



OIST SEMINAR

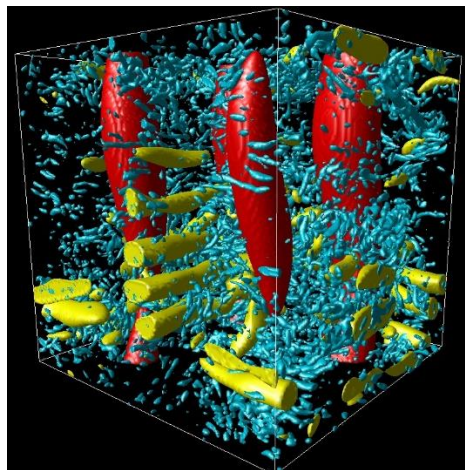
Date: October 31st, 2017 (Tue)

Time: 3:00 pm – 4:00 pm

Venue: D015 (Lab1, Level D)

Speaker: Prof. Susumu Goto (Osaka University)

Hierarchy of vortices in turbulence at high Reynolds numbers



Abstract:

We conduct direct numerical simulations of developed turbulence in a periodic cube to show that it is composed of a hierarchy of vortex tubes. At each level of the hierarchy, counter-rotating (anti-parallel) pairs of vortex tubes tend to align to each other. Since strongly straining regions exist around pairs of the vortices, smaller-scale vortices are effectively created by being stretched around the pairs of vortices. This process of creation of smaller-scale vortices gives a concrete picture of the Richardson energy cascade in developed turbulence.

The hierarchy of vortices also explains the origin of strong turbulent mixing because anti-parallel pairs of vortex tubes effectively stretch and fold the working fluid. In this talk, we shall also show some results of the laboratory experiment of turbulence in a precessing container, which support the picture shown in the above-mentioned numerical simulations.

Reference:

S. Goto, Y. Saito and G. Kawahara, Phys. Rev. Fluids, 2 ([2017](#)) 064603.

Contact information: Fluid Mechanics Unit

Kaori Egashira: (Tel) 098-966-8683 (e-mail) e-kaori@oist.jp