

**Date:** September 8th

**Time:** 11:00 AM

**Location:** Maryland Hall 110

**Speaker:** Dr. Paolo Luchini  
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**Title:** “Turbulent drag reduction through controlled blowing and suction in duct flow”

### **Abstract**

Control of a turbulent flow with the purpose of reducing its drag (or sometimes the opposite purpose of increasing its mixing) can be achieved through passive or active means, and in the latter case with a fixed or feedback-controlled action. Using flow in a plane duct, and more specifically its numerical simulation, as a test bed, some recent advances will be presented in both feedback and fixed control through alternating blowing/suction of zero mean at the wall. In feedback control, the introduction of the concept of average linear response of the turbulent flow to external excitations (Quadrio & Luchini 2002) leads to a more effective optimal design strategy for the control laws (Luchini, Bewley & Quadrio 2005). In fixed control an (a priori unexpected) skin friction reduction was observed by Quadrio, Floryan & Luchini (2003) and by Kang, Min, Speyer & Kim (2005). This phenomenon can at least partially be explained as an instance of Rayleigh streaming and takes place even in laminar flow, leading in the latter case to sublaminal skin friction (but not power expenditure).