

ERCOFTAC/SIG's/Henri Bénard PC workshop: ASTROFLU VI.

Ecole Centrale de Lyon, Amphi 1, May 23-24, 2024

General context

Meetings around the DFGA theme (Dynamics of Geophysical and Astrophysical Fluids) have shown promising and truly multidisciplinary perspectives, in particular from the meeting co-organized by Philippe Fraunié in Paris in 2017, with the CNRS and the University. These themes are found in ERCOFTAC's pan-European `SIG's (Special Interest Groups). Our event will therefore bring together the heads of three SIG's: Tomas Bodnar (SIG 14 Stably-Stratified & Rotating Flows), Claude Cambon, (SIG 35 Multipoint Turbulence Structure & Modelling), and Andrzej Nowakowski (SIG 42 Synthetic Models in Turbulence.) Recent work has illustrated the rapprochement of modal projection techniques for deterministic and statistical equations, and those of stochastic modeling for the internal intermittency of turbulence (e.g. last ERCOFTAC workshop at CIRM, near Marseille.)

Modal projection is essential to describe the complex dynamics of turbulence in the presence of waves, which help structure in atmospheric and oceanic flows, such as inertia (rotation) and gravity (stratification) waves. These waves can be combined with Alfvén waves in MHD flows. As far as possible, compressibility will be addressed, first in considering acoustic waves (e.g. magnetosonic waves) and acoustic systems in weak turbulence.

The first two local events 'ASTROFLU' were principally organized by the Henri Bénard PC in Lyon, 12-13/11/2008 and 15/12/2011. The third one, which took place on November 20-21, 2013, attracted an European audience and was supported by ERCOFTAC with label and scholarships. The fourth and the fifth ones were supported as well, and took place at Ecole Centrale de Lyon, January 24-25, 2019, and December 7-8, 2021.

As for the previous ASTROFLU's workshops, the main goal of ASTROFLU VI is to gather specialists of fluids mechanics (FLU) in engineering, environment and geophysics, with astrophysicists (ASTRO). Cross-fertilization has been possible, from fluids to plasmas, from stability to turbulence, from fundamental research to applied one. These workshops were an opportunity to compare the tools, theoretical and numerical, used in the different SIG's mentioned above.

Wednesday May 22

- **Satellite meeting: SIG 35. 4:00 6:00**
- **Welcome session for ASTROFLU VI: 7:00 8:00 (cash bar?)**

Thursday May 23

- **Opening** (Christophe **Bailly**, Claude **Cambon**, Andrzej **Nowakowski**) 9:30 10:00 AM

- Claude **Cambon** (LMFA, ECL, ERCOFTAC SIG 35) 10:00

Short survey, wave turbulence and beyond

-Sébastien **Galtier** (LPP Polytechnique Palaiseau) 10:15

Compressible wave turbulence in the solar wind at sub-MHD scales: theory, DNS and observation

-Abdelaziz **Salhi** (Université de Tunis, Tunisie) 10:45

Waves and non propagating modes in stratified and rotating MHD turbulence

11:15 Coffee break

-Daniel **Schertzer** (Ecole Nationale des Ponts et Chaussées, near Paris) 11:30

Intermittent vector fields and multivariate multifractal modelling

- Doris **Folini** (ENS-Lyon) noon

Intermittency in supersonic turbulence and potential implications for astrophysics

00.30 to 2:00 PM Lunch

-Julian **Scott** (LMFA, ECL) 2:00

Weak turbulence theory and DNS, with non-propagating modes

- Ilias **Sibgatulin** (ENS-Lyon) 2:30

Internal wave instabilities and transition to turbulence in large aspect ratio wave attractors

-Benjamin **Favier** (IRPHE, Marseille) 3:00

Asymptotic structure of inertial wave singularities in spherical shells

Coffee break : 3:30 – 4 :00

-Natalia **Dimitrieva** (Institute of Hydromechanics of NASU, Ukraina) 4:00

TO BE REPLACED

- Sebastian **Gallon** (ENS-Lyon) with Javier **Sierra** and Alain **Pumir**. 4:30

Lagrangian irreversibility in rotating-stratified turbulent flows

- Anne **Cadiou** (LMFA, ECL) 5:00

Numerical solution of a wave turbulence model in a rotating channel

7:30 Dinner

Friday May 24

-Andrzej **Nowakowski** (Université de Sheffield, UK, ERCOFTAC SIG 42) 9:00

Variational formulation for recovering pressure field from velocity-vorticity formulation of Navier-Stokes equations

-Bruno **Chaouat** (ONERA, Palaiseau) 9:30

Scale analysis of non-homogeneous turbulent flow using direct numerical simulation database

Tomas **Bodnar** (Prague, Czech Republic, ERCOFTAC SIG 14) 10:00

Compressible flows with diffusivity

Coffee break 10:30 11:00

-Eric **Serre** (M2P2, Marseille) 11:00

Recent results of modelling turbulent transport in the tokamak WEST

- Ying **Zhu** (UNICE, Nice) 11:30

Acoustic systems with weak dispersion

- Léa **Cherry** (Université de Perpignan et Promes) with Françoise **Bataille**. Noon

EDQNM for solar energy

Lunch 00:30 2:00

- Rolf **Walder** (Zurich, and ENS-Lyon) 2:00

Accretion and jets in high mass microquasars

- Jeremy **Fench** (CRAL Lyon) 2 :30

Universality of gravity-driven compressible turbulence across galactic disks

-Philippe **Fraunié** (Pythéas, Toulon) 3:00

Some turbulent mechanisms at air/sea interface

Coffee break 3:30 4:00

- Mickaël **Bourgoin** (ENS-Lyon) 4:00

Settling of magnetic rods at low Reynolds number

Round table / Open form / Closing