Abstract Submitted
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Computational Sensitivity Analysis of Low-Reynolds Number Turbulent Channel Flow[1] RICHARD KIRKMAN, MEREDITH METZGER, University of Utah — Computational sensitivity analysis has been performed for low-Reynolds number turbulent flow in a plane channel. Two methods: (i) the continuous sensitivity equation method (CSEM) and (ii) complex step differentiation (CS), have been implemented in the context of direct numerical simulations to determine the sensitivity derivatives (or coefficients) of the primitive variables to changes in the Reynolds number. Simulations were performed at Reynolds numbers of 100 and 180, based on the friction velocity and channel half-width. Turbulent velocity statistics compare very well to others in the literature (Kim et al., 1987; Kuroda et al., 1989). The sensitivity results correctly predict the expected change in both the mean streamwise velocity and Reynolds shear stress profiles to changes in Reynolds number. Furthermore, the mean sensitivity results correctly predict the local slope of the skin friction coefficient versus Reynolds number. The *instantaneous* sensitivity results also reveal that regions of high magnitude sensitivity correlate to regions containing coherent structures in turbulent channel flow. The additional computational expenses incurred in order to run the computational sensitivity simulations in this context are also discussed.

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