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Wall-resolved Large-eddy simulation of flow past a grooved cylinder up to $Re_D = 6\times10^4$ WAN CHENG, Mechanical engineering program, King Abdullah University of Science and Technology, DALE PULLIN, Graduate Aerospace Laboratories, California Institute of Technology, RAVI SAMTANEY, Mechanical engineering program, King Abdullah University of Science and Technology — We present wall-resolved, large-eddy simulations (LES) of flow past a groove-walled circular cylinder. Periodic span-wise boundary conditions are implemented with span up to $3\,D$. The stretched-vortex sub-grid scale model is utilized in the whole domain, including regions of large-scale separated flow. The circumferential cylinder surface comprises 32 sinusoidal, span-wise groves of equal height ϵ. For the first set of LES, with $Re_D = 3.9 \times 10^3$ fixed and $0 \leq \epsilon \leq 1/32$, some properties of the mean flow behave similarly to changes in the smooth-cylinder flow when Re_D is increased, such as shrinking mean-flow recirculation length and near-constant pressure coefficient. A second set of LES uses fixed $\epsilon/D = 1/32$ and varies Re_D from 3.9×10^3 to 6×10^4, the latter value reaching the beginning of the transcritical flow regime. Comparison with experiment as well as wall-friction and Q plots, will be discussed.

Wan Cheng
KAUST

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