Seminar/Talk

Stabilization of pipe flows by a flattened mean profile

Elena Marensi
University of Sheffield

Host: Björn Hof

Recent experimental observations (Khnen et al. 2018) show that a flattened streamwise velocity profile destabilises turbulence. By constructing variational problems that seek the minimal seed for turbulence, we show that flattening of the mean streamwise velocity profile also enhances stability of the laminar base flow, thus potentially preventing the transition to turbulence. To mimic the presence of a baffle that locally flattens the base profile, we apply a localised force. In order to generate initial conditions that may be considered to model ambient disturbances, we first compare the (unforced) transition behaviour of the minimal seed with several forms of randomised initial disturbances in the range Re=2400 to 10000. Scalings Ec? Re?? are obtained with ? in the range 2 ? 3 for different forms of disturbance, with ? ? 2.8 for the minimal seed. We find that the energy of the minimal seed after the Orr and oblique phases is close to that of the localised random disturbance, so that in this sense the minimal seed after the oblique phase is a reasonable proxy for measuring transition thresholds. Feeding simulations in the presence of localised forcing with the initial conditions generated above, we continue to find increases in Ec , i.e. enhanced stability of the laminar flow, and destabilisation of turbulence. Drag reduction is found even when the turbulence is not fully relaminarised by the forcing.

Thursday, May 17, 2018 01:30pm - 03:00pm

Foyer seminar room Ground floor / Office Bldg West (I21.EG.128)

This invitation is valid as a ticket for the ISTA Shuttle from and to Heiligenstadt Station. Please find a schedule of the ISTA Shuttle on our webpage: https://ista.ac.at/en/campus/how-to-get-here/ The ISTA Shuttle bus is marked ISTA Shuttle (#142) and has the Institute Logo printed on the side.