals
(a)
counter−rotation
$Re_o = 0$
co−rotation
Re_i
Re_o
exp. Wendt 1933
exp. Taylor 1936
exp. Smith et al. 1982
exp. Andereck et al. 1986
exp. Tong et al. 1990
exp. Lathrop et al. 1992
ana. Esser et al. 1996
sim. He et al. 2007
sim. Pirro et al. 2007
sim. Bilson et al. 2007
sim. Dong 2007/2008
exp. Ravelet et al. 2010
exp. Borrero et al. 2010
exp. TUC 2010

Motivation

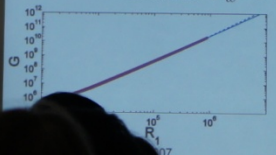
- Measuring the dissipation rate and transport parameters
- Variation of boundary layers and near wall structures
- Measuring the angular momentum flux $J_\omega = \nu^2 G$



Vetel et al. JFM 2008

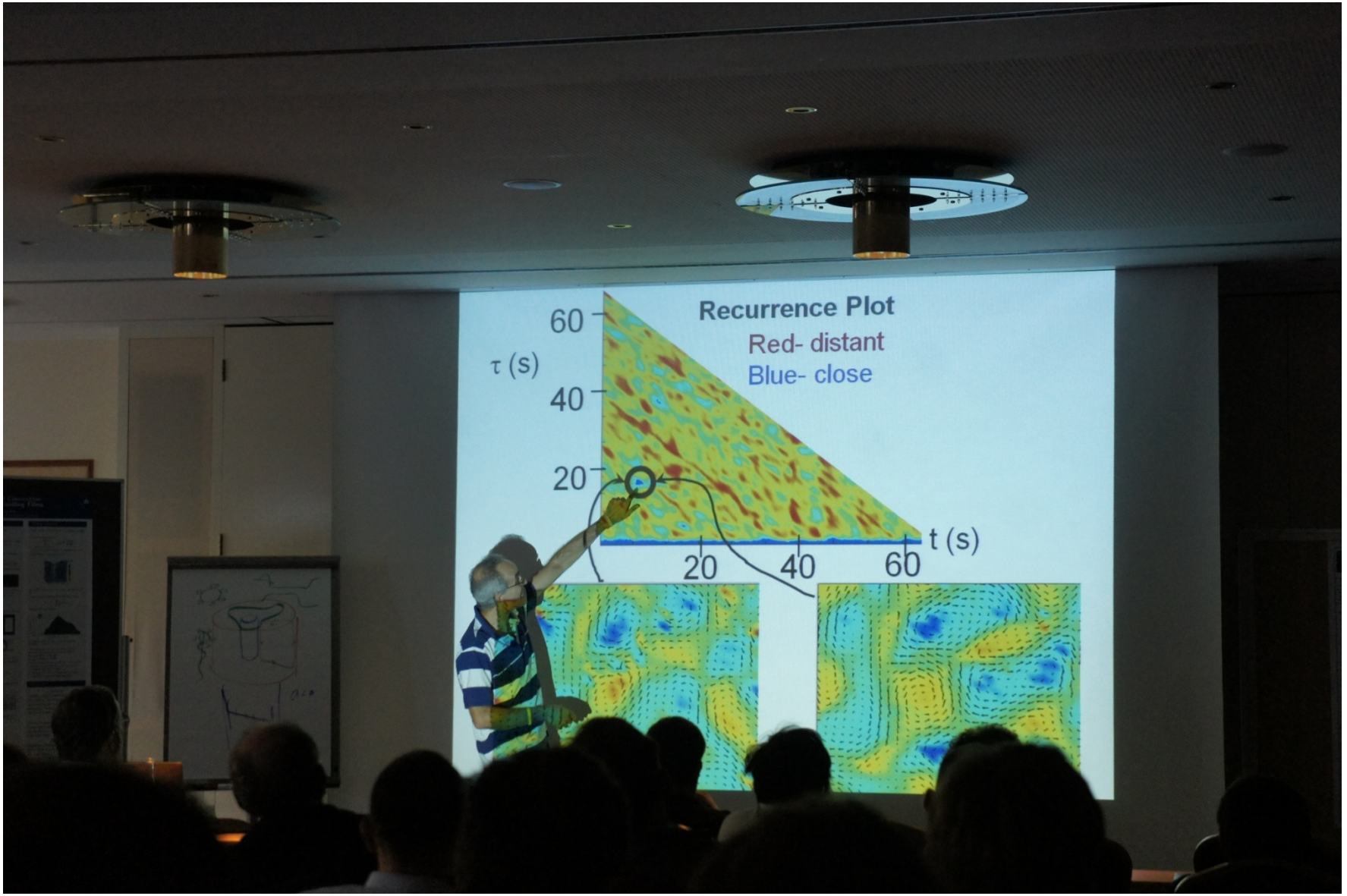


Meseguer et al. PhysRevE (2009)

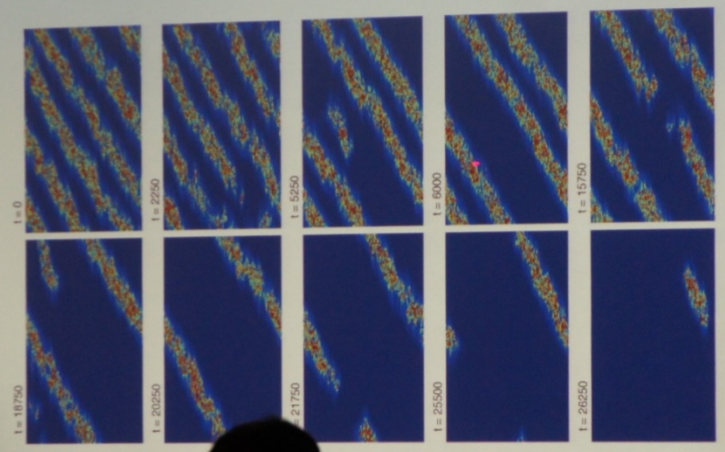


- Turbulence in sub- and supercritical domains
- Scaling of the torque $G \sim Re^{\alpha}$

cs and Fluid Mechanics


Recurrence Plot
Red- distant
Blue- close
τ (s)
60
40
20
t (s)
20
40
60

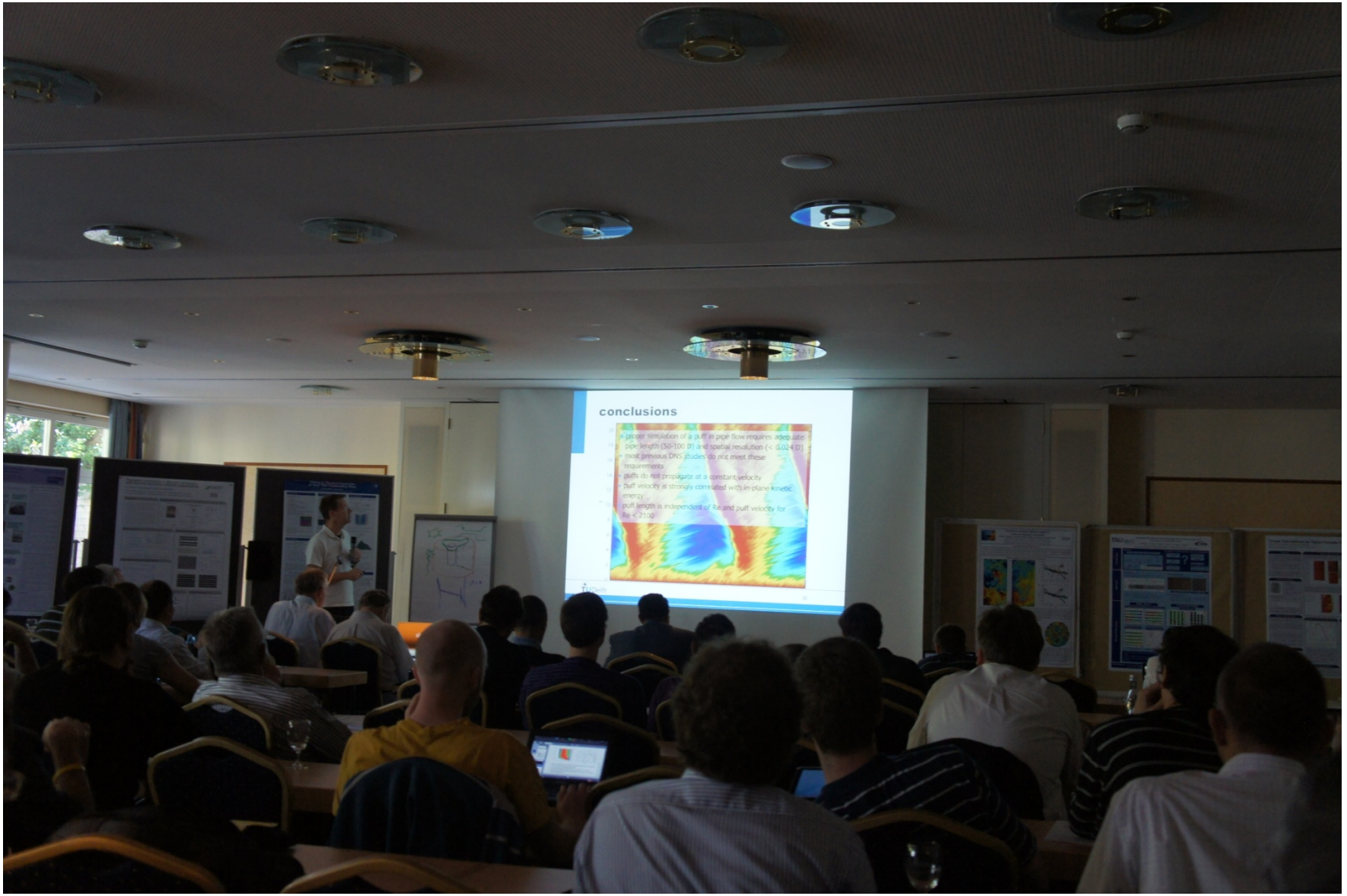
- video 1: decay of well-formed bands $R = 272.5$




eutsche Ban


Audi


Nikon


conclusions
proper simulation of a puff in pipe flow requires adequate pipe length (50-100 D) and spatial resolution (< 0.024 D)
most previous DNS studies do not meet these requirements
puffs do not propagate at a constant velocity
puff velocity is strongly correlated with in-plane kinetic energy
puff length is independent of Re and puff velocity for Re < 2100


DFG
FOR 1182 workshop 19-21. Sept. 2011, Bad Dürkheim, Germany
Sabrina LECHEHEB
Ahcène BOUABDALLAH and Mahmoud ZIZI
Laboratory of Thermodynamics and Energetic Systems
University of Science and Technology Houari Boumediene, Algiers, Algeria
Numerical approach of modified Graëtz problem with and without magnetic field
USTHB, BP 32 El Alia, Babezzouar, Algiers, Algeria


Analytical solution for laminar oscillatory pipe flow ‡
$C \cdot \sin(\omega t)$
C
$\frac{1}{2}\pi$
π
$\frac{3}{2}\pi$
2π
ωt[rad]
$Wo \ll 1$
$Wo = 1$
$Wo > 1$
$Wo \gg 1$
‡ J.R. Womersley Journal of Physiology (1955)
Deutsches Zentrum für Luft- und Raumfahrt e.V.
in der Helmholtz-Gemeinschaft
DLR
Oscillatory pipe flow, D. Fel
Slide 4 of 15


Research Department for Underwater Acou
and Marine Geophysics
• Measurements of flow noise
axisymmetric boundary layer
• Coherent *convective* turbulen
and fluid-structure interactio
• Scaling and statistics of flow