Data Availability

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NORDITA

Linné Flow Centre, KTH Mechanics,

KTH Royal Institute of Technology

Stockholm, Sweden

April 6-30, 2010

Data Availability

Boundary layers:

- **X. Wu**: DNS Re_theta 80 to 2000. Full 3D velocity fields.
  http://www.stanford.edu/group/ctr/
- **G. Coleman**: Ekman-layer DNS data, with profiles of the usual first- and second-order statistics, and a few instantaneous fields.
- **J. Jimenez**: DNS, One point profiles of velocities, vorticities and full balances (both for ch180-2000 and bl (at Retheta=1000, 1500, 2000). 2D (kx-kz) spectra for the four channels at several wall distances, and kz, x-x' correlations for bl. 1D and 2D pdfs of several quantities and for several wall distances (e.g. u, v, w, p. -- u-v, u-omega, etc.) for ch and bl.
  http://torroja.dmt.upm.es/
- **B. McKeon**: Profiles from the SLTEST data about atmospheric (high Re) data
- **R. Örlü**: Access to statistics of recent (lower-Re) experiments at KTH Stockholm; limited access to time series
- **ICET**: Access to the mean and rms profiles for the high-Re experiments within the ICET - International Collaboration on Experiments in Turbulence effort.
- **P.-Å. Krogstad**: Data from –92 JFM paper (Vol 245, pp 599-) on mesh type roughness (3D roughness) and on rod type roughness (2D roughness), Fluid Dynamic research 2001 (Vol 28, pp 139-). This will primarily be Mean velocity and Reynolds stresses, but some triple correlations are also available.

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Pipe flow:

- **X. Wu**: DNS: Mean, second-order statistics for pipe flow at Re_D 5300, 25,000 and 44,000. Full 3D velocity fields.
  http://www.stanford.edu/group/ctr/

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Channel flow:

- **H. Abe**: Channel-flow DNS data, 11 cases for the velocity and scalar fields (Velocity at Re_tau=180, 395, 640 and 1020; scalar Pr=0.71 at Re_tau=180, 395, 640 and 1020; scalars Pr=0.025 at Re_tau= 180, 395 and 640).

  http://murasun.me.noda.tus.ac.jp/

  http://www.iat.jaxa.jp/db/index.html/

- **J. Jimenez**: DNS Re_τ=180-2000 (see above) Raw data: there are test files for the 180-950 chs in the web page, freely downloadable (and often downloaded). A larger data base of about 70 fields (950)

  http://torroja.dmt.upm.es/

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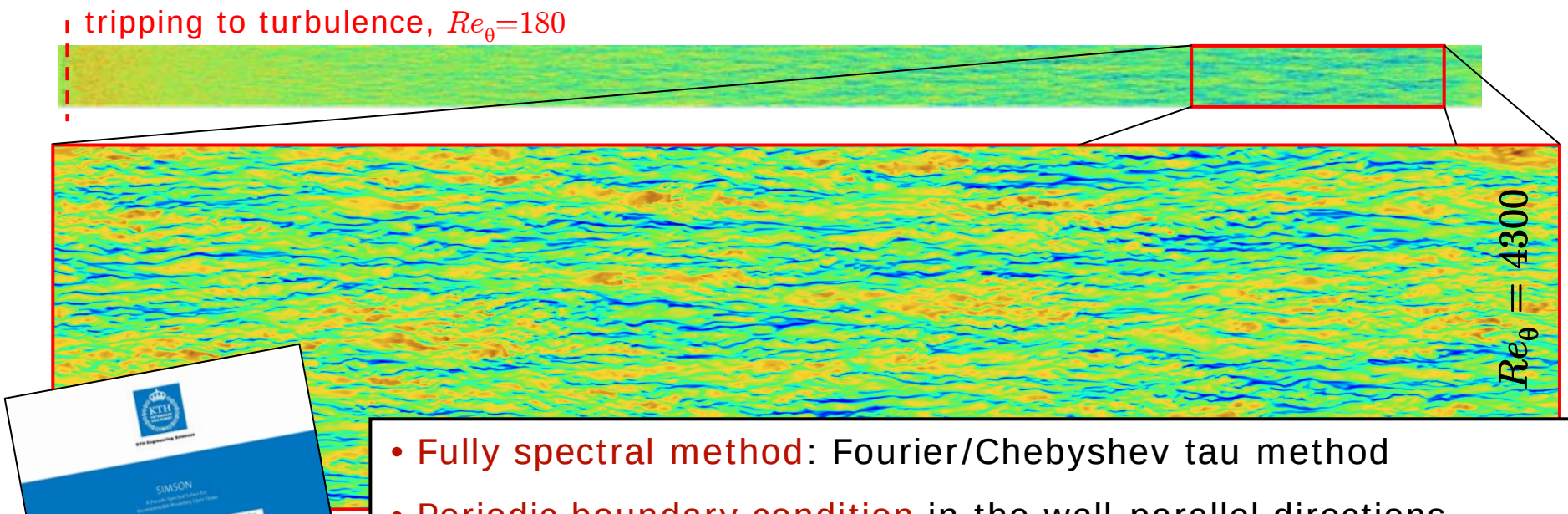
KTH Boundary-Layer Data

- DNS with 8192 x 513 x 768 = 8 billion grid points
  $\Delta x^+ = 9$, $\Delta y^+ = 0.04\text{-}14$, $\Delta z^+ = 4$



- Fully spectral method: Fourier/Chebyshev tau method
- Periodic boundary condition in the wall-parallel directions, no-slip at lower wall, Neumann conditions at upper boundary.
- Fringe region (volume force) to enforce laminar Blasius inflow
- Trip forcing to induce “natural” laminar-turbulent transition
- Code **SIMSON** (Chevalier *et al.* 2007) on $\mathcal{O}(1000)$ processors

KTH Data

Turbulent boundary layers (Philipp Schlatter)
www.mech.kth.se/~pschlatt/DATA

DNS Re_θ=300-4300

- statistics, time series/spectra, budgets etc.
- full velocity fields

LES Re_θ=300-4300

- essentially the same as for DNS, but with the much easier possibility to rerun

For access to the data, please contact me.

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TBL with passive scalars

DNS (Qiang Li)

- Re_θ=300-850
- 5 scalars: Pr=0.2, 0.71, 2.0
- statistics, budgets, time series, and instantaneous fields, two-point correlations

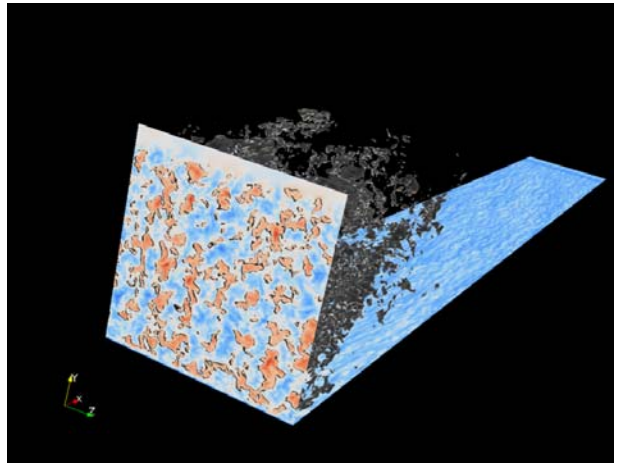
  http://www.mech.kth.se/~qiang/DATA/

LES

- Re_θ=300-2500
- 3 scalars: Pr=0.2, 0.71, 2.0
- statistics, budgets, spectra, fields

LES with free-stream turbulence

- Re_θ=300-1000
- 1 scalar: Pr=0.71
- statistics, budgets, spectra, fields



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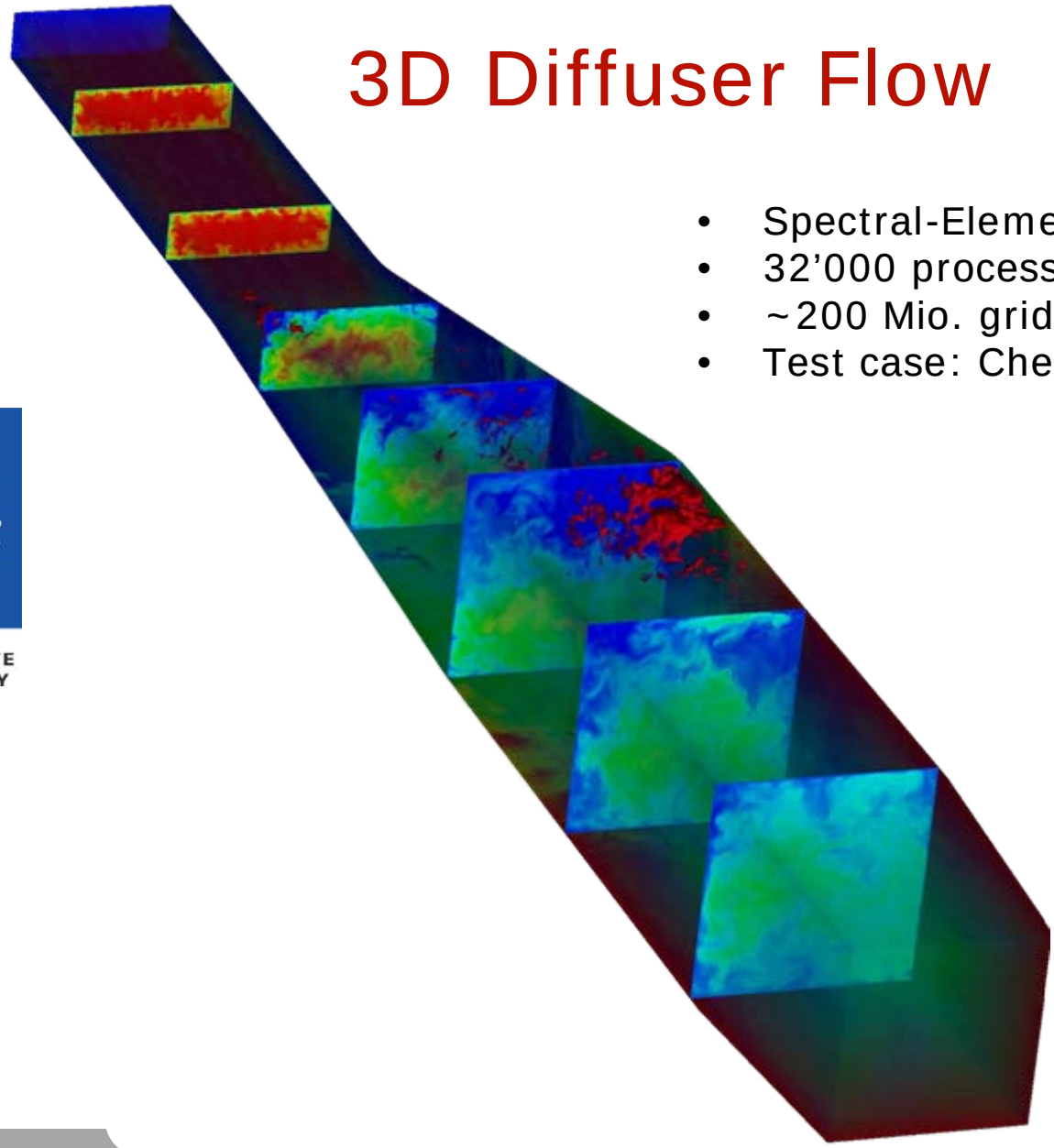
3D Diffuser Flow



- Spectral-Element Method
- 32’000 processors BG/P
- ~200 Mio. grid points
- Test case: Cherry et al. (2007)

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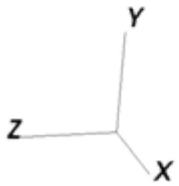

List of Topics

- **DNS/EXP comparison, what to expect, what to compare**
- **Resolution/box size requirements, both exp and simulation**
- Peak-rms: flow case, resolution issues. Higher order statistics, urms in channel/pipe centre...?
- New analysis methods of data (experimental and simulation)
- **Visualisation, feature extraction, coherency**
- Log law/power law, coefficients, dependency on flow case etc.
- Near-wall dynamics, cycle, dominant structures, hairpins
- Scaling of spectra (spatial and temporal) and other time features ("Bursting frequency", Taylor scale...)
- Effect of pressure gradients on statistics and dynamics
- Applicability of LES to high-Re boundary layers, filtering, modelling
- Rough walls
- Passive scalars, Prandtl number effects
- Effects of compressibility
- Linear amplification based on mean profiles
- Additional physics: pulsation, rotation, stratification, MHD forcing, side walls.
- **Triggering of turbulence**
- **Integral quantities**

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