

Presenter: **Bruno Voisin**

Affiliation: LEGI, Grenoble

Coauthors: E. Ermanyuk, N. Shmakova & J.-B. Flór

Title: **Internal wave focusing from oscillating tori**

A specific three-dimensional mechanism has recently attracted the attention of physical oceanographers, as a way of transferring energy from the large barotropic scales to small turbulent scales: the self-focusing of internal gravity waves generated at circular or horseshoe-shaped bottom topography, for example a Gaussian ring (Bühler & Muller JFM 2007; Grisouard & Bühler JFM 2012). The waves propagate on a cone and focus at its apex, leading to energy intensification inside the fluid away from the topography and, at sufficiently large forcing amplitude, to overturning, breaking, mixing and deposit of momentum.

An experimental realization of this setup is the oscillation of a torus, introduced for the closely related inertial waves in rotating fluids by Duran-Matute, Flór, Godeferd and Jause-Labert (Phys. Rev. E 2013). We consider an oscillating torus in a uniformly stratified fluid and apply to it a new measurement technique based on Laser-Induced Fluorescence. The deformation of isopycnal lines is visualized directly and used for the three-dimensional reconstruction of the internal wave field. This technique is inherently Lagrangian and complementary to usual Eulerian techniques such as Synthetic Schlieren and PIV. Comparison is performed with an original theory allowing precise determination of the wave amplitudes and slopes in the linear regime for a thin torus.

As the amplitude of oscillation increases, the waves are strongly amplified both close to the torus and in the focal region. Overturning takes place, which is triggered by the slopes rather than the amplitudes. Viscosity, however efficient it may be for wave damping, is seen to have little effect on overturning, which is observed even at moderate Stokes number.