PHD ON ALFVEN WAVES AND MAGNETOHYDRODYNAMIC TURBLUENCE AT GRENOBLE UNIVERSITY/CNRS/COVENTRY UNIVERSITY

Under the joint supervision of Alban Pothérat, (LnCMI Lab/CNRS and Coventry University) (http://users.complexity-coventry.org/~potherat/), Laurent Davoust (Grenoble-INP, SIMAP Lab) and François Debray (LnCMI/CNRS)

Applications are invited for a PhD (possibly including an MSC internship) in experimental fluid mechanics at the LNCMI-G (Grenoble High Magnetic Field Laboratory, http://lncmi.cnrs.fr/?lang=en). The topic concerns the experimental study of turbulence in liquid metals in a very high magnetic field. Turbulence is one of the major challenges of classical physics. Here, we seek to understand the role played by the propagation of magneto-mechanical waves (called *Alfven waves*) in the statistical and dissipative properties of turbulence and in its transition between two- and three-dimensional states. This type turbulence plays a key role in the dynamics of a number of astrophysical, geophysical, amongst which stellar accetion disks, planetary interiors but is also suspsected to appear in engeineering problems such as the cooling of nuclear fusion reactors. Until now, Alfven waves have been difficult to reprocuce in laboratories because of the extreme conditions in which they appear (high Reynolds numbers and/or high magnetic fields).

The PhD student will be conducting an experimental project during which a turbulent flow is generated within a experimental device filled with liquid metal and placed inside of one the large magnets available at LNCMI in Grenoble, which are capable of producing some of the strongest magnetic fields in the world. In the extreme fields available at LNCMI, the electromagnetic force becomes becomes propagative on the top being diffusive (propagation of Alfvén waves). The goal of this PhD is to use this unique combination of features to reproduce in the laboratory some of the mechanisms that occur in astrophysical or planetary systems and in the context of nuclear energy production, so as to understand them in detail.
The flow will be diagnosed by means of advanced metrology techniques such as ultrasound velocimetry and electric potential mapping. The PhD student will be in charge of running and improving the experimental deveice, interpreting the results so as to better understand the observed flow regimes. The combination of extreme magnetic fields and this unique experimental device developped by our joint team in Coventry and Grenoble offers for the first time a possibility to extensively map atrophysical and planetary phenomena that have been extremely difficult to probe direclty until now.

Applicants are required to hold, or be on course for an MSc in fluid mechanics or related speciality (Mathematics or Physics). To apply please forward complete academic records and CV to Alban Pothérat (Coventry University, alban.potherat@coventry.ac.uk, +44(0)2476 88 88 65), Laurent Davoust (Grenoble-INP, +33(0)476825206, Laurent.Davoust@simap.grenoble-inp.fr) or Francois Debray, LNCMI (francois.debray@lncmi.cnrs.fr, +33(0)476 88 12 44). Informal contacts per phone or email are recommended.