# Third Madrid Summer School on Turbulence 2017

Journal of Physics: Conference Series Volume 1001

Madrid, Spain 29 May - 30 June 2017

**Editor:** 

**Javier Jimenez** 

ISBN: 978-1-5108-6168-8

ISSN: 1742-6588

# Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2017) by the Institute of Physics All rights reserved. The material featured in this book is subject to IOP copyright protection, unless otherwise indicated.

Printed by Curran Associates, Inc. (2018)

For permission requests, please contact the Institute of Physics at the address below.

Institute of Physics Dirac House, Temple Back Bristol BS1 6BE UK

Phone: 44 1 17 929 7481 Fax: 44 1 17 920 0979

techtracking@iop.org

# Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA

Phone: 845-758-0400 Fax: 845-758-2633

Email: curran@proceedings.com Web: www.proceedings.com

# **Table of contents**

# **Volume 1001**

Third Madrid Summer School on Turbulence

29 May to 30 June 2017, Madrid, Spain

Accepted papers received: 23 March 2018

Published online: 12 April 2018

# **Preface**

Third Madrid Summer School on Turbulence

Javier Jiménez

Peer review statement

# **Papers**

#### **STRUCTURES**

Reynolds stress structures in a self-similar adverse pressure gradient turbulent boundary layer at the verge of separation.

C. Atkinson, A. Sekimoto, J. Jiménez and J. Soria....1

Flow topology of rare back flow events and critical points in turbulent channels and toroidal pipes

C. Chin, R. Vinuesa, R. Örlü, J. I. Cardesa, A. Noorani, P. Schlatter and M. S. Chong....14

Intense structures of different momentum fluxes in turbulent channels

Kosuke Osawa and Javier Jiménez.....28

Extremely	high /	wall-shear	stress	events	in a	turbulent	boundary	layer
	_							

Chong Pan and Yongseok Kwon.....40

Coherent structure dynamics and identification during the multistage transitions of polymeric turbulent channel flow

Lu Zhu and Li Xi....53

Linear estimation of coherent structures in wall-bounded turbulence at Re  $_{\tau}$  = 2000

S Oehler, A Garcia–Gutiérrez and S Illingworth.....63

Wall-based identification of coherent structures in wall-bounded turbulence

C. Sanmiguel Vila and O. Flores.....76

Characterization of turbulent coherent structures in square duct flow

Marco Atzori, Ricardo Vinuesa, Adrián Lozano-Durán and Philipp Schlatter.....85

Analysis of secondary motions in square duct flow

Davide Modesti, Sergio Pirozzoli, Paolo Orlandi and Francesco Grasso.....100

# WALL MANIPULATION

<u>Identification of flow structures in fully developed canonical and wavy channels by means of modal decomposition techniques</u>

Sacha Ghebali, Jesús Garicano-Mena, Esteban Ferrer and Eusebio Valero.....110

Manipulation of near-wall turbulence by surface slip and permeability

G. Gómez-de-Segura, C. T. Fairhall, M. MacDonald, D. Chung and R. García-Mayoral.....125

TO 1 '		1			
Turbu	lent ti	ows	over	sparse	canopies
				00000	TO PIE

Akshath Sharma and Ricardo García-Mayoral.....144

### THEORETICAL MODELS

Causal analysis of self-sustaining processes in the logarithmic layer of wall-bounded turbulence

H. J. Bae, M. P. Encinar and A. Lozano-Durán....156

The mechanism by which nonlinearity sustains turbulence in plane Couette flow

M-A. Nikolaidis, B. F. Farrell and P. J. Ioannou....167

Description and detection of burst events in turbulent flows

P J Schmid, A García-Gutierrez and J Jiménez.....182

Overdamped large-eddy simulations of turbulent pipe flow up to  $Re_{\tau} = 1500$ 

Daniel Feldmann and Marc Avila....192

Exploring the large-scale structure of Taylor-Couette turbulence through Large-Eddy Simulations

Rodolfo Ostilla-Mónico, Xiaojue Zhu and Roberto Verzicco.....207

Towards the computation of time-periodic inertial range dynamics

L van Veen, A Vela-Martín and G Kawahara.....220

#### **COMPLEX FLOWS**

<u>Linearised dynamics and non-modal instability analysis of an impinging under-expanded supersonic jet</u>

Shahram Karami, Paul C. Stegeman, Vassilis Theofilis, Peter J. Schmid and Julio Soria.....230

# Characterisation of minimal-span plane Couette turbulence with pressure gradients

Atsushi Sekimoto, Callum Atkinson and Julio Soria.....243