Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Existence of non-dispersion niches of long perturbation waves in the plane Poiseuille flow. Impact on wave packets morphology. FEDERICO FRATERNALE, Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Torino, Italy., GABRIELE NASTRO, Dipartimento di Ingegneria Meccanica ed Aerospaziale, Politecnico di Torino, Torino, Italy., DANIELA TORDELLA, Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino, Torino, Italy. — We consider the dispersion of 3D wavy perturbations in the plane Poiseuille flow. We focus on the wavenumbers-Reynolds numbers map. By considering the long-term evolution of these linear traveling waves, we found a sub-region nested in the dispersive part of the map where dispersion is abruptly inhibited. This region is observed at the bottom right dial of the map (Re>29840 and k<0.35) and includes non-dispersive waves moving as the basic flow. Two other regions were observed with a dispersion substantially different with respect to the surroundings. In one case, the dispersion level measured as the difference between the group speed and the phase speed is enhanced. In the other, the dispersion level is damped. Such regions contain waves with higher phase speed than waves in the surrounding area of the parameter space. This study builds on a previous one (PRE 93, 2016) where, by moving in the map from small to high wavenumbers, we show that a dispersive-to-nondispersive transition occurs in sheared flows under fixed flow conditions. The transition takes place at a specific wavenumber threshold, which splits the map in two main regions: the lower one, the dispersive one, being that hosting the nested regions above. An inference on the morphology of wave packets is presented.

Daniela Tordella
Dipartimento di Scienza Applicata e Tecnologia, Politecnico di Torino

Date submitted: 09 Aug 2017 Electronic form version 1.4