Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Irregular wall roughness in turbulent Taylor-Couette flow PIETER BERGHOUT, XIAOJUE ZHU, ROBERTO VERZICCO, DETLEF LOHSE, RICHARD STEVENS, University of Twente — Many wall bounded flows in nature, engineering and transport are affected by surface roughness. Often, this has adverse effects, e.g. drag increase leading to higher energy costs. A major difficulty is the infinite number of roughness geometries, which makes it impossible to systematically investigate all possibilities. Here we present Direct Numerical Simulations (DNS) of turbulent Taylor-Couette flow. We focus on the transitionally rough regime, in which both viscous and pressure forces contribute to the total wall stress. We investigate the effect of the mean roughness height and the effective slope on the roughness function, ΔU^+. Also, we present simulations of varying Ta (Re) numbers for a constant mean roughness height (k^+_{mean}). Alongside, we show the behavior of the large scale structures (e.g. plume ejection, Taylor rolls) and flow structures in the vicinity of the wall.

Pieter Berghout
University of Twente

Date submitted: 12 Sep 2017 Electronic form version 1.4