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Instantaneous shear stress distribution in a turbulent wall-bounded flow OMID AMILI, JULIO SORIA, Laboratory for Turbulence Research in Aerospace and Combustion, Department of Mechanical and Aerospace Engineering, Monash University, Australia — Knowledge of wall shear stress is crucial for understanding of all wall-bounded turbulent flows and also for many technical applications. The aim of the present work is to develop a novel stress sensor which is capable of measuring surface shear stress over an extended region of the flow. This sensor as a direct method for measuring surface stresses consists of mounting a thin film made of a elastic polymer on the surface of the solid model. The geometry and mechanical properties of the elastomer are measured, particles acting as markers are applied on the film surface, and an optical technique is used to measure the film deformation caused by the flow. While the technique can be used in air or water, its sensitivity can be tuned for different flow conditions. The static and dynamic calibration of the sensor, and its application to a fully developed turbulent channel flow at moderately high Reynolds numbers will be addressed, and results will be compared with indirectly measured wall shear stress from PIV experiment.

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