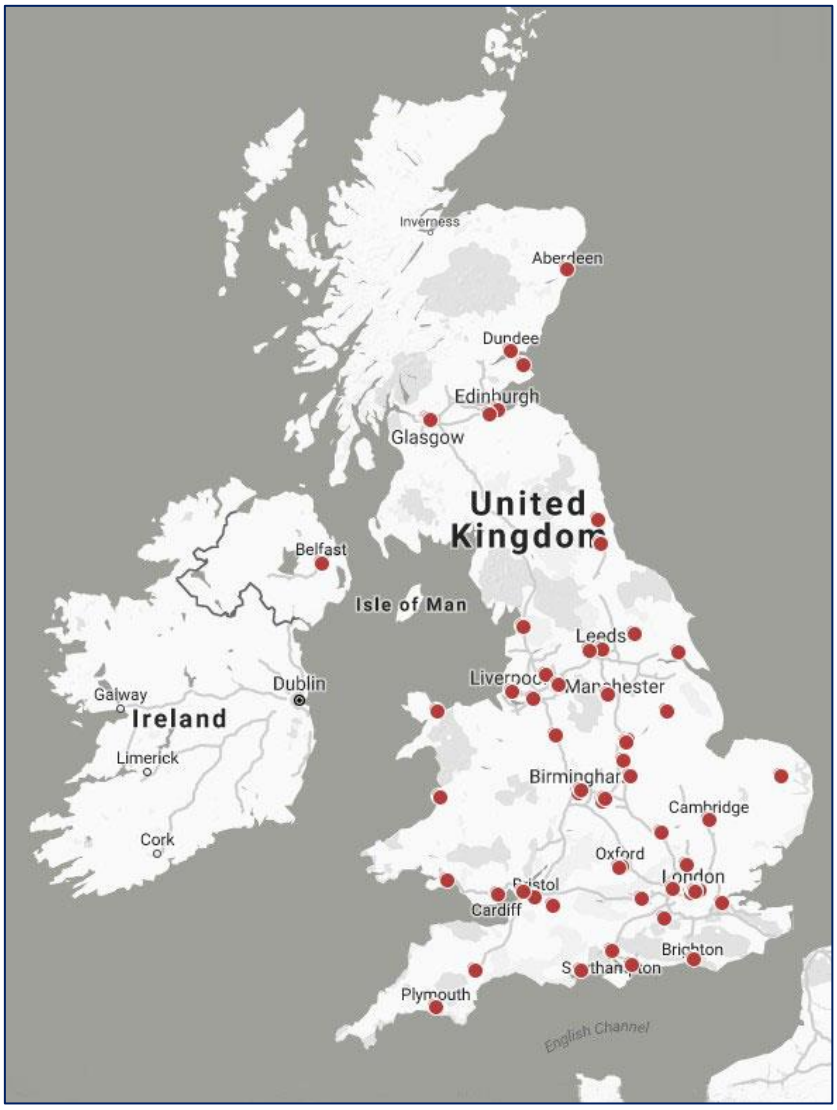
Special Interest Groups
Short Research Visits

September 2017

Special Interest Group institutions (https://fluids.ac.uk/sig)

Aberdeen
Aberystwyth
Aston
Bangor
Bath
Birmingham
Bolton
Bournemouth
Bradford
Brighton
Bristol
Brunel
Cambridge
Cardiff
City
Coventry
Cranfield
Dundee
Durham
Edinburgh
Exeter
Glasgow
Heriot-Watt
Hertfordshire
Huddersfield
Hull
ICL
KCL
Keele
Kingston
Lancaster
Leeds



Leicester
Lincoln
Liverpool
L'pool John Moores
Loughborough
Manchester
Manchester Metro.
Newcastle
Northumbria
Nottingham
Nottingham Trent
Oxford
Oxford Brookes
Plymouth
Portsmouth
QMUL
Queens Belfast
Reading
Sheffield
Sheffield Hallam
Southampton
St. Andrews
STFC
Strathclyde
Surrey
Swansea
UCL
UEA
UWE Bristol
Warwick
York

Welcome to the first UK Fluids Network booklet.

UKFN has now been up and running for one year, and it already involves many hundreds of UK fluids researchers. At its core are the 41 Special Interest Groups that UKFN has set up. These cover a broad range of topics in fluid mechanics, with each one a world-class centre of expertise in its chosen speciality. In the following pages you will find an overview of each SIG, its planned activities and who to contact if you would like to join or just find out more.

Another way to connect with other UK fluids researchers is through the Short Research Visits scheme, where UKFN funds a collaborative visit of one to two weeks.

You are warmly invited to take part in the UK Fluids Network. Follow the links below for more information on how to get involved.

Special Interest Groups

With 41 SIGs connecting over 60 institutions and 700 researchers, join a SIG and help define the Next Big Thing in your research area https://fluids.ac.uk/sig

Short Research Visits

Propose a 1- or 2-week visit to collaborate with other UK researchers. Around 5 visits are funded every 4 months, up to £1000 each https://fluids.ac.uk/srv

Competitions

Win cash prizes for your fluids photos and videos – winners profiled and runners-up showcased on UKFN website https://fluids.ac.uk/competition

Directory

Register and broadcast your research interests, application areas and facilities across UKFN and beyond https://fluids.ac.uk/register

Talks

Check out listings of UK fluids talks and watch our growing archive of recorded talks – and add your own with an RSS feed https://fluids.ac.uk/talks

Researcher Resources

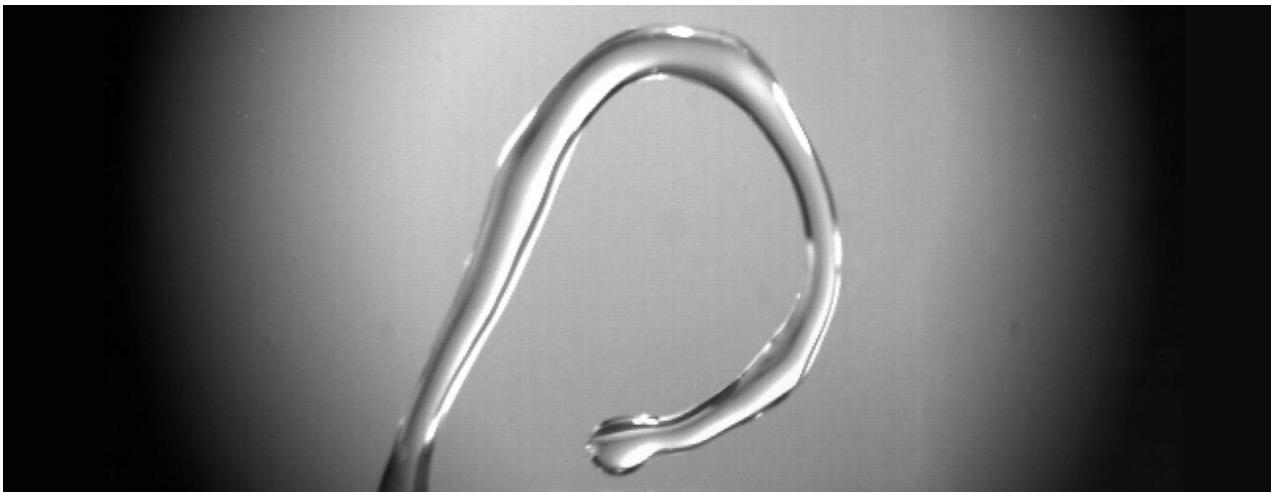
Add a course, with lecture videos, presentation slides, course notes and example code, and reach a global audience https://fluids.ac.uk/researcher-resources

Contact UKFN by email or Twitter, and visit the website:

https://fluids.ac.uk info@fluids.ac.uk @UKFluidsNetwork

Index of Special Interest Groups by theme

1 · Acoustofluidics



Jetting of a 20µL water droplet induced by ZnO surface acoustic waves (from left side). Sub-nanometre-amplitude SAWs interact with the droplet, causing jetting along the Rayleigh angle.

Acoustofluidics is the physics of the phenomena observed when acoustic waves interact with fluids. These phenomena have been utilised in a wide range of applications, such as acoustic streaming, acoustic radiation forces acting on particles and droplets (acoustic tweezers), cavitation, sono-chemistry and sono-luminescence. This field has recently opened up many new areas in process engineering, medical diagnostic systems, biotechnology and biomedicine (e.g. regenerative medicine). Acoustofluidics operates at the short/medium length scale, so works well with microfluidics, microanalysis and diagnosis.

The SIG aims to create a forum to encourage new ideas and collaborations, both within acoustofluidics and beyond. In addition, it plans to

- widen the usual academic interactions to include more stakeholders, through outreach events, and industry, through targeted workshops, to help our members widen the impact and relevance of their research
- collaborate with other SIGs (e.g. 'Droplet and flow interactions with bio-inspired and smart surfaces') to help the development of PhD students and PDRAs by enabling them to form initial collaborations and connections.

Website

https://fluids.ac.uk/sig/Acoustofluidics

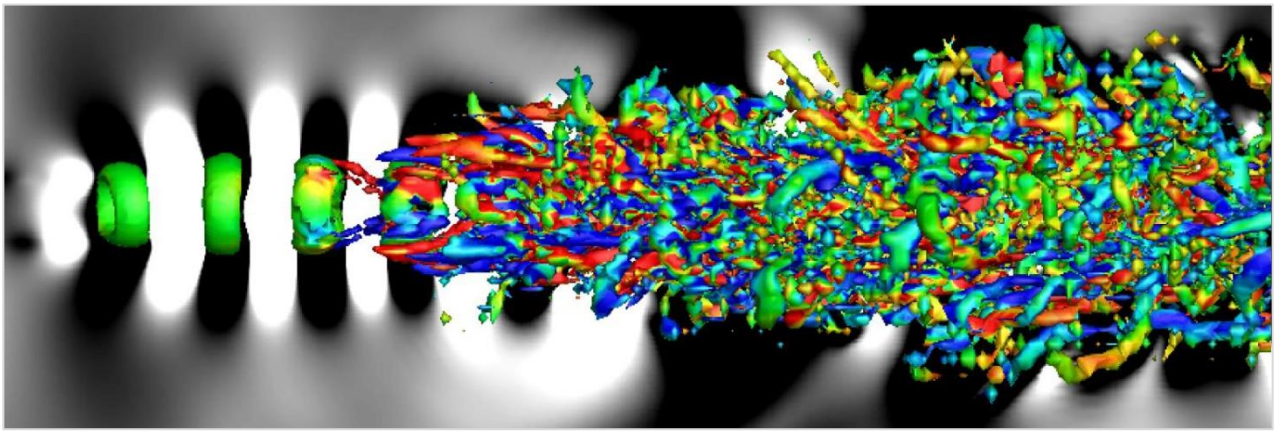
Forthcoming meetings

SIG meeting #2, during the 2018 Anglo-French Physical Acoustics Conference, 17-19 January 2018, Selsdon Park Hotel, South Croydon

For more information on our SIG, or to join the mailing list, please contact:

Richard Fu (University of Northumbria): richard.fu@northumbria.ac.uk
Julien Reboud (University of Glasgow): Julien.Reboud@glasgow.ac.uk

2 · Aeroacoustics



Numerical simulation of sound radiated from a Mach 0.9 turbulent jet. The inner (coloured) region shows iso-contours of the vorticity field and the outer region shows the radiated pressure field.

Aeroacoustics is the science of unsteady aerodynamics coupled with fluid-structure interactions and acoustics. It is multi-disciplinary, rich and diverse. Typical areas of applications include: noise prediction and reduction from aircraft, wind turbines and domestic appliances; and sound propagation, modelling and utilisation in biology and medicine.

The SIG has 20 members from 12 universities, bringing together expertise in this area for the first time across numerical, experimental and theoretical modelling. It will define and address the grand challenges in the area, such as the prediction and control of turbulence-generated noise by novel disruptive technologies.

The group meetings are twice a year, focusing on grand challenges, creating a wish list of novel technologies and identifying the best groups to propose projects to RCUK and industry within that theme. The SIG will also make its members familiar with the outstanding UK facilities in experimental and computational aeroacoustics, to help keep UK research in this area at the forefront internationally. PhD students and PDRAs are strongly encouraged to participate, and where appropriate will be named on proposals.

Website

https://fluids.ac.uk/sig/Aeroacoustics

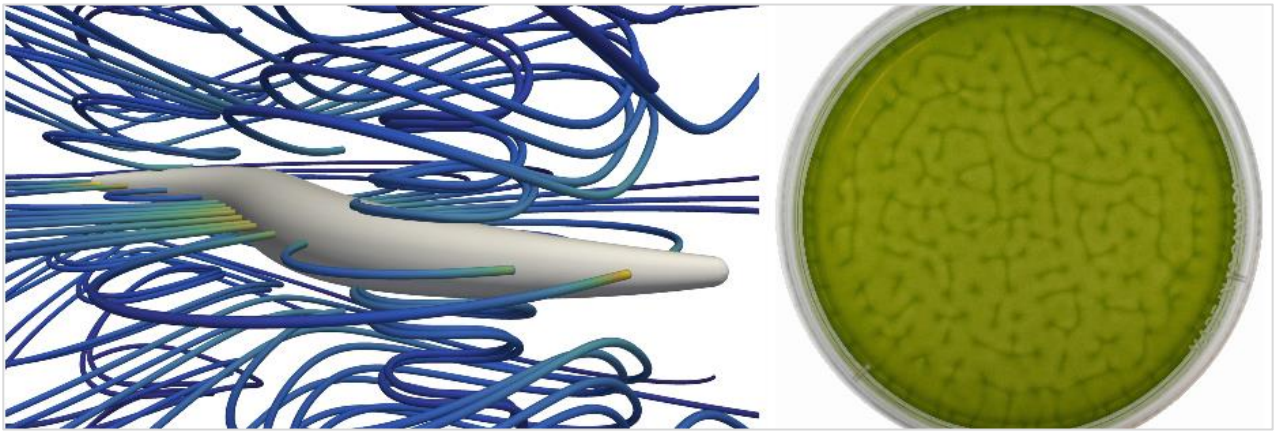
Forthcoming meetings

SIG Meeting #2, September 2017, University of Bristol

For more information on our SIG, or to join the mailing list, please contact:

Anurag Agarwal (University of Cambridge): anurag.agarwal@eng.cam.ac.uk
Mahdi Azarpeyvand (University of Bristol): m.azarpeyvand@bristol.ac.uk

3 · Biologically active fluids



Computer simulation predicting streamlines around swimming nematode worm C. elegans *(left); bioconvection pattern formed by swimming alga* D. salina *(right).*

This SIG is concerned with fluids whose biological activity (swimming, growth) significantly impacts their flow, e.g. growing plant tissue, swimming microbe suspensions, or flocks of birds. New theoretical and experimental approaches are required to study these fascinating and challenging fluid systems.

The SIG brings together leading UK research groups in the area. Approaches from different disciplines (mathematics, physics, engineering, biology) are combined to solve important problems in the field, e.g. understanding concentrated microswimmer suspension behaviour. The SIG acts as a research hub, facilitating new collaborations and funding bids. It also aims to aid the development and career progression of its associated early career researchers.

The SIG organises an annual meeting, as well as an invited seminar exchange scheme. Relevant international meetings in the area are advertised to members, who convene at them to discuss SIG activities. These activities, in particular the SIG meeting and student workshops, allow early career researchers to receive advanced training, as well as informal mentoring at drink/meal time.

Communications by the SIG leader and co-leader, together with the SIG website and social media, allow the members to keep abreast of SIG events, as well as news and opportunities, e.g. relevant jobs.

Website

https://bioactivefluids.wixsite.com/biofluids

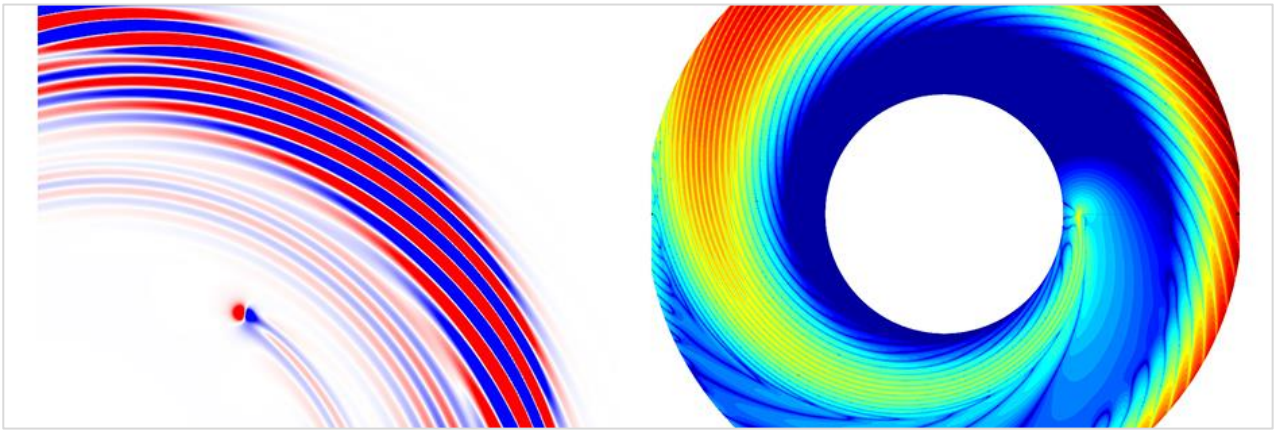
Forthcoming meetings

SIG Meeting #2, 2018 (date TBD), University of York

For more information on our SIG, or to join the mailing list, please contact:

Otti Croze (University of Cambridge): oac24@cam.ac.uk
David Smith (University of Birmingham): d.j.smith.2@bham.ac.uk
Twitter: @bioactivefluids

4 · Boundary layers in complex rotating systems



DNS simulation of the initial appearance and subsequent long-term arrangement of stationary crossflow vortices in the von Kármán boundary layer arising from a single roughness element. (Photo credit: Elinor Appelquist, KTH)

The SIG acts as a focal point for UK activities in fundamental and applied research in rotating boundary layer and related flows. It brings together engineers and mathematicians to coordinate complementary analytical, simulation and experimental approaches in collaborative research. We are interested in both Newtonian and non-Newtonian fluids.

The SIG aims to

- facilitate pooling of individual fundamental research and expedite novel applications
- pool expertise coordinating communications with research councils
- ensure the UK remains at the centre of international efforts in rotating flows
- generate networking opportunities for the benefit of ECRs

SIG members are from both academia and industry. This pooling of expertise facilitates the application of fundamental science to engineering problems, for example, CVD reactors, aerospace technologies, drilling and elsewhere. Furthermore, expertise in macro-scale, geophysical flows is also represented. This membership permits a two-way dialogue between fundamental and applied science that will last for the duration of the UKFN-funded period and beyond.

Website

https://fluids.ac.uk/sig/RotatingBL

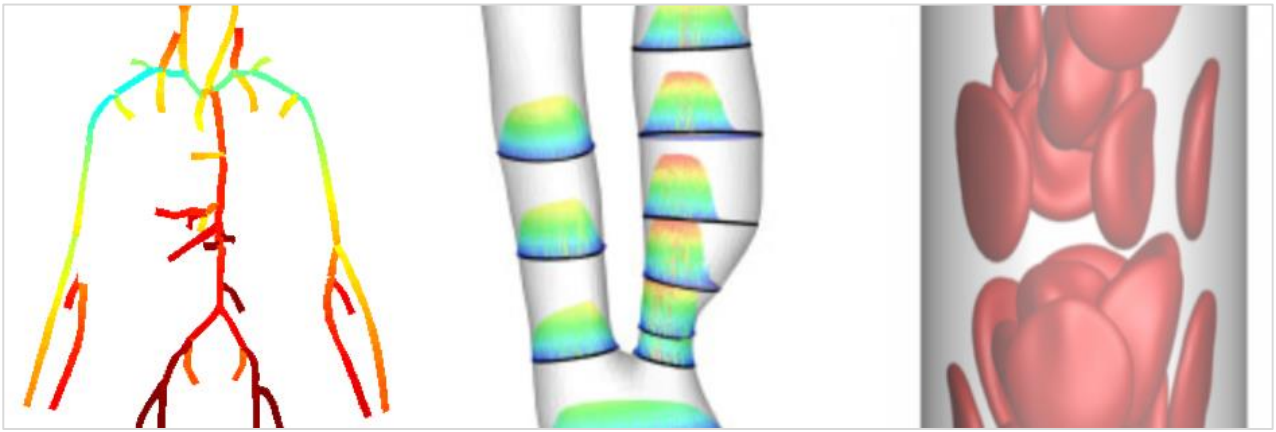
Forthcoming meetings

SIG meeting #3: 17-19 June 2018, Gregynog Hall, Tregynon

For more information on our SIG, or to join the mailing list, please contact:

Stephen Garrett (University of Leicester): sjg50@leicester.ac.uk
Christopher Davies (Cardiff University): daviesc9@cardiff.ac.uk

5 · Challenges in cardiovascular flow modelling



Bridging the scales in cardiovascular modelling: flow distribution through a human arterial network (left); 3D velocity field in a stenotic human carotid artery (centre); blood flow capturing the deformation of red blood cells in a capillary vessel (right).

The blood flow in the heart and vascular system can change significantly in health, disease and intervention. An extensive expertise has been built in the UK for the computational modelling of cardiovascular flows and the development of suitable solvers for these incompressible, unsteady flows in deformable confined geometries (requiring the capture of fluid-structure interactions).

Researchers have developed techniques from studying the fundamental fluid behaviour in idealised geometries to detailed flow simulations in geometries based on MRI, CT or ultrasound. Furthermore, using similar techniques, CFD has been used a lot to study blood flow through medical devices. In parallel to the 3D developments, 1D modelling techniques evolved for describing the wave propagation of pressures and flows throughout a cardiovascular network with compliant walls.

Hence the aim of this SIG is to bring together expertise, through periodic meetings, in three fields of cardiovascular flow modelling, i.e. 1D vascular network modelling, 3D image-based modelling and medical device modelling. The SIG network will aim to identify significant challenges in cardiovascular flow and device modelling and how the different skill sets can be integrated to tackle these challenges.

Website

https://fluids.ac.uk/sig/Cardiovascular

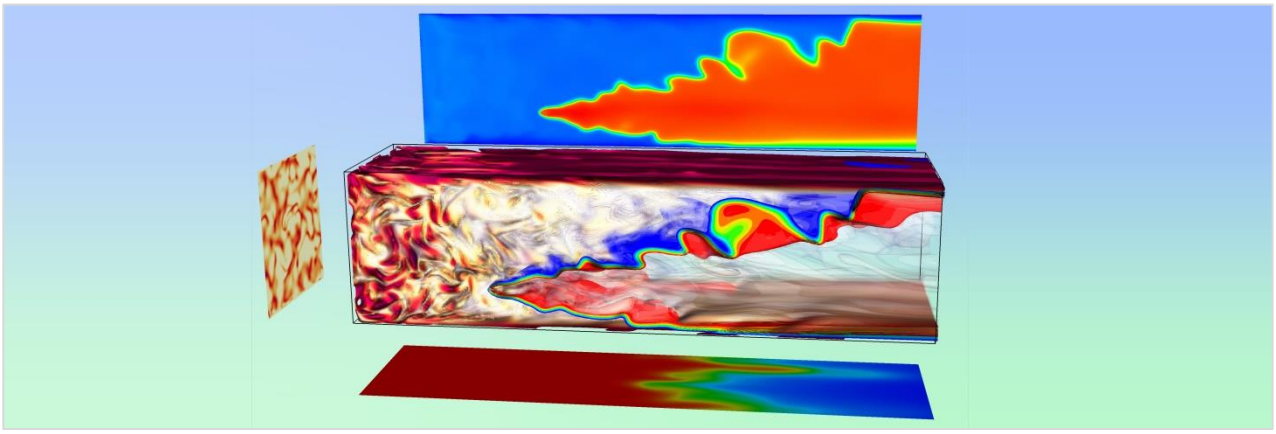
Forthcoming meetings

Kick-off SIG meeting, October/November 2017, Swansea University

For more information on our SIG, or to join the mailing list, please contact:

Raoul van Loon (Swansea University): r.vanloon@swansea.ac.uk
Alberto Gambaruto (University of Bristol): alberto.gambaruto@bristol.ac.uk

6 · Combustion science, technology and applications



DNS of turbulent flame close to a wall. Colours represent (red-high and white-low) the magnitudes of vorticity magnitude (background colour) and temperature (side view) and reaction progress variable (lower wall view) which increases monotonically from blue to red from unburned reactants to fully burned products.

Combustion has immense socio-economic relevance, with conflicting demands from energy generation and environmental pollution: future energy and transport processes need to be simultaneously fuel-economic, reliable and environment-friendly. These challenges are associated with fundamental questions: How fast can we burn? How can we accurately predict the emissions? How can we predict/control the size of particulate emissions? How to control combustion instabilities? How do the flames accelerate/detonate?

This SIG brings together world-leading UK experimentalists and modellers in the field of reacting flows. The interest group provides a forum for researchers to present their novel scientific ideas, as well as relevant industrial challenges regarding fluids in combustion. The SIG aims to identify complementary skill sets between the different research groups and facilitate collaboration. Among the wide range of reacting flows, the SIG concentrates primarily on several sub-topics:

- Numerical simulations and theoretical modelling of reacting flows
- Development of novel experimental diagnostic techniques
- Combustion instabilities
- Internal Combustion Engine and gas-turbine combustion

Website

https://fluids.ac.uk/sig/Combustion

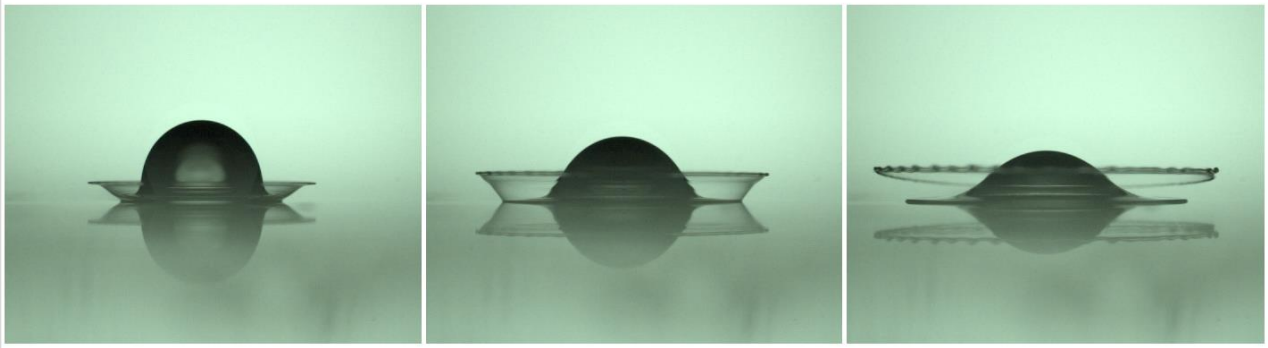
Forthcoming meetings

Kick-off SIG meeting, 27 September 2017, Loughborough University

For more information on our SIG, or to join the mailing list, please contact:

Salvador Navarro-Martinez (Imperial College, London): s.navarro@imperial.ac.uk
Nilanjan Chakraborty (University of Newcastle): nilanjan.chakraborty@ncl.ac.uk

7 · Drop dynamics



High-speed impact of a drop of ethanol onto a thin layer of the same fluid.

The study of liquid drops and the break-up of jets is important in several natural (physical and biological) and practical (technological) contexts, including defensive and hunting mechanisms of some animals, dispersion of liquid drugs into droplets for inhalation, crop- and paint-spraying, the manufacturing of biomaterials, and inkjet printing. The main objective of this SIG is to encourage discussion and establish collaborative networks around the topic of Drop Dynamics. We wish to bring together experimentalists, theoreticians and numerical modellers to study topics including (but not limited to!) pinch-off, drop formation and generation, coalescence, drop interactions, drop impact, spreading and splashing, evaporation, contact line dynamics, and applications of drops (inkjet, sprays, microfluidics, coatings, 3D printing). Membership of this group is open and aimed at researchers and students working in the field of droplets. Please, email us to be included on the SIG's circulation list.

Our community offers an unmatched set of skills and expertise, ranging from fundamental theoretical approaches and high resolution numerical modelling (DNS, Lattice Boltzmann and Molecular Simulations), through state-of-the-art experimental techniques (ultra-high-speed image visualisation and holography), to applied research (microfluidics, inkjet, spray/combustion, and biofluids).

Website

http://www.eng.ox.ac.uk/fluidlab/sig-drop-dynamics

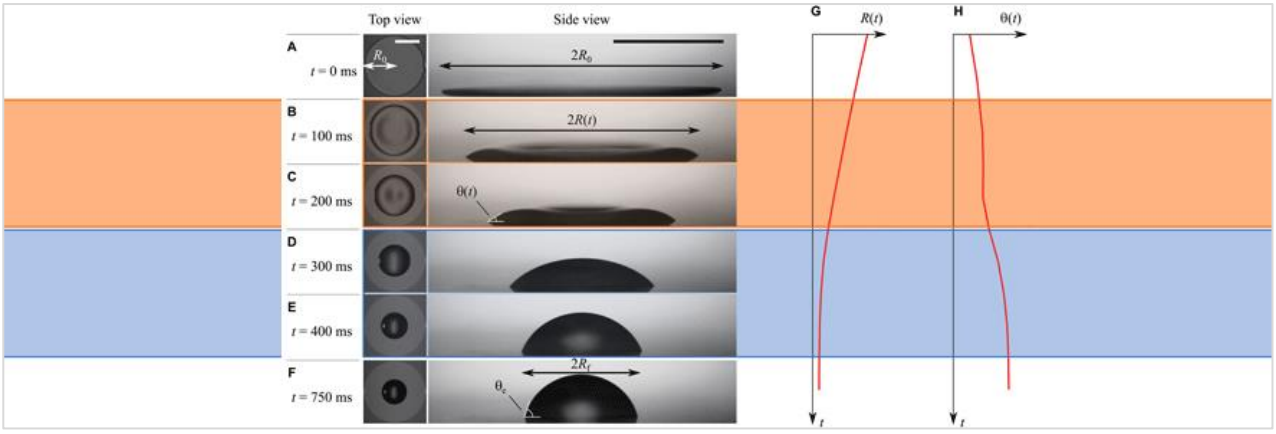
Forthcoming meetings

SIG Meeting #2, December 2017 (location TBD)

For more information on our SIG, or to join the mailing list, please contact:

Alfonso Castrejón-Pita (University of Oxford): alfonso.castrejon-pita@eng.ox.ac.uk
Rafael Castrejón-Pita (QMUL): r.castrejonpita@qmul.ac.uk

8 · Droplet and flow interactions with bio-inspired and smart surfaces



The dewetting of a liquid droplet from a smooth solid surface. (See: Edwards et al. *Sci. Adv. 2016; 2: e1600183)*

This interdisciplinary SIG aims to bring together researchers from Chemistry, Physics, Engineering and Materials Science with interests in cutting edge surface engineering/science phenomena. Our interest centres on fluid interactions with bioinspired and smart textured (e.g. ribbed, superhydrophobic, liquid-impregnated) surfaces. It includes both droplets moving across surfaces and flow adjacent to surfaces at different length scales and Reynolds numbers.

Understanding such fluid flows undoubtedly requires techniques from bench-top in-lab observation to large-scale flumes, and complementary modelling techniques. Applications are equally diverse. To promote the sharing of knowledge, ideas and research methodologies, our SIG schedules six-monthly SIG meetings and thematic mini-symposia (e.g. on flow characterization, surface fabrication, and modelling). It is hoped that these events will leverage new collaborations leading to joint publications and grant applications. We have also planned dedicated PGR and ECR events to facilitate their professional development, as well as regular industrial networking events.

Website

https://fluids.ac.uk/sig/SmartSurfaces

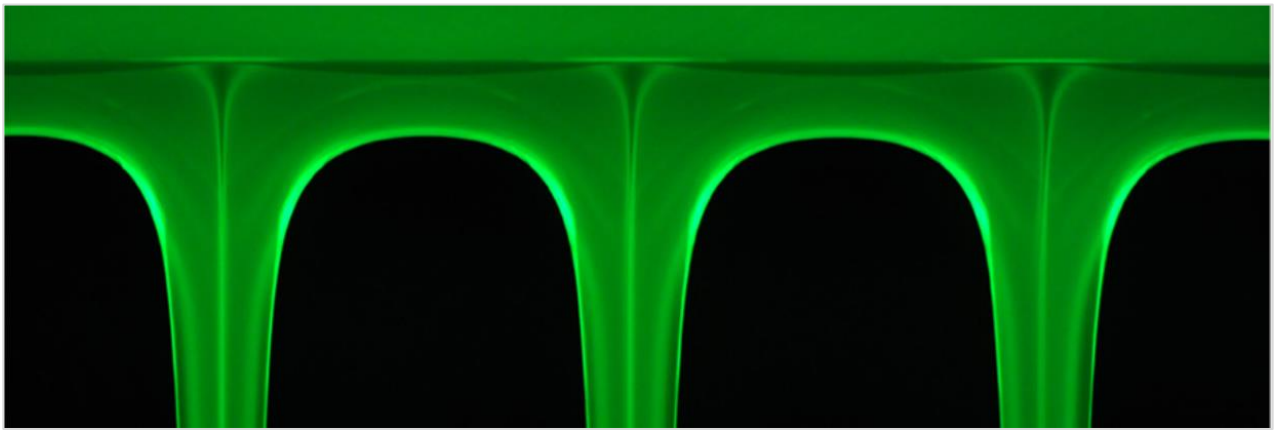
Forthcoming meetings

Industrial Day, 29 November 2017, Nottingham Trent University
Mini-symposium on Functional Interfaces, April 2018, Heriot-Watt University
Modelling workshop on solid-liquid interface, Summer 2018, Durham University

For more information on our SIG, or to join the mailing list, please contact:

Glen McHale (University of Northumbria): glen.mchale@northumbria.ac.uk
Halim Kusumaatmaja (University of Durham): halim.kusumaatmaja@durham.ac.uk

9 · Evolving interfaces in complex flows



Break-up into threads of a three-layered liquid curtain as it falls under gravity.

This SIG is devoted to interfacial phenomena in complex fluid flows. Interfacial flows are ubiquitous in Nature and occur in a multitude of applications, and the many technical challenges we face span a wide range of scales.

The interests of the group cover a broad base, and we aim to make novel and creative use of analytical, computational and experimental methods to probe basic mechanisms, interpret physical observations, and to create innovative solutions of practical utility to industrial partners.

Our objective is to create a major focus for applied interfacial fluids research and training in the UK. We indend to have a strong cross-disciplinary component, notably with biology (for example, skin modelling, digestion, pulmonary dynamics, biofilms), and environmental research (rivers, ice flows and avalanches), and we will seek to build and maintain strong links with industrial partners.

Graduate-level training will also form a key part of the SIG's activities and we aim to hold a residential taught course in free boundary problems in fluid mechanics.

Website

https://fluids.ac.uk/sig/InterfacialFlows

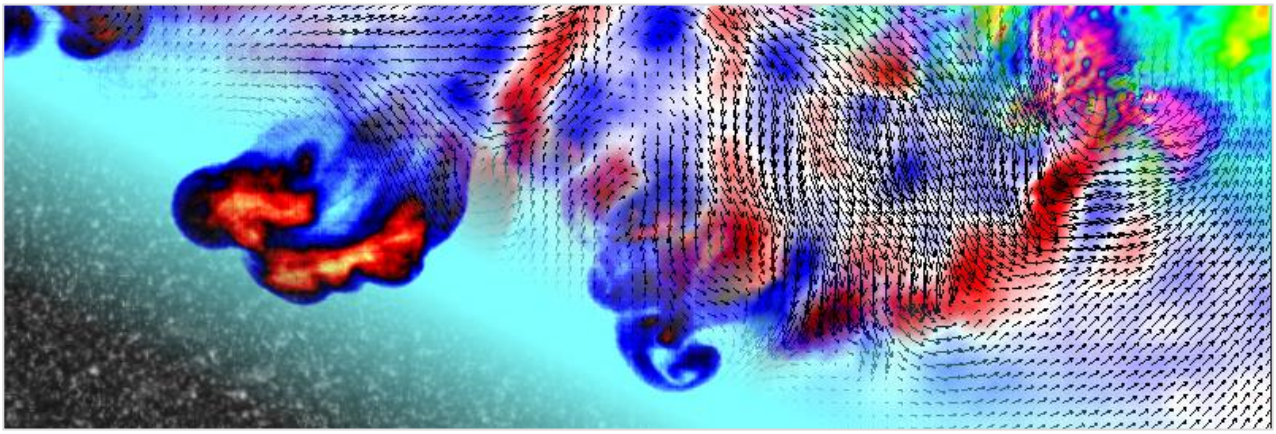
Forthcoming meetings

SIG Meeting #2, "EICF: a meeting on open problems", 18-19 December 2017, University of Nottingham

For more information on our SIG, or to join the mailing list, please contact:

Mark Blyth (University of East Anglia): m.blyth@uea.ac.uk
John Billingham (University of Nottingham): John.Billingham@Nottingham.ac.uk

10 · Experimental flow diagnostics (xFD)



Early-time development of Rayleigh-Taylor instability on an unstable density interface. The image contains (from bottom-left to top-right): particles used for PIV, density field from PLIF, 3D velocity field (colour showing out-of-plane component) and in-plane vorticity field.

Experimental diagnostics utilise diverse technologies to access the state of a flow at a single point or integrated over regions of the flow. This SIG will focus on non-intrusive diagnostics that image a flow to determine velocity, composition, stress state, density and other important fields. Imaging is typically optical, although this SIG will include a range of image sources, from acoustics to NMR.

Dramatic advances in hardware and algorithms offer enormous opportunities to push experimental diagnostics to previously inconceivable spatio-temporal resolutions and accuracies in substantially increased regions of a flow. The SIG will capitalise on these opportunities by providing a common focus for a range of researchers to develop and share expertise, approaches and formats that will support and drive both use of and advances in experimental diagnostics.

Benefits will arise for all fluid mechanics through discovery and understanding of governing physics, increased collaboration and compatibility with complementary approaches such as computational simulations and field studies, and, ultimately, improved modelling ability. The SIG will stimulate addressing interdisciplinary research problems and support the many UK-based world-leading laboratory facilities for fluid dynamics research in realising their full potential.

Website

https://fluids.ac.uk/sig/xFD

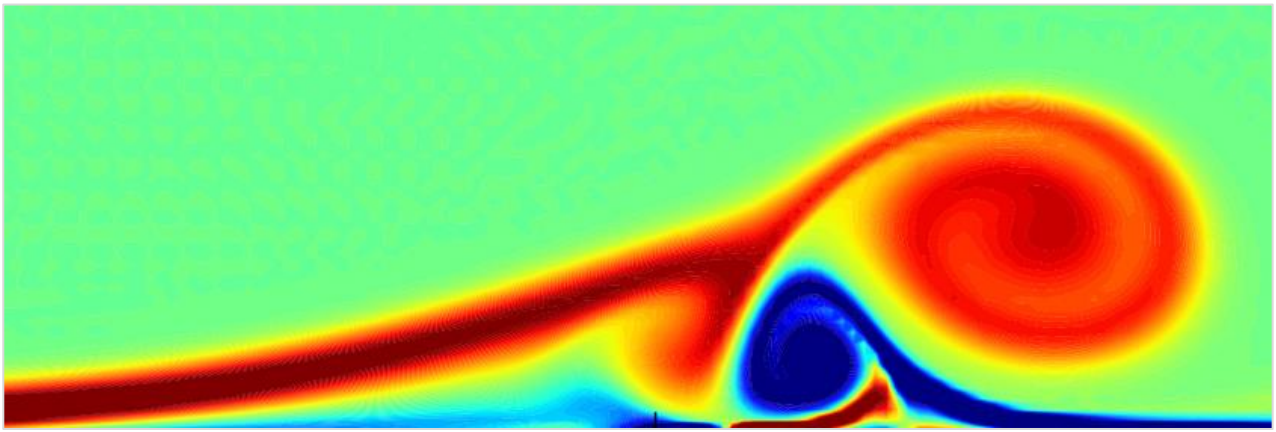
Forthcoming meetings

Kick-off SIG meeting, 11 September 2017, Imperial College, London

For more information on our SIG, or to join the mailing list, please contact:

Graham Hughes (Imperial College, London): g.hughes@imperial.ac.uk
Stuart Dalziel (University of Cambridge): s.dalziel@damtp.cam.ac.uk

11 · Flow instability, modelling and control



Vorticity contours of a laminar separation bubble with shear-layer instability.

The SIG specialises in fluid flow transition and control, areas in which the UK has maintained world-class research for many years. The topics of the SIG include hydrodynamic stability, transition to turbulence, coherent structures and nonlinear dynamics, model reduction, simulations, experiments, and development of novel flow control strategies.

The SIG members comprise leading figures in both established areas (flow instability) and emerging areas (dynamical systems, flow control, optimisation) from both academia and industry (Airbus, Rolls-Royce & McLaren), and their expertise covers all the technical aspects (theory, computation and experiments). The scope of the SIG is to

- improve communication across boundaries between traditional and emerging areas
- foster the next generation of academics and industrial researchers at the subject interface
- respond collectively to research council funding initiatives
- increase international visibility of the UK's research activities in the areas of the SIG

Website

https://fluids.ac.uk/sig/FlowInstability

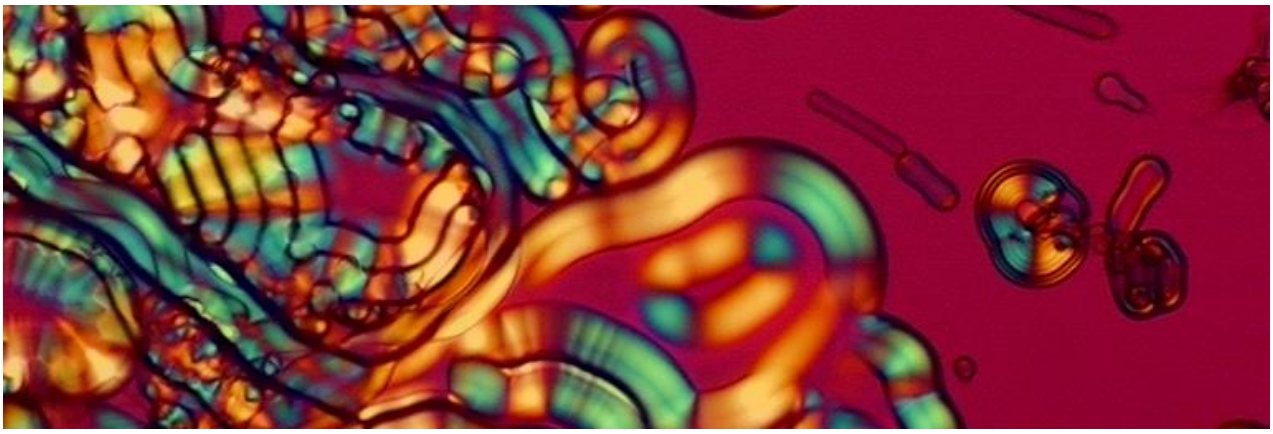
Forthcoming meetings

Annual workshop, Spring 2018 (details to be announced soon)
Annual workshop, Spring 2019 (details TBD)
Summer school for PhD students and PDRAs, Summer 2019 (details TBD)

For more information on our SIG, or to join the mailing list, please contact:

Yongyun Hwang (Imperial College, London): y.hwang@imperial.ac.uk
Ati Sharma (University of Southampton): a.sharma@soton.ac.uk

12 · Fluid dynamics of liquid crystalline materials



Structure formation during a phase transition of the chemical DOPC. (Picture credit: Stephen Cowling, University of York)

Liquid crystalline materials are anisotropic fluids with orientational and sometimes positional ordering of constituent molecules. This ordering leads to an array of fascinating properties – from the ability to maintain internal elastic stress, to orientation-dependent viscous, optical and electromagnetic effects.

The aim of this diverse and intrinsically multidisciplinary SIG is to bring together UK scientists from both academic and industry with a wide range of skills and expertise to address both the present and future challenges in the theory of liquid crystals.

Our particular focus is on fundamental scientific questions and technological applications in which fluid dynamic effects are either hindering future advances or are essential for novel liquid crystal devices.

In addition to developing the UK community by fostering new and sustaining existing scientific collaborations, we will facilitate future research activities that are targeted towards the most scientifically interesting and practically important challenges arising from the flow of liquid crystals.

Website

https://fluids.ac.uk/sig/LiquidCrystals

Forthcoming meetings

“Liquid crystal flow in bulk, drops and films”, University of Sheffield (date TBD)
“Geometric and topological methods”, University of Southampton (date TBD)
“Non-display applications of liquid crystals”, University of Leeds (date TBD)

For more information on our SIG, or to join the mailing list, please contact:

Nigel Mottram (University of Strathclyde): nigel.mottram@strath.ac.uk
Carl Brown (Nottingham Trent University): carl.brown@ntu.ac.uk
Stephen Wilson (University of Strathclyde): s.k.wilson@strath.ac.uk
Twitter: @LiqCrystFlowSIG

13 · Fluid mechanics of cleaning and decontamination

Ice pigging of a pipe in the food industry (left); study of removal of viscous petroleum jelly by an impinging jet on an inclined surface (centre); PIV study of a laminar jet impinging normally to a vertical surface (right).

Cleaning and decontamination are critically important operations in many manufacturing, food, healthcare, agricultural and military applications. Since many cleaning agents are either liquids or delivered in the form of aqueous solutions, or gases and vapours, fluid mechanics underpins their delivery and the performance of these operations.

The field is interdisciplinary, as the fluid interacts with different soiling materials, surfaces and organisms under various chemical and physical conditions. Timescales can vary from seconds to days, while length scales span from the molecular scale to the largest dimensions of the system to clean. This SIG was established to bring together those working in the field within mathematics and the related sciences: chemistry, physics, the biologies and engineering.

The objective of this group is to maximise UK effort in the area by creating a supportive framework for researchers to share expertise, provide training in techniques, present recent work and facilitate knowledge transfer. The plan is to have two physical meetings per year, interspersed by webinars from SIG members. Linking to industry is an important part and the group includes representatives from several companies and government agencies. The SIG is always open to new members and association with related activities in other countries.

Website

http://www.sig10-cleaning-decontamination.net/

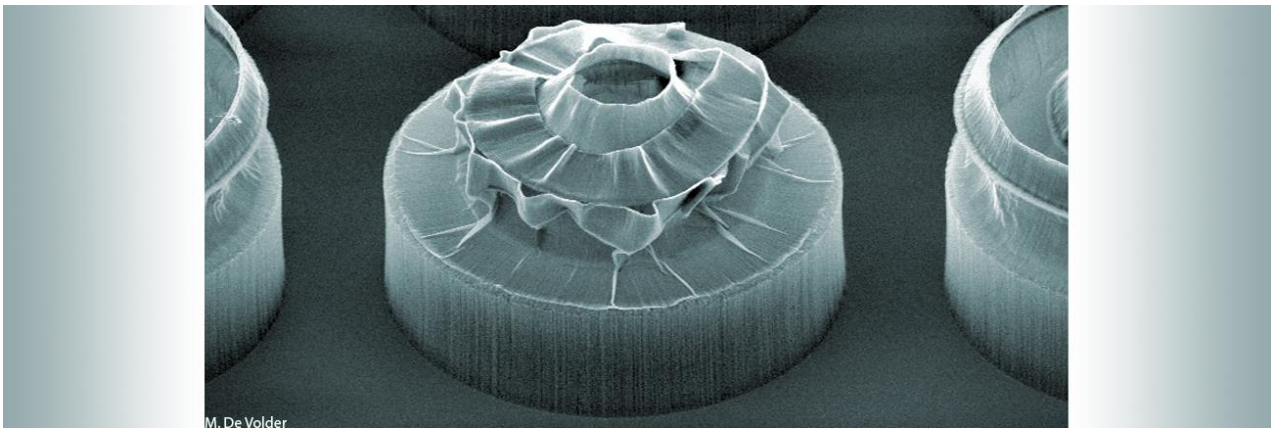
Forthcoming meetings

The next meeting will be at Bath (curiously appropriate) on 29-30 January 2018.

For more information on our SIG, or to join the mailing list, please contact:

Julien Landel (University of Manchester): julien.landel@manchester.ac.uk
Ian Wilson (University of Cambridge): diw11@cam.ac.uk
Twitter: @UKFluids_SIGCleaning

14 · Fluid mechanics of nanostructured materials



Complex-shaped carbon nanotube structure formed by capillary aggregation. (Picture credit: Dr. M. De Volder, University of Cambridge)

Governments and funding agencies in the UK and beyond believe in the importance of materials research. "Advanced materials" is one of the 8 Great Technologies the UK will continue to invest in heavily for the future. We believe that fluid mechanics can play a pivotal role in supporting the growth of materials research, by providing insights into basic mechanisms at play during solvent-based (liquid) processes, by suggesting non-equilibrium routes to make materials that it would be impossible to obtain in the absence of flow, and by helping materials engineers overcome bottle-necks in the scaling-up of many fluid-based, continuous manufacturing processes.

The SIG will establish a new branch of fluid mechanics research, bringing together experts in fluid mechanics and materials science to tackle important challenges in the area of advanced materials. The SIG will identify relevant scientific questions, organise training activities and form a network to reply promptly to relevant funding calls.

In the next 3 years, we plan five SIG meetings and one training workshop with international speakers. We will develop a 'Gallery of Fluids in Materials', and a white paper containing recommendations for the EPSRC on priority areas and strengths of the UK community in the SIG's focus area.

Websites

https://fluids.ac.uk/sig/NanostructuredFM

http://www.fluids.qmul.ac.uk/sig-materials/

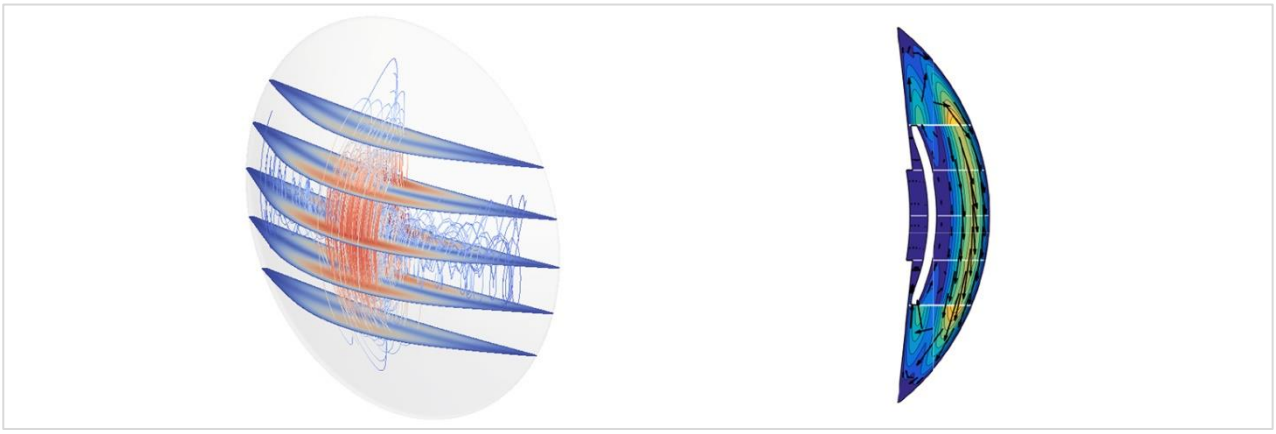
Forthcoming meetings

SIG Meeting #2, 14 September 2017, Queen Mary University of London

For more information on our SIG, or to join the mailing list, please contact:

Lorenzo Botto (Queen Mary University of London): l.botto@qmul.ac.uk
Dominic Vella (University of Oxford): dominic.vella@maths.ox.ac.uk

15 · Fluid mechanics of the eye



3D flow in the natural eye (left); flow in vertical plane of symmetry when a thermally conducting lens has been inserted to correct vision (right). Shading represents velocity magnitude.

Fluid dynamics is involved in many common conditions causing sight loss, including age-related macular degeneration, glaucoma and diabetic retinopathy. UK research boasts strength in eye fluid mechanics, and this SIG aims to galvanise our efforts by facilitating entry of new researchers into the field and building stronger links with clinicians. Areas of interest include:

- Lipid deposition in retina and loss of permeability in age-related macular degeneration
- Fluid mechanics of alternative outflow pathway of eye (through the suprachoroidal space), relevant to glaucoma
- Fluid mechanical model of vitreous humour in health and disease, relevant to retinal detachment and drug delivery
- Viscoelasticity of the lipid layer of the tear film, relevant to dry eye
- Traumatic injury of the eye due to rotational forces during shaking, influence on retinal integrity, fibre damage of the optic nerve

At SIG meetings, the members will form working groups, each of which will work on a problem suggested by a clinician in close interaction with them. The aim is to progress existing research strands to produce clinically useful results and link up disparate areas of eye research.

Website

https://fluids.ac.uk/sig/EyeFM

Forthcoming meetings

SIG Meeting #2, 25-26 September 2017, University of Oxford

For more information on our SIG, or to join the mailing list, please contact:

Jennifer Tweedy (Imperial College, London): j.siggers@imperial.ac.uk
Eamonn Gaffney (University of Oxford): gaffney@maths.ox.ac.uk

16 · Granular flows in the environment and industry

Sand dunes in Qatar: dune migration is a granular flow that can have profound impacts on communities.

Granular materials impact our everyday life and feature in a wide range of mass flows where the key underlying physical processes are still poorly understood. Granular materials are of enormous technological significance, because grains are the second most handled material after water. Industrial users try to reduce efficiency losses, environmental agencies monitor and respond to coastal erosion, while geophysical processes may form a hazard to life and infrastructure.

This SIG provides a much-needed national forum for UK-based scientists working on granular flows in a variety of applications, bringing together members from engineering, physics, geoscience and mathematics.

There will be a series of six 1-day workshops, each targeting one key topic:

(1) Assessing the state of the art and upcoming developments
(2) Enhancing collaboration with industry
(3) Creating a successful CDT/DTP bid in the particulate/granular area
(4) Spotlight on early-career granular researchers
(5) Teaching undergraduate and graduate student courses in granular particle-laden and fluid flows
(6) Summarizing the major insights gained in the SIG and planning for the future

Website

https://fluids.ac.uk/sig/GranularFlows

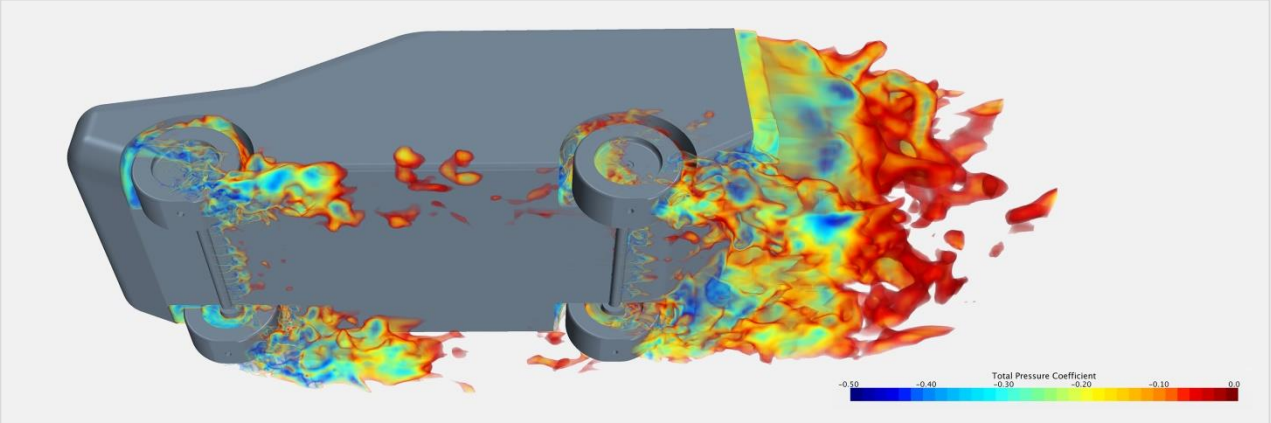
Forthcoming meetings

SIG Meeting #2, 13-14 September 2017, University of Sheffield

For more information on our SIG, or to join the mailing list, please contact:

Nathalie Vriend (University of Cambridge): nv253@cam.ac.uk
Elisabeth Bowman (University of Sheffield): e.bowman@sheffield.ac.uk
Eliza Calder (University of Edinburgh): ecalder@staffmail.ed.ac.uk

17 · Ground vehicle aerodynamics



Wake structures of a generic SUV.

This SIG focuses on core challenges in the aerodynamics of ground vehicles:

- Reduction in energy consumption, addressed through reducing vehicle drag
- Addressing aerodynamic challenges in safety and refinement, aeroacoustics and real world behaviour that arise from vehicle weight reduction
- Providing access to accurate, appropriate and validated simulation tools in all phases of product development
- Rail safety, ranging from aerodynamic loads and cross-wind stability to pressure transients and sonic booms

The SIG will address research that increases our understanding of the fundamental nature and consequences of the flows around ground vehicles and their measurement and calculation using a range of experimental and computational techniques. It includes the measurement and prediction of steady and unsteady loads, pressure distributions and aeroacoustics, passive and active flow control, lateral stability, multiphase flows, wake structures and wake dynamics.

The SIG meets biannually: each meeting has a substantial research topic, with the focus on discussion, exchange of ideas, identifying relevant research and synergies. In addition, meetings will include workshops a) jointly with industry, b) to develop an academic roadmap, and c) to identify a set of standard validation cases. A final meeting will develop research proposals.

Website

https://fluids.ac.uk/sig/GroundVehicleAero

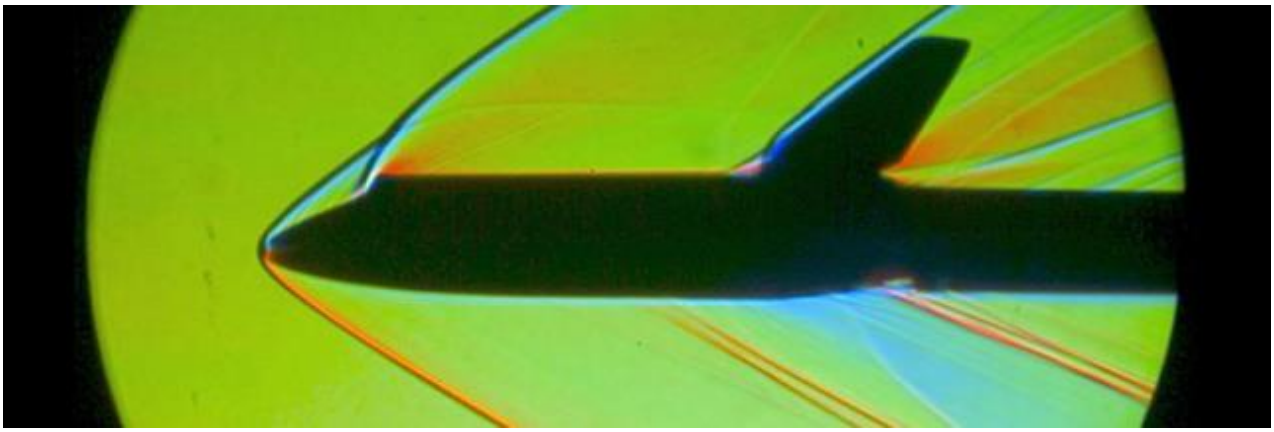
Forthcoming meetings

SIG Meeting #2, 13-14 November 2017, University of Manchester

For more information on our SIG, or to join the mailing list, please contact:

Martin Passmore (Loughborough University): m.a.passmore@lboro.ac.uk
Chris Baker (University of Birmingham): c.j.baker@bham.ac.uk

18 · High speed experimental aerodynamics



Schlieren visualisation of flow around space shuttle.

We provide an active network for UK high-speed aerodynamics researchers with experimental facilities to:

- re-establish the UK's world-leading reputation in this area
- showcase the capabilities of SIG members to UK industry
- identify funding opportunities to support collaborative research
- promote best practice for high-speed experimental aerodynamicists

The primary activity of the SIG is the facilitation of regular (6-monthly) meetings for all SIG members and invitees from industry. These meetings comprise a combination of technical and discussion sessions alongside (uniquely) a session dedicated to the practical demonstration of an experimental facility and associated data-processing techniques. Each meeting is hosted at a different research organisation. All SIG members are encouraged to bring members of their research groups along to the meetings.

Website

https://fluids.ac.uk/sig/HighSpeedAero

Forthcoming meetings

Kick-off SIG meeting, 14 September 2017, City University, London

For more information on our SIG, or to join the mailing list, please contact:

Paul Bruce (Imperial College, London): p.bruce@imperial.ac.uk
Holger Babinsky (University of Cambridge): hb@eng.cam.ac.uk

19 · Low-energy ventilation

The urban environment creates myriad challenges – and research opportunities – in low-energy ventilation.

Building ventilation strategies that optimise energy consumption and occupancy experience offer tangible benefits, such as lower energy consumption and emissions, increased occupant productivity, health and well-being, and cost reductions for owners/operators. However, much of the associated building ventilation research takes little account of the important role played by air flows.

This SIG will address this by

- developing collaborations/securing funding for research to address key knowledge gaps, and implementing findings within industrial best practice
- collating current national resources for UK ventilation
- disseminating UK research findings
- contributing to codes of practice, design guidance, regulation and standards
- supporting a new generation of researchers entering the research field

The SIG will meet biannually with a mix of 1-day and 2-day meetings. In addition,

- the SIG's online presence includes an expanding repository for UK-based building ventilation research, and social media for disseminating new results
- the SIG will develop a long-term research strategy for building ventilation research, including defining research standards such as standardised benchmark test cases appropriate for modern ventilation strategies

Website

http://www.lowenergyventilation.org/home

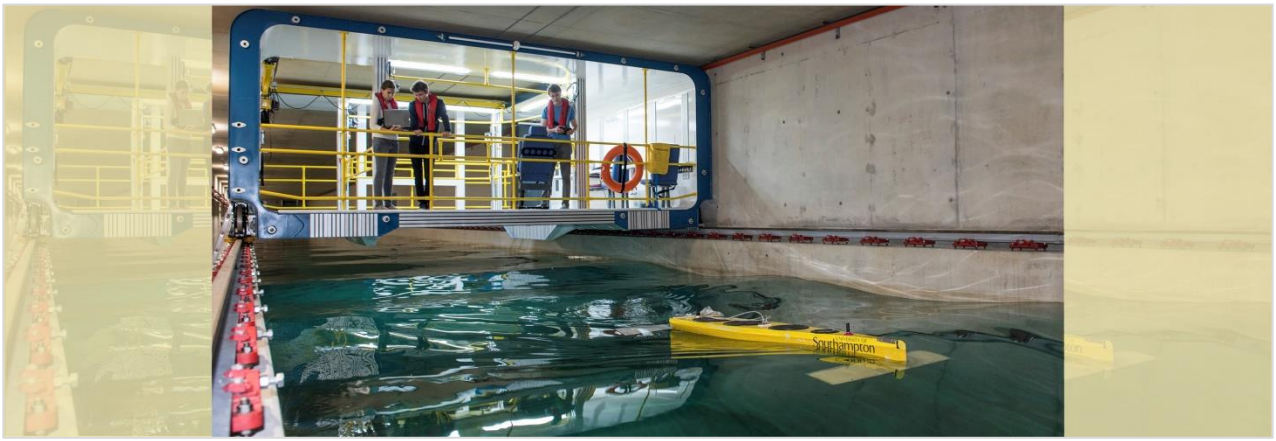
Forthcoming meetings

SIG Meeting #2, 19 December 2017, University of Leeds

For more information on our SIG, or to join the mailing list, please contact:

Cath Noakes (University of Leeds): C.J.Noakes@leeds.ac.uk
Henry Burridge (Imperial College, London): h.burridge@imperial.ac.uk

20 · Marine hydrodynamics



Converting wave energy into propulsive and electrical power for small vessels using flapping foils in the University of Southampton's new Hydrosciences Facility.

The Marine Hydrodynamics SIG focuses on the unsteady fluid dynamic challenges in naval architecture, offshore structures and marine renewable energy.

Marine hydrodynamics (MH) is characterised by unsteady flow behaviours created by a range of factors including high Reynolds numbers, separated flows and violent free surface effects. Understanding the fundamental fluid dynamics of how these highly unsteady marine flows interact with engineered structures is crucial to improving the performance of our ships, offshore structures and marine renewable energy devices such as tidal turbines.

Our objectives are to

- engage with commercial partners to establish the challenges facing industry
- stimulate research funding for fundamental hydrodynamics research through collaborative grants
- promote the capabilities of UK experimental facilities associated with the SIG
- evaluate the range of hydrodynamic assessment tools available and their applications to create an open resource for the MH community

We plan to meet twice a year and increase the MH presence at the UK Fluids Conference in future years to engage with ECRs working in this area.

Website

https://fluids.ac.uk/sig/MarineHydro

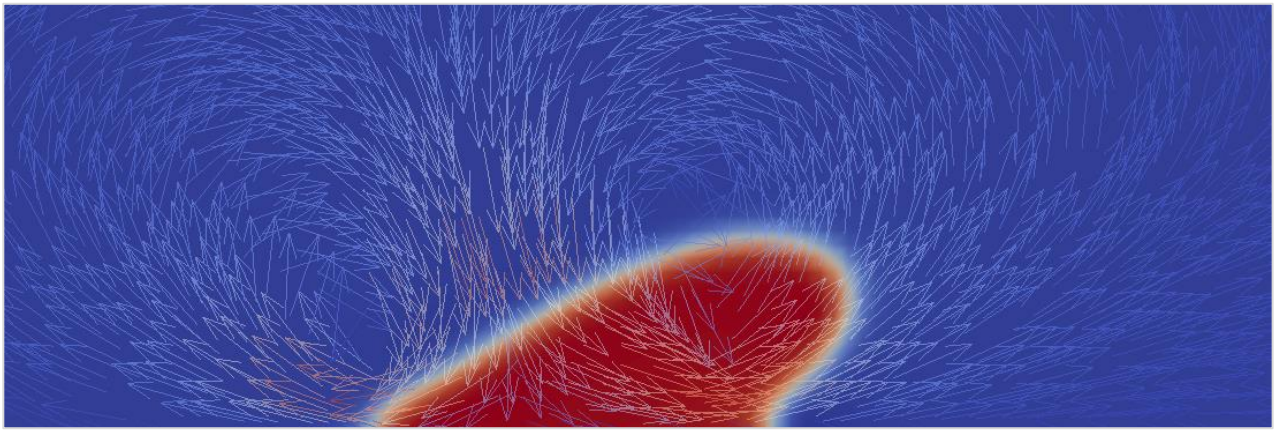
Forthcoming meetings

SIG Meeting #2, 28 November 2017, University of Edinburgh

For more information on our SIG, or to join the mailing list, please contact:

Joseph Banks (University of Southampton): j.banks@soton.ac.uk
Contact for the second meeting: Ignazio Maria Viola (I.M.Viola@ed.ac.uk)

21 · Mathematical challenges of nonlinear waves and interfacial dynamics



Motion of a two-phase fluid along a surface due to an applied pressure drop.

This SIG will develop and promote new mathematical techniques to model nonlinear multi-scale phenomena in waves and interfacial dynamics. Our group possesses excellent multi-disciplinary expertise in the mathematical modelling of interfacial phenomena across the scales, from the extremely small, e.g. a few ångströms, $O(10^{-10}$ m), to the very large-scale, e.g. tsunami wavelength, $O(10^{5}$ m). Small-scale structures in solids and fluids have an impact on the underlying dynamics of systems, from colloidal fluids to fluid-structure interaction, and can predict large-scale emergent behaviour. On the macro-scale, interfacial phenomena of interest are linked to oceanography and meteorology, as well as wave-structure interaction problems relevant to emerging wave energy technologies.

Website

https://fluids.ac.uk/sig/NonlinearWaves

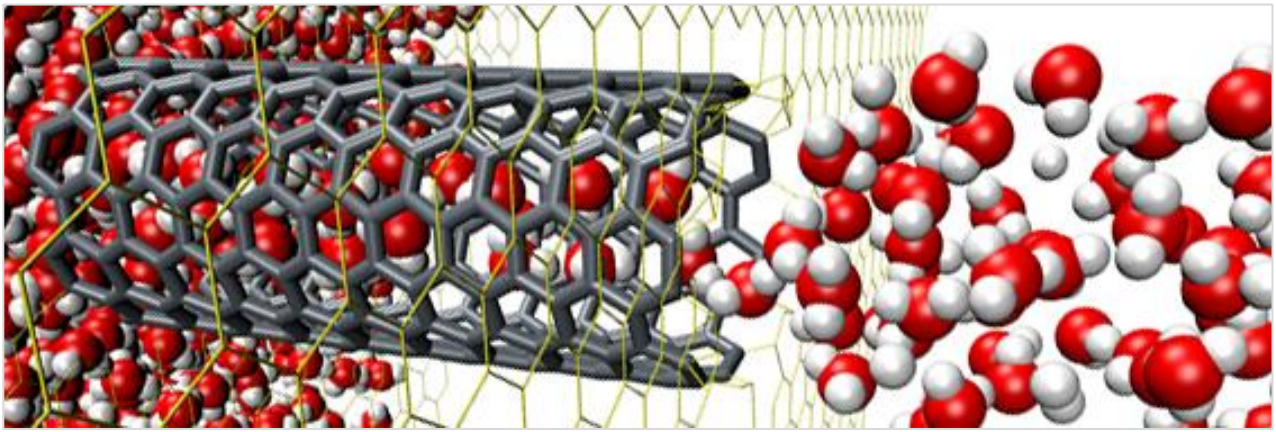
Forthcoming meetings

Kick-off SIG meeting, 25-26 September 2017, Loughborough University

For more information on our SIG, or to join the mailing list, please contact:

Emiliano Renzi (Loughborough University): E.Renzi@lboro.ac.uk
Demetrios Papageorgiou (Imperial College, London): d.papageorgiou@imperial.ac.uk
Paul Milewski (University of Bath): p.a.milewski@bath.ac.uk

22 · Multi-scale and non-continuum flows



Molecular dynamics simulation of water molecules transported through a short carbon nanotube, which is fixed between two graphene sheets to model a nanostructured membrane.

In *multi-scale* flows, the overall behaviour at the macroscale is determined by molecular time- and length-scales (or, if the flow is granular, by the particle dynamics). A *non-continuum* flow is one in which the conventional fluid-dynamic assumptions of material continuity and local thermodynamic equilibrium are not applicable. These types of flows can be found in some important emerging technologies. Quintessential examples are internal flow systems with nano-complexity (e.g. in separation membranes), interfacial fluid dynamics (e.g. moving contact lines), gas flows at the microscale (e.g. aerosols), and low-density gas flows (e.g. vacuum systems). This SIG targets the gap in both experimental and theoretical/numerical understanding of these flows, and aims to build a community of experts ready for the flow systems challenges of the next 20 years.

Biannual meetings focus on commonalities in the fluid physics that underlie different applications and methodologies, on unsolved problems and roadmapping research directions, and on networking for the development of future projects, particularly with industry. We encourage early career researchers through organising special forums and poster sessions.

We aim for some industrially-funded projects to be initiated by the end of the SIG period – in particular, on introducing multi-scale methods into CFD software.

Website

https://fluids.ac.uk/sig/MultiscaleNonCntm

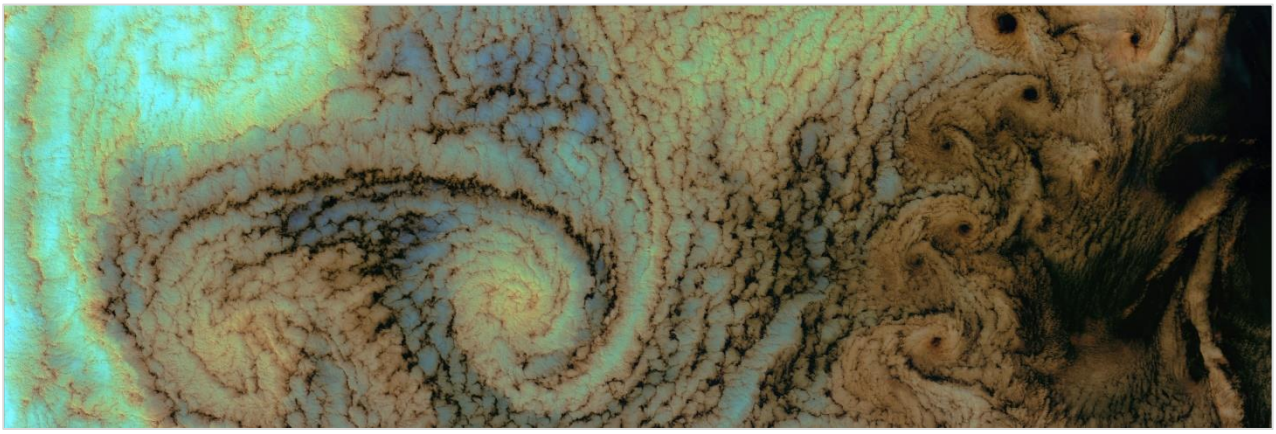
Forthcoming meetings

SIG Meeting #2, 27 September 2017, University of Warwick

For more information on our SIG, or to join the mailing list, please contact:

Jason Reese (University of Edinburgh): jason.reese@ed.ac.uk
Duncan Lockerby (University of Warwick): duncan.lockerby@warwick.ac.uk

23 · Multi-scale processes in geophysical fluid dynamics



Von Kármán vortices in the atmospheric boundary layer over the Northern Pacific, generated by flow over the Aleutian islands (Photo credit: NASA).

The SIG will focus on grand challenges with a common theme of multi-scale interactions in geophysical fluid dynamics, in which small-scale processes (clouds, convection, fronts, inertia-gravity waves, small-scale turbulence) interact with planetary-scale motions. It will assess current parameterizations of the relevant small-scale processes and develop new ones, for use in weather prediction, climate and ocean circulation models.

Challenges, to be driven by sub-teams of SIG members, may include:

- Stochastic methods to estimate probabilities of rare events
- Impact of `sub-mesoscale' ocean processes on larger-scale dynamics
- Inertia-gravity wave interaction with large-scale atmospheric circulation
- Moist convection

The SIG will convene at the established biannual `Dynamics of Rotating Fluids' (DRF) meetings, held at UCL and Oxford, with a second day focused on technical/ specialist talks and development of structured plans for research projects, studentships and grant proposals. Research outputs, such as videos of invited DRF talks, technical SIG talks, overseas presentations by SIG members and other educational material for students, will be posted online.

Website

https://fluids.ac.uk/sig/MultiscaleGFD

Forthcoming meetings

Kick-off SIG meeting, 22 September 2017, University of Oxford

For more information on our SIG, or to join the mailing list, please contact:

Gavin Esler (University College London, University of London): j.g.esler@ucl.ac.uk
David Dritschel (University of St. Andrews): dgd@mcs.st-and.ac.uk
Peter Read (University of Oxford): peter.read@physics.ox.ac.uk

24 · Multicore and Manycore Algorithms to Tackle Turbulent flows (MUMATUR)

Iso-surfaces of Q-criterion coloured by velocity magnitude in wake of single low pressure turbine blade at Re=80000.

This SIG covers research activities related to algorithms, software, tools, data management and applications to tackle turbulent flows (single and multiphase) exploiting modern high performance computing platforms ranging from multi-core/many-core architectures to accelerators to graphics processing units. The SIG provides opportunities to meet colleagues from across various institutions in the UK, enhance existing skills or learn new ones, and share technical knowledge with people from a wide range of scientific backgrounds.

The SIG serves as a sustainable forum to communicate research and computing expertise within the UK turbulence community, to speak collectively to funding bodies, and to help UK science remain in the lead internationally in turbulence HPC-based research. Its three main goals are to

- share expertise, experience and open-source algorithms
- initiate innovative and challenging software developments for emerging hardware architectures
- offer training courses to present and promote multicore/manycore algorithms to young scientists

Website

https://fluids.ac.uk/sig/MUMATUR

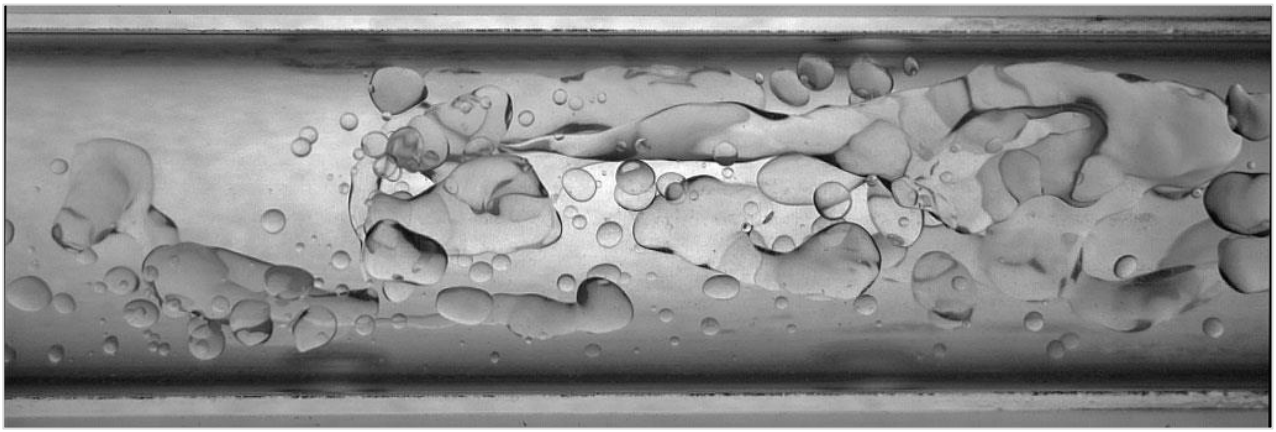
Forthcoming meetings

SIG Meeting #2, April 2018, Imperial College, London

For more information on our SIG, or to join the mailing list, please contact:

Sylvain Laizet (Imperial College, London): s.laizet@imperial.ac.uk
Charles Moulinec (Daresbury Laboratory (STFC)): charles.moulinec@stfc.ac.uk

25 · Multiphase flows and transport phenomena



Complex oil-water dispersions in pipelines.

Multiphase flows are ubiquitous in industry and in nature. They are inherently multiscale, as the bulk flow is influenced by the interfacial dynamics scales orders of magnitude smaller than the core flow. These interactions between scales and accompanying transport phenomena lead to complex behaviours, which are poorly understood and yet critical to engineering design.

This SIG covers all aspects of multiphase flows and related transport phenomena, encompassing experimental, theoretical and computational methodologies, and scales from contact lines to large interfacial waves. Membership is a multi-disciplinary mix of engineers, physicists, chemists and mathematicians, from both academia and industry, active in the world-leading UK multiphase community.

The core objectives of the SIG are to

- exchange knowledge, drive innovation and train early career researchers
- accelerate industrial uptake and promote the area to the wider public
- encourage cross-fertilisation of ideas between ECRs and senior colleagues

Our activities include a rich mix of day workshops, summer schools, ECR-focused cross-SIG events, ECR-driven career events, industry days and half-yearly agenda-setting SIG meetings.

Website

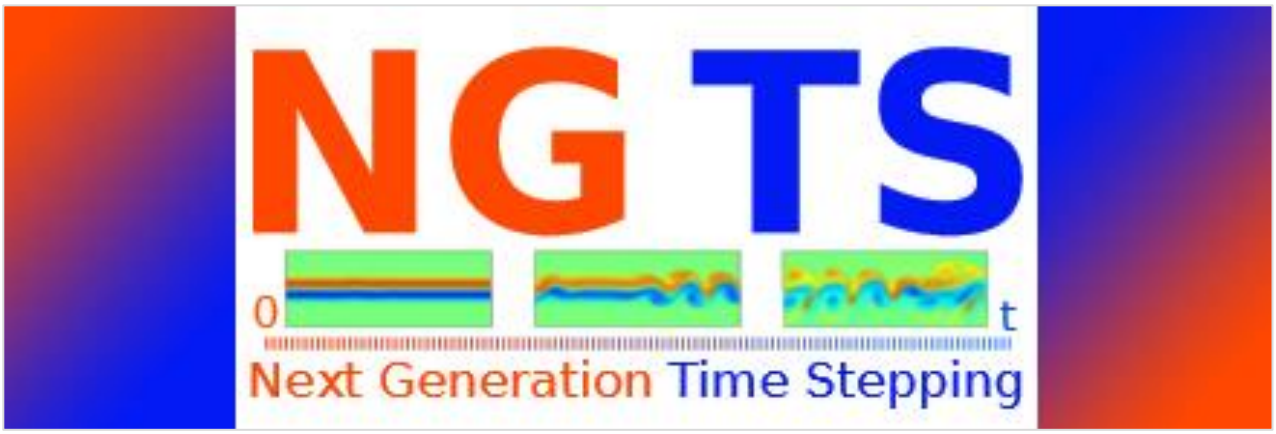
https://fluids.ac.uk/sig/Multiphase

Forthcoming meetings

SIG Meeting #2, December 2017, University College London

For more information on our SIG, or to join the mailing list, please contact:

Prashant Valluri (University of Edinburgh): prashant.valluri@ed.ac.uk
Panagiota Angeli (University College London): p.angeli@ucl.ac.uk
Twitter: @MultiphaseTPSIG



Galweski benchmark for simulations of global atmospheric flow on the sphere: balanced steady state initial conditions with small (invisible) perturbations eventually leading to turbulent flow.

Computer simulations of multi-scale fluid flow are widely used in engineering and natural sciences. Prominent examples include simulations of arterial blood flow and numerical weather prediction. The complexity of many of these flows translates into substantial computational cost so that high-performance computing (HPC) architectures are often required to obtain solutions within reasonable times.

HPC systems, however, are evolving rapidly, illustrated by steadily growing numbers of cores, an increase in size of vector registers, heterogeneity, deep memory and storage hierarchies, energy constraints and increasing likelihood of faults. This fast pace of change calls for new computational strategies and numerical algorithms to ensure continued efficiency and robustness of simulation software.

This SIG will explore strategies that can maximise the efficiency of time-stepping algorithms in computer simulations of transient flows. It brings together researchers from applied mathematics, computer science, engineering and the physical sciences. In two meetings per year, we discuss a selected topic and record and publish two expert presentations on our YouTube channel (https://www.youtube.com/channel/UCY4ViwP_SVYoRgS-qTSxenQ). The ultimate aim is the creation of a white-paper laying out a systematic approach to developing efficient tools for numerical time-stepping on next generation HPC systems.

Website

https://ngtssite.wordpress.com/

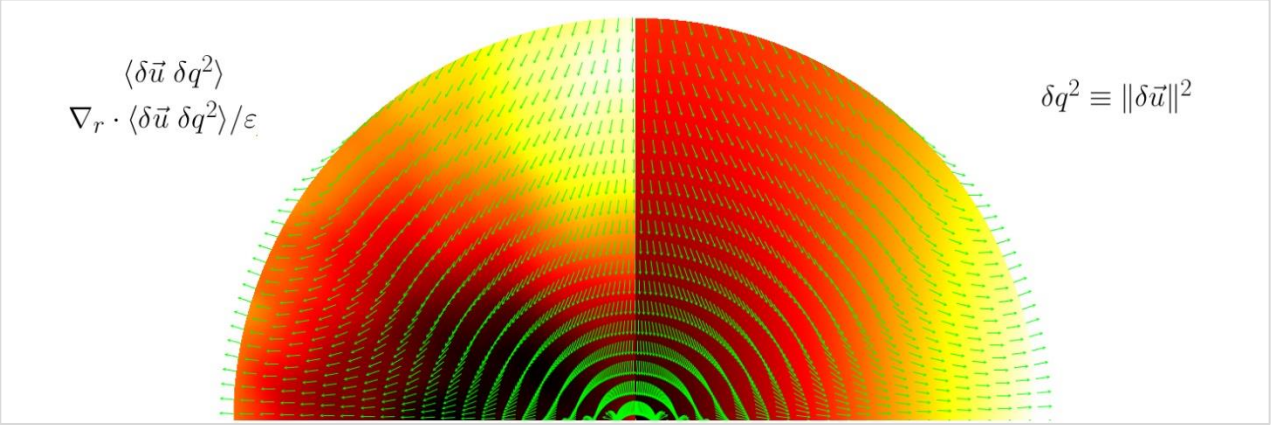
Forthcoming meetings

SIG Meeting #2, 11-12 December 2017, University of Bristol (provisional location)

For more information on our SIG, or to join the mailing list, please contact:

Daniel Ruprecht (University of Leeds): d.ruprecht@leeds.ac.uk
Jemma Shipton (Imperial College, London): j.shipton@imperial.ac.uk
Martin Schreiber (University of Exeter): M.Schreiber@exeter.ac.uk

27 · Non-equilibrium turbulence



The turbulence cascade in a non-homogeneous and anisotropic turbulent flow – see Alves Portola et al. *J. Fluid Mech.* **825**, 315-352 *(2017)*.

Many turbulent flows are, or contain substantial regions which are, out of equilibrium between turbulence dissipation and production or energy injection. This causes a lack of equilibrium in the turbulence cascade, which has far-reaching consequences. In the last decade, a turbulence dissipation scaling law for non-equilibrium cascades has been discovered. This has important implications that include (i) wake/jet width growth, (ii) mean flow decay, (iii) eddy viscosity scalings, (iv) local entrainment velocities at turbulent/non-turbulent interfaces and (v) turbulence decay rates.

Our SIG's objectives include

- understanding the physics of turbulence under non-equilibrium conditions
- developing fundamental and applied approaches for non-homogeneous and non-isotropic turbulence
- broadening our understanding to the non-equilibrium dynamics of superfluid turbulence, scalar cascades and buoyancy-driven flows

These will lead to fundamentally new descriptions of the turbulence cascading process, and the physics of how dissipation arises. The longer-term objective is to improve the tools used in computational fluid dynamics, since their closure models typically adopt an equilibrium formulation for the cascading process.

Website

https://fluids.ac.uk/sig/NonEqmTurbulence

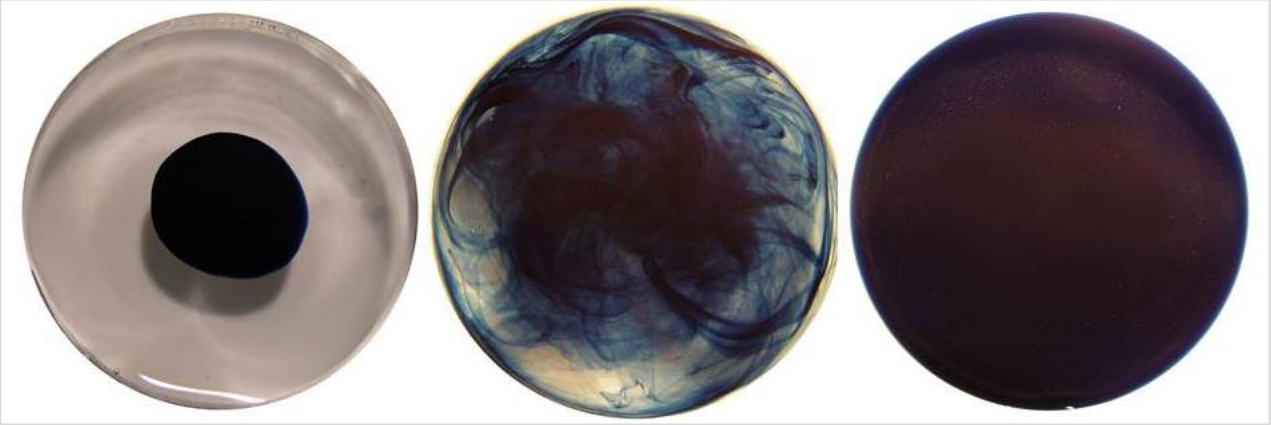
Forthcoming meetings

SIG Meeting #2, March/April 2018, Imperial College, London (provisional location)

For more information on our SIG, or to join the mailing list, please contact:

Christos Vassilicos (Imperial College, London): j.c.vassilicos@imperial.ac.uk
Chris Keylock (University of Sheffield): c.keylock@sheffield.ac.uk

28 · Non-Newtonian fluid mechanics



Passive scalar mixing using elastic turbulence.

The SIG addresses two of the outstanding challenges in the area of Non-Newtonian fluid mechanics. The first is *yield stress (viscoplastic) fluids*: these occur frequently in industrial settings (e.g. drilling muds, foodstuffs), and such novel materials offer distinct challenges in both modelling and in experimentation. The second is *elastic fluid instabilities*: even at vanishingly small Re, elastic fluids can give rise to instabilities, or even "turbulence", that is otherwise completely absent in equivalent Newtonian fluids – the UK has world-leading expertise in this area and the SIG will bring these researchers together. A third, more general, sub-theme, namely the flow of *suspensions*, has also been selected by the group.

Activities of the SIG will include

- meetings and focused discussions to agree on grand challenges in each of sub-themes, and documents defining the grand challenges will be published
- compilation of a comprehensive database of research groups with expertise in NNFM, to be posted on the UKFN website
- production of videos highlighting interesting non-Newtonian phenomena for the UKFN website (e.g. viscoplastic Leidenfrost drops), as well as a lecture on Non-Newtonian Fluids for a general fluids audience

Website

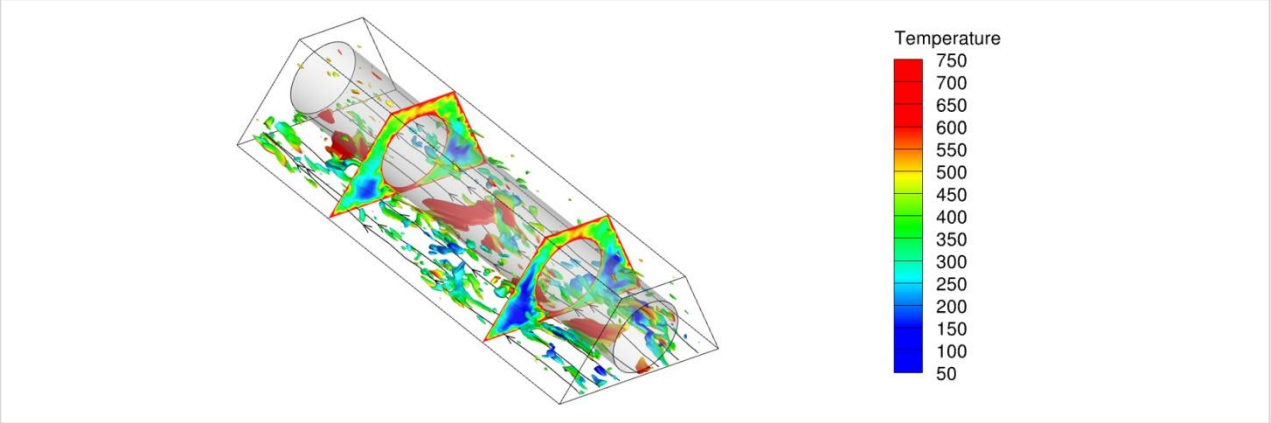
https://fluids.ac.uk/sig/Non-Newtonian

Forthcoming meetings

SIG Meeting #2, 11-12 January 2018, University of Edinburgh

For more information on our SIG, or to join the mailing list, please contact:

Rob Poole (University of Liverpool): robpoole@liverpool.ac.uk
Alexander Morozov (University of Edinburgh): Alexander.Morozov@ph.ed.ac.uk



Flow structures over a fuel pin in a sub-channel simulated using LES, and coloured with temperature of flow.

Nuclear Thermal Hydraulics (NTH) has been identified as a key area for development to underpin the UK's ambitious strategy in expanding its nuclear energy R&D capability. This reflects the growing industrial activities in the UK: the imminent nuclear new build; the renewed interest in small modular (SMR) and Generation IV reactors; and the lifetime extension of the existing ageing reactors.

These developments present a range of challenges relevant to this SIG. Examples include: natural and mixed convection; multiphase flow and heat transfer; conjugate heat transfer; fluid-structure interaction; development of multi-scale, multi-phase and multi-physics methodologies and computer codes for reactor simulation; validation and uncertainty quantification; and code coupling.

The NTH SIG brings together academics and industrialists to examine critically progress in research and development in nuclear thermal hydraulics, identify challenges and urgent research needs to underpin the activities of the nuclear industry and foster the development of collaborative research and advanced training for early career researchers.

The SIG organises biannual meetings aimed at gauging industry needs, discussing strategic research directions and grand challenges, facilitating research collaboration, and providing training opportunities for young researchers. Additionally, the SIG plans to organise training courses and maintain a website.

Website

https://fluids.ac.uk/sig/Nuclear

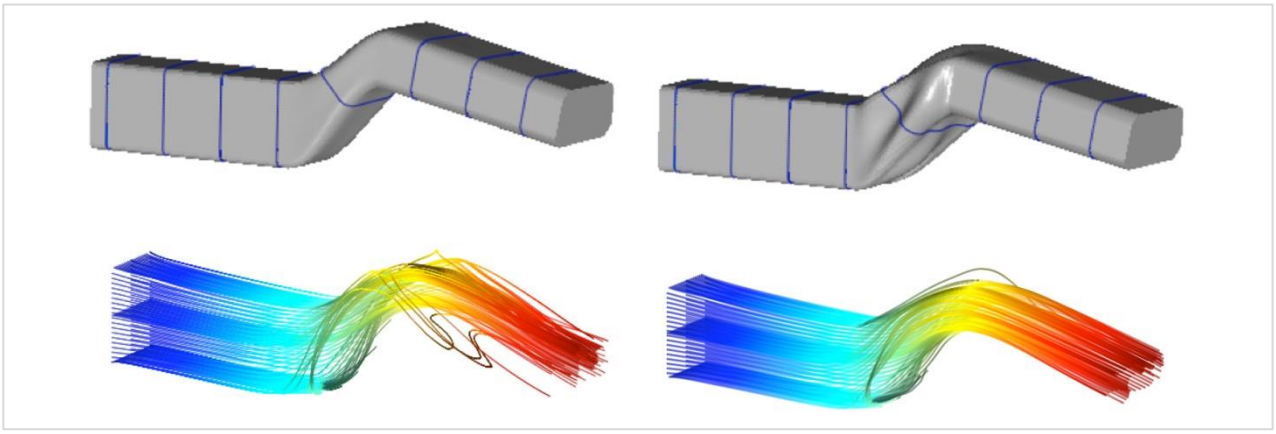
Forthcoming meetings

SIG Meeting #2, early 2018, Imperial College, London

For more information on our SIG, or to join the mailing list, please contact:

Shuisheng He (University of Sheffield): s.he@sheffield.ac.uk
Hector Iacovides (University of Manchester): h.iacovides@manchester.ac.uk

30 · Numerical optimisation with fluids



Shape optimisation for minimal pressure loss of a an S-bend duct using a CAD-based surface parametrisation.

Numerical Optimisation has become an important tool in the engineering design of structures, but application in fluids is less mature. To advance the state of the art in academia and industry, this SIG brings together the leading academic groups working on numerical optimisation of processes, devices and immersed bodies involving fluid dynamics. It covers shape optimisation of wings and turbine blades, as well as less widely-covered topics such as shape optimisation for semiconductor cooling, or sensitivity analysis of acoustic phenomena in combustion chambers.

The SIG will organise workshops to review the state of the art, provide training and enable a transfer of knowledge between developers in academia, industrial end users, as well as the commercial code vendors. Tangible outcomes will be a set of curated optimisation benchmark cases, as well as a range of training materials to serve as introduction to the field.

Topics that will be covered by the workshops include: effective design parameterizations for shape and topology optimisation, advanced meta-modelling approaches for large design spaces, computationally efficient and robust adjoint solvers for inexpensive gradient computation, advances with optimisation of unsteady flows and uncertainty quantification.

Website

https://fluids.ac.uk/sig/NumOptFluids

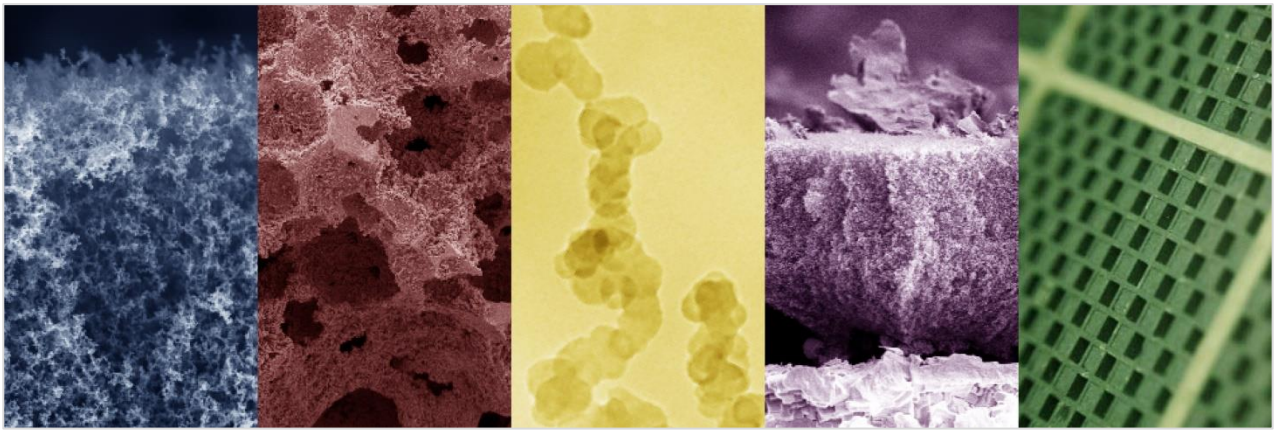
Forthcoming meetings

SIG Meeting #2, “Geometry-handling and parametrisation workshop”,
24-26 October 2017, CFMS, Bristol

For more information on our SIG, or to join the mailing list, please contact:

Jens-Dominik Müller (Queen Mary University of London): j.mueller@qmul.ac.uk
Ning Qin (University of Sheffield): n.qin@sheffield.ac.uk
Thomas Rendall (University of Bristol): Thomas.Rendall@bristol.ac.uk

31 · Particulate matter filtration flows in automotive and marine applications



Left to right: particulate cake layer from automotive diesel engine; particulate-loaded ceramic foam filter; close-up of agglomerated particle; particulate cake layer on wall flow filter; automotive diesel particulate filter substrate.

Introduction of particulate matter (PM) emissions regulations for gasoline engines, tighter regulations for diesel engines and alternative fuels development means automotive and marine industries are struggling to advance the filtration technology fast enough. This SIG aims to coordinate and boost activity in this area, with focus on fundamental flow properties.

A coordinated effort from researchers in fluid dynamics, two-phase flows, flow kinetics, particle characterisation and general vehicle/marine vessel system efficiency is essential to provide a technology breakthrough for improving PM filtration. Industry representatives from automotive and marine sectors and researchers in adjacent areas such as air filtration flows have joined the dialogue.

The group's activities involve organising two meetings a year, development of a knowledge database for the research and industrial community, creating collaboration networks, engaging academia and industry in a discussion together with policy makers, defining targets and building consortia for funding bids. Group members include academia (Coventry, Loughborough, Birmingham, Newcastle) and industry (British Marine, CAT, C4FF, Evolution Measurement, Ford, Horiba MIRA, JLR, JCB, MAHLE, Perkines Engines), and new members are welcome.

Website

http://www.coventry.ac.uk/SIG-PM-filtration

Forthcoming meetings

SIG Meeting #2, “Particulate matter flows: experimental methods and measurements”, 11 September 2017, Loughborough University

For more information on our SIG, or to join the mailing list, please contact:

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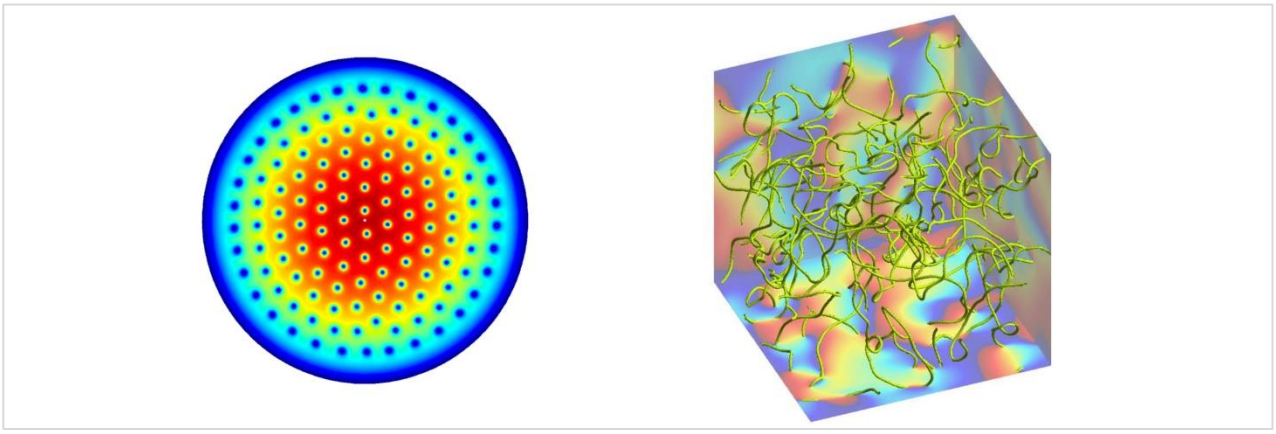
Andy Williams (Loughborough University): A.M.Williams@lboro.ac.uk

32 · Quantum fluids



Abrikosov lattice of quantised vortices in a rotating Bose-Einstein condensate (left); vortex tangle of a turbulent superfluid overlaid on phase field of the superfluid wavefunction (right).

The Quantum Fluids SIG focuses on fluid systems that exhibit quantum mechanical effects at the macroscopic scale. The most significant of the properties displayed by such systems is the phenomenon of superfluidity, in which a fluid can behave as an essentially inviscid fluid. Superfluidity has now been experimentally realized across many different systems including liquid helium-4, helium-3, ultracold atomic Bose-Einstein condensates (BECs), and non-equilibrium exciton-polariton condensates. These achievements have been recognised by the award of several Nobel prizes in the field. Superfluids are also believed to exist in more exotic systems such as neutron stars. In recent years, the community has witnessed remarkable advances in our ability to create and accurately control superfluids in new systems. These developments have narrowed the gap between theory and experiments and have opened the opportunity to explore the dynamical role of vortex and other topological excitations in the non-equilibrium properties of superfluids.

A key aim of the SIG is to promote collaboration between experimentalists and theoreticians as well as among researchers working on different superfluid systems. Specific areas include dynamics of vortex excitations in unconventional superfluids, non-equilibrium phenomena and superfluid turbulence.

Website

https://fluids.ac.uk/sig/Quantum

Forthcoming meetings

SIG Meeting #2, December 2017/January 2018 (location TBD)
SIG Meeting #3, April 2018, Newcastle University

For more information on our SIG, or to join the mailing list, please contact:

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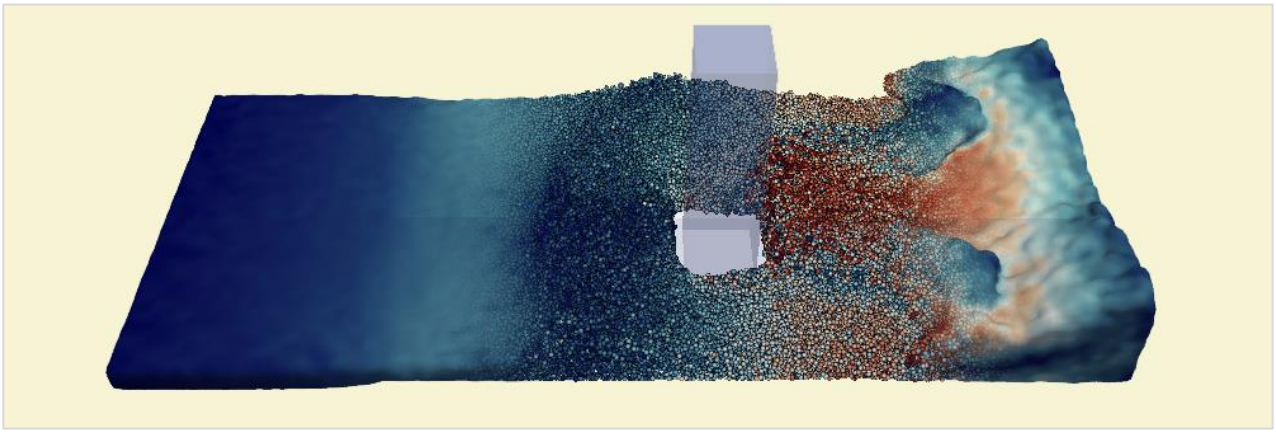
Paul Walmsley (University of Manchester): paul.walmsley@manchester.ac.uk

33 · Smoothed particle hydrodynamics (SPH)



A weakly-compressible SPH simulation of water breaking against a pillar inside a container. Particles representing volumes of fluids are depicted as spheres and an isosurface of the fluid surface is overlaid.

This SIG considers the mesh-less method, Smoothed Particle Hydrodynamics (SPH), which provides a Lagrangian solution to both fluid dynamics and solid mechanics problems involving a free surface or large deformation. SPH typically finds use in astrophysics, engineering and computer graphics applications. Although well-defined as a method, the challenge for UK researchers is now to improve it, from fundamentals through to result processing: this is best driven by real-world applications delivered by industrial contributors.

This SIG looks to enlist the UK research community in SPH to disseminate the method to industry and new areas of science. As the future of computational modelling is towards multi-physics, multi-scale frameworks, this SIG looks to define where SPH sits within this, and to drive the method's development accordingly.

Website

https://fluids.ac.uk/sig/SPH

Forthcoming meetings

Academic interaction meeting – introduce new scientific domains to SPH, April 2018 (location TBD)

Industrial interaction meeting – introduce SPH to new areas of industry, September 2018, DETC, Loughborough University (London campus)

Joint technical meeting and technical training session, July 2019 (location TBD)

For more information on our SIG, or to join the mailing list, please contact:

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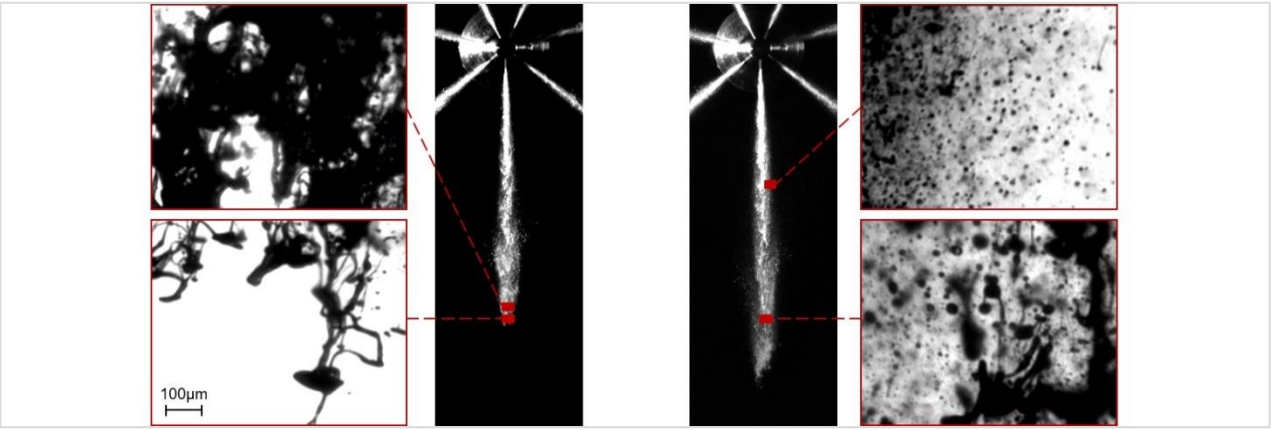
Benedict Rogers (University of Manchester): Benedict.Rogers@manchester.ac.uk

34 · Sprays in engineering applications: modelling and experimental studies



Sprays in diesel engines.

The SIG aims to critically analyse recent results obtained by the groups involved in the project from modelling and experimental studies on the fluid dynamics, heat/mass transfer and ignition/combustion processes in sprays. We focus on building bridges between modellers and experimentalists. Modellers with engineering and mathematical backgrounds will be able to engage in constructive dialogues. In contrast to most other conferences/workshops, where fluid dynamics, heat/mass transfer and ignition/combustion processes in sprays are considered in isolation, in our workshops we will establish links between these processes. Particular attention will be given to establishing and strengthening the links between academic and industrial groups, and groups working on various applications of sprays. We anticipate that this critical analysis will lead to an improvement in the quality of research results obtained by the SIG participants from existing projects. It will also result in the development of a universal spray model suitable for engineering, environmental and medical application. The scope of the SIG includes modelling and experiments on turbulent combustion in multiphase fluids, the stability analysis of jets, and an investigation of the link between the flows inside the nozzle and subsequent spray formation.

Website

https://fluids.ac.uk/sig/Sprays

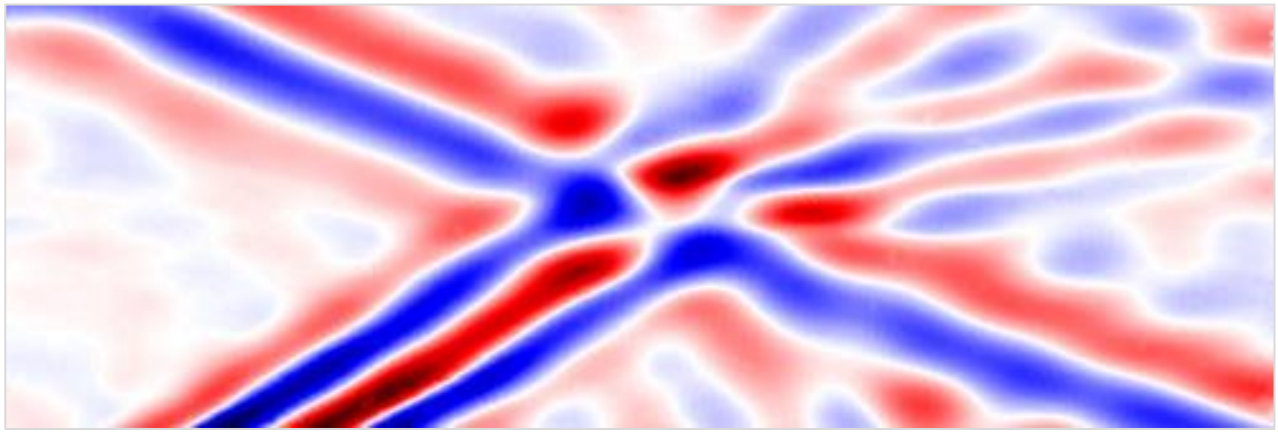
Forthcoming meetings

SIG Meeting #2, 4-5 December 2017, Brunel University London

For more information on our SIG, or to join the mailing list, please contact:

Sergei Sazhin (University of Brighton): s.sazhin@brighton.ac.uk
Nilanjan Chakraborty (Newcastle University): nilanjan.chakraborty@newcastle.ac.uk

35 · Surface and internal waves



Two incoming beams of internal wave energy in a stratified fluid nonlinearly interact to produce a third principal beam in a new direction. (Synthetic schlieren imaging courtesy of Tom Dobra, 2016)

This SIG brings together researchers who use theoretical, numerical, laboratory and field-based approaches to investigate surface and internal waves in a variety of fluid environments, with the goal of synthesizing knowledge across disciplines to advance our understanding of such waves and feedback mechanisms between surface and internal waves.

Surface and internal waves (SIW) play a key role in large scale ocean and climate dynamics, remote sensing, air/sea interaction, offshore oil/gas and marine renewable energy infrastructure, the shipping industry, and defense applications. This SIG will develop multidisciplinary approaches to address key issues such as:

- How do we best parameterize and model SIW interactions across scales?
- What is the mixing efficiency of turbulence driven by SIW in a range of stratified flows?

This platform will foster a critical mass working on waves across scales, from direct numerical simulations to the ocean; only in this manner can we identify scale-dependent processes and leverage field and laboratory experiments to enhance our fundamental understanding of SIW and improve model parameterizations.

Website

https://fluids.ac.uk/sig/SurfaceInternalWaves

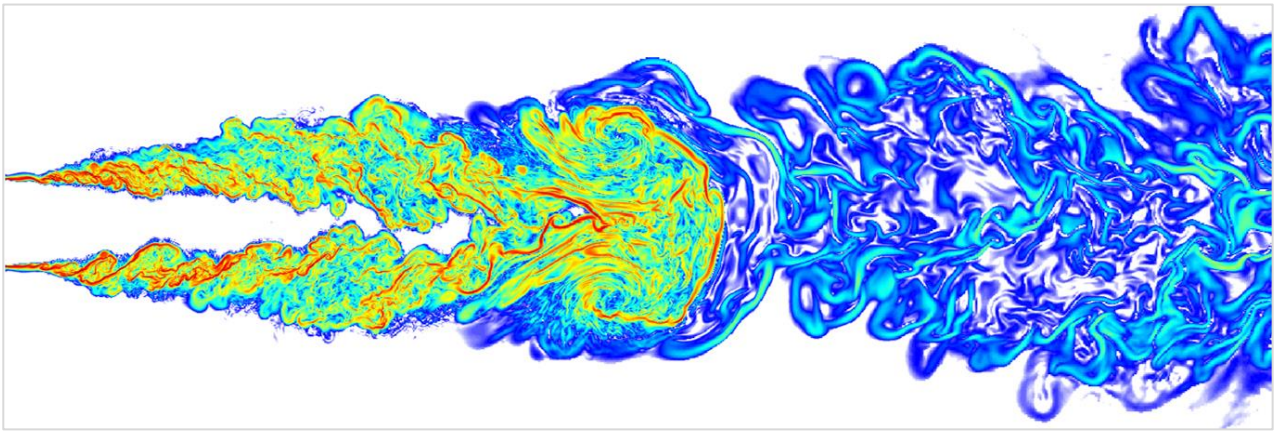
Forthcoming meetings

SIG meeting #2, February 2018 (details TBD)

For more information on our SIG, or to join the mailing list, please contact:

Danielle Wain (University of Bath): d.j.wain@bath.ac.uk
Andrew Lawrie (University of Bristol): Andrew.Lawrie@bristol.ac.uk

36 · Turbulent free shear flows



Simulation of mixing in duel fuel injection, showing scalar dissipation rate: this helps to predict the ignition location and timing and hence optimal injection schedules for clean diesel engines.

The scope of the SIG includes any kind of turbulent flow in an unbounded domain: free shear flows (jet, wake, and mixing layer) with unsteady inflow conditions, inhomogeneous ambient conditions, multiple species and chemical reactions. Such flows underpin many practical engineering and environmental problems, such as combustion, ventilation, aircraft noise and weather prediction. Although the steady-state, single-species jet is well characterized, departures from this idealised case remain largely unsolved.

The main motivation of the SIG is to stimulate researchers to share their knowledge in the form of research data, research code and best practices in order to accelerate research activities and help to educate PhDs/PDRAs effectively.

The two main objectives of the SIG are to

- produce best practice guides for each research methodology (numerical, experimental, analytical), and compile the state of the art and most important techniques for new students
- share research data and code, and enhance communication between researchers and facilitate acquisition of shared data and codes

The SIG will organise 5 meetings, including a data/code share workshop and 3 best practice workshops, one on each of the research methodologies.

Website

https://fluids.ac.uk/sig/FreeShearFlows

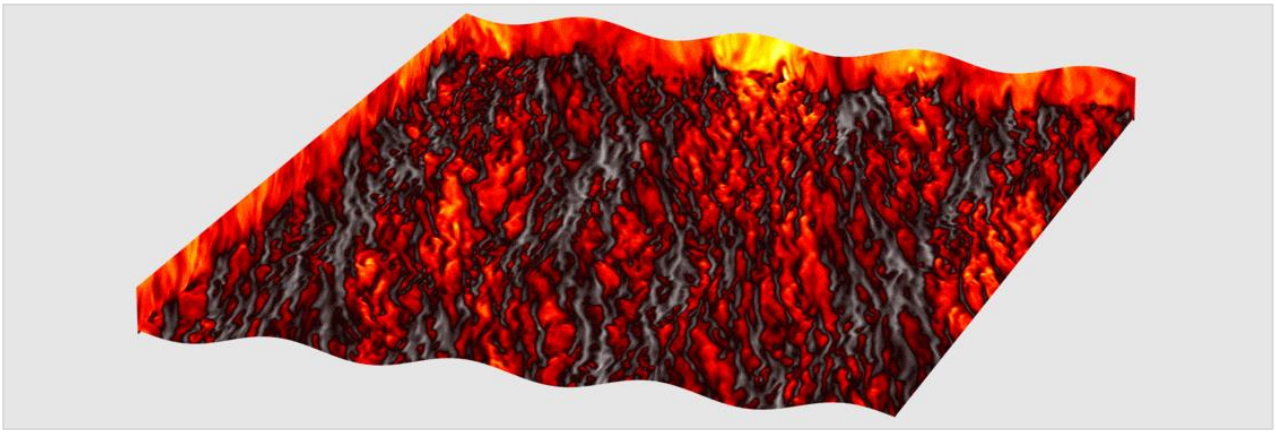
Forthcoming meetings

SIG Meeting #2, November/December 2017, University of Edinburgh

For more information on our SIG, or to join the mailing list, please contact:

Dong-hyuk Shin (University of Edinburgh): D.Shin@ed.ac.uk
Andrew McMullan (University of Leicester): wam3@le.ac.uk

37 · Turbulent skin-friction drag reduction



Flow past a drag-reducing wavy wall.

The SIG is concerned with techniques and understanding of flow physics involved in reducing the skin-friction drag in turbulent flows. All approaches to achieve these goals will be covered, including: passive and active methods of surface modification (for example riblets); feedback control; open-loop actuation; polymer and surfactant additives; and hydrophobic/super-hydrophobic surfaces. Its scope also includes the issue of practical feasibility of methods of turbulent skin-friction reduction, as well as how various techniques might be combined to achieve maximum efficiency.

The SIG has 19 academic members from 12 universities, as well as representatives from industry. Besides biannual meetings for presentations and discussion, some hosted by industrial partners, the SIG will produce several publications on the state of the art, in both the general area of turbulent skin-friction drag reduction as well as related specialist topics such as rheology of drag-reducing surfactants and surface wetting. The SIG also plans to compile a database of parties interested in turbulent skin-friction reduction.

Website

https://fluids.ac.uk/sig/DragReduction

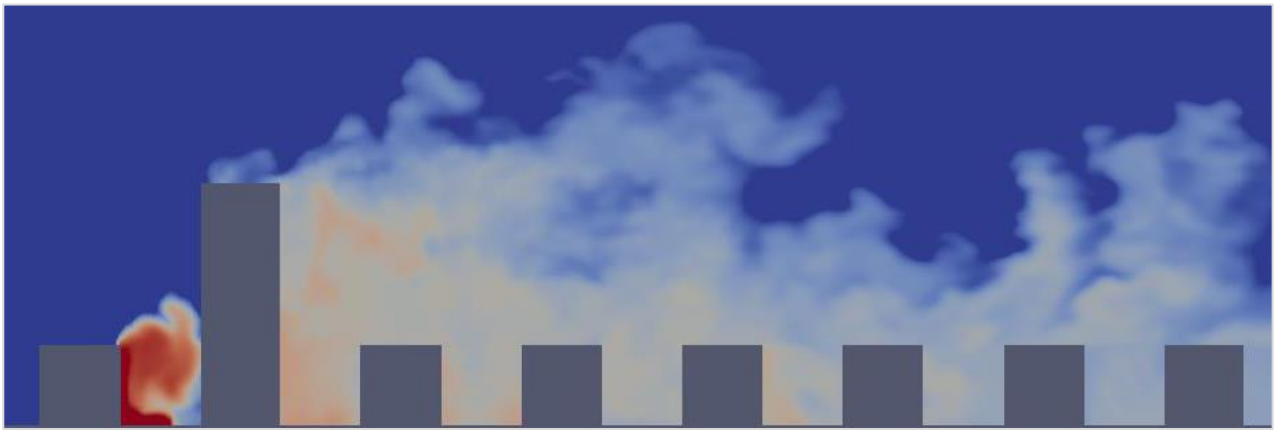
Forthcoming meetings

SIG Meeting #2 (details TBD)

For more information on our SIG, or to join the mailing list, please contact:

Sergei Chernyshenko (Imperial College, London): s.chernyshenko@imperial.ac.uk
Kwing-So Choi (University of Nottingham): Kwing-So.Choi@nottingham.ac.uk

38 · Urban fluid mechanics



Instantaneous concentration contours, computed with LES, for a passive scalar release just upstream of a tall building (3×height of neighbouring buildings), in vertical section through tall building centre plane.

The Urban Fluid Mechanics SIG aims to bring together research communities and industry working on atmospheric problems involving short distance dispersion, urban microclimates and wind engineering. It aims to disseminate established and new techniques across different communities, generate new ideas through cross-fertilisation and enhance established links to government bodies (e.g. Met. Office, DSTL), engineering companies (e.g. Arup, Foster + Partners, RWDI) and societies (e.g. the UK Wind Engineering Society).

The SIG will address the following challenges:

- Understand turbulent flows over very rough and heterogeneous surfaces, such as urban areas, and understand and quantify the effects of stratification, differential heating and topography on atmospheric flow and mixing
- Understand the transport and dispersion of gasses, particular matter (PM) over urban areas, and indoor-outdoor exchange
- Better understand the flow field around buildings in urban areas, due to both synoptic and convective wind conditions

The SIG meets biannually to share the latest research and to disseminate it across the various stakeholders. It will also organise special sessions at conferences, and will provide help for PhDs/PDRAs to visit SIG members.

Website

www.urbanfluidmechanics.org

Forthcoming meetings

SIG Meeting #2, 18 December 2017, Imperial College, London

For more information on our SIG, or to join the mailing list, please contact:

Zheng-Tong Xie (University of Southampton): Z.Xie@soton.ac.uk
Maarten Reeuwijk (Imperial College, London): m.vanreeuwijk@imperial.ac.uk

39 · User's forum for National Wind Tunnel Facility

British Aerospace Advanced Turboprop aircraft model in the deHavilland wind tunnel, University of Glasgow. (Picture credit: Richard Green, University of Glasgow)

The National Wind Tunnel Facility (NWTF), http://www.nwtf.ac.uk is funded jointly by EPSRC and the Aerospace Technology Institute (ATI). Its chief aim is to provide, principally to UK researchers, access to world-class wind tunnel facilities in a cost-effective way such that each facility (or group of facilities at a single institution) is financially sustainable. To that end, each facility expects to operate as open access for some of the available tunnel time, at an agreed charge-out rate payable directly to the host institution by the researcher's grant/contract.

The SIG and its members have the view that NWTF facilities could also operate through an ARCHER-like process that is free at the point of access for PhD students who are otherwise unable to have access to experimental facilities. The Users' Forum is considering setting up such a process as well as providing feedback to NWTF on matters such as usage, type and number of facilities.

We are currently in discussion with EPSRC for possible funding: the objective of our SIG is to assist UK researchers without access to high-class experimental facilities at their own institutions, by giving them the opportunity to carry out world-class research with the help of NWTF and its state-of-the art instrumentation.

Website

https://fluids.ac.uk/sig/NWTF

Forthcoming meetings

SIG Meeting #3 (details TBD)

For more information on our SIG, or to join the mailing list, please contact:

Kwing-So Choi (University of Nottingham): Kwing-So.Choi@nottingham.ac.uk

40 · Wave turbulence

A strongly nonlinear wave breaking event arising from a sea of random weakly nonlinear surface gravity waves.

The Wave Turbulence SIG focuses on the development of wave turbulence theory—a non-equilibrium statistical mechanics description of weakly interacting dispersive waves—to strong nonlinearities and applications to industrial related fluid dynamics.

The overall scope of the SIG is to bring together UK fluid dynamicists, both theoretical and experimental, who work in areas of nonlinear waves, coherent structures and turbulence, with the aim of actively targeting two goals:

- A theoretical extension of the existing wave turbulence theory framework in order to incorporate the creation, dynamics and annihilation of long-lived coherent structures
- The creation of links with UK research institutions outside academia and industrial partners that might be interested in applying wave turbulence approaches or results in real-world technologies

The SIG will run biannual meetings for UK researchers working in nonlinear optics, quantum fluids, geophysical fluid dynamics, MHD and plasma physics. Ultimately, the Wave Turbulence SIG is a first attempt to unite the community and establish a coherent future direction for the subject.

Website

http://www.jasonlaurie.com/sig/

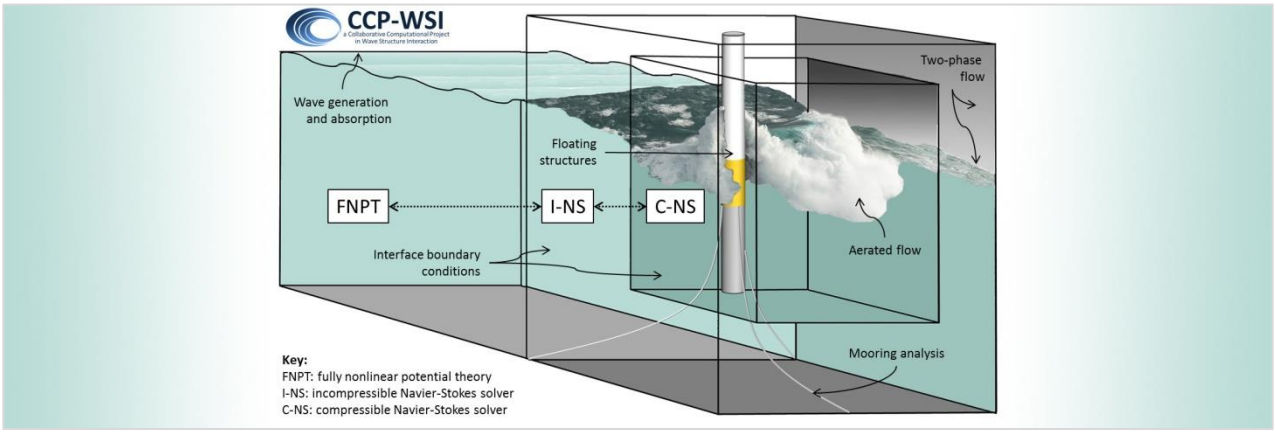
Forthcoming meetings

Wave Turbulence in Photonics and Nonlinear Optics, 11-12 December 2017, Aston
Turbulence in Quantum Fluids: Celebrating Carlo Barenghi's 65th Birthday, 9-11 April 2018, Newcastle (run jointly with Quantum Fluids SIG)

For more information on our SIG, or to join the mailing list, please contact:

Jason Laurie (Aston University): j.laurie@aston.ac.uk
Davide Proment (University of East Anglia): d.proment@uea.ac.uk

41 · Wave-structure interaction



A 'zonal CFD' approach for efficient wave-structure interaction simulations.

The Special Interest Group in Wave-Structure Interaction (SIG-WSI) brings together the community of researchers and developers in the field of Wave Structure Interaction (WSI). The SIG-WSI joins the Collaborative Computational Project in Wave Structure Interaction (CCP-WSI), with the shared objective of providing a focus for numerical modelling, software development and laboratory experimentation in WSI applications relating to offshore renewable energy, and ocean and coastal engineering. Members of the SIG-WSI will be invited to join the CCP-WSI programme of workshops and training courses contributing to the development and validation of an open-source, community-serving Numerical Wave Tank (NWT) facility.

Websites

https://fluids.ac.uk/sig/WSI

http://www.ccp-wsi.ac.uk/

Forthcoming meetings

SIG-WSI Kick-off Meeting, 25 October 2017, Manchester Metropolitan University
CCP-WSI Repository Workshop 2, May 2018, RAL, Didcot, UK

For more information on our SIG, or to join the mailing list, please contact:

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Deborah Greaves (University of Plymouth): deborah.greaves@plymouth.ac.uk
Ling Qian (Manchester Metropolitan University): L.Qian@mmu.ac.uk

Contact form at: http://www.ccp-wsi.ac.uk/contact

A-Z index of Special Interest Groups

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5	Challenges in cardiovascular flow modelling
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15	Fluid mechanics of the eye
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29	Nuclear thermal hydraulics – advanced modelling, simulation and experimentation
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34	Sprays in engineering applications: modelling and experimental studies
35	Surface and internal waves
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37	Turbulent skin-friction drag reduction
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39	User's forum for the National Wind Tunnel Facility
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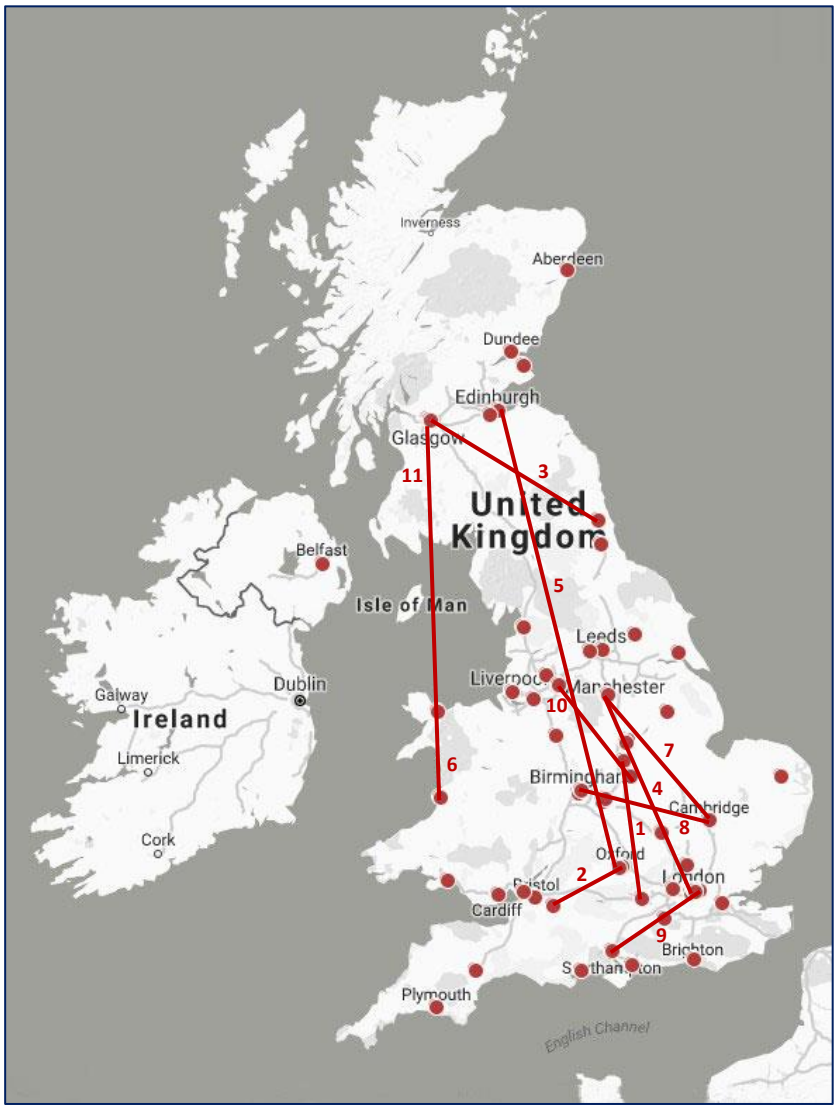
41	Wave-structure interaction

KEY:

- Aerodynamics
- Biological
- Complex
- Environmental
- Experimental
- Industrial
- Instability & turbulence
- Multiphase
- Numerical
- Urban

Short Research Visits so far (https://fluids.ac.uk/srv)

1	Advancing atmospheric models: aspects of spatial discretisation
2	Controlling nematic microfluidics: modelling, simulation and experiments
3	Exploration of integrated microfluidics with phononics and acoustofluidics based on thin-film platform
4	Interrogating local shear effects on coherent structure identification in turbulent flows
5	Towards a mechanistic understanding of haematocrit changes in tumour vasculature



6	Effect of surfactant re-distribution on the flow and stability of foam film
7	Modelling sediment transport in an integrated free-surface and subsurface water flow framework
8	Positron Emission Particle Tracking (PEPT) measurements of silo honking
9	The nature of secondary flows in turbulent boundary layers over rough beds
10	The stability and transition of rotating flows as applied to Chemical Vapour Deposition
11	Viscous froth and surfactant mass transfer

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