OIST SEMINAR

Date: February 15th, 2018 (Thu)
Time: 15:00 – 16:00
Venue: D015 (Lab1, Level D)
Speaker: Prof. Masato Nagata
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Subcritical transition in plane Poiseuille flow

Plane Poiseuille flow differs from other shear flows such as plane Couette flow or pipe flow, in that it loses instability to infinitesimal disturbances at a finite value of the Reynolds number, which is given by R = 5772. It is known that this linear instability mechanism is bypassed in practical conditions, but the role of Tollmien-Schlichting derived flows - that is the secondary flows that bifurcate from the linear neutral points, and the tertiary flows that in turn bifurcate from these secondary flows – in transition and turbulence in channel flow, and their relation to other known exact coherent states remains an open question. As a first step towards addressing this question we consider Tollmien-Schlichting derived flows, thus re-examining and extending the problem considered by Ehrenstein & Koch (1991). The main conclusions of this seminal study are significantly revised by the present study. We also obtain a three-dimensional secondary flow bifurcating directly from the basic state. The flow has two low-speed streaks in stream-wise velocity per span-wise wavelength accompanied by aligned vertical structures. Furthermore, the corresponding span-wise localised flow can be continued to smaller values of R.