Abstract Submitted
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An adverse-pressure-gradient turbulent boundary layer with nearly-constant $\beta \simeq 1.4$ up to $Re_\theta \simeq 8,700$.[1] RAMON POZUELO, QIANG LI, PHILIPP SCHLATTER, RICARDO VINUESA, SimEx/FLOW, KTH Engineering Mechanics, Stockholm, Sweden — The results of a new well-resolved large-eddy simulation (LES) of an adverse-pressure-gradient (APG) turbulent boundary layer (TBL) are presented. Using a resolution of $13824 \times 301 \times 1920$ collocation points, the momentum-thickness-based and friction Reynolds numbers reach $Re_\theta = 8,700$ and $Re_\tau = 1,900$, respectively. We impose a freestream-velocity distribution following a power law, which leads to near-equilibrium conditions as discussed in previous studies. We obtain a long region where the Rotta-Clauser pressure-gradient parameter is nearly constant at 1.4. We perform detailed statistical and spectral analyses of the data and compare the results with those of a zero-pressure-gradient (ZPG) TBL at similar Re_τ. We observe larger outer-region fluctuations in the APG, which are due to a combination of increased small-scale energy and a large-scale spectral peak far from the wall. Close to the wall, the spanwise premultiplied spectrum $k_z\phi_{uu}$ is very similar in the APG and ZPG, even for increasing Reynolds number. The spanwise premultiplied spectra $k_z\phi_{vv}$, $k_z\phi_{ww}$ and co-spectrum $k_z\phi_{-uv}$, exhibit noticeable differences between APG and ZPG, both close and far from the wall. This becomes more pronounced for increasing Re

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