Abstract Submitted
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Amplitude modulation of vorticity and dissipation by large-scale motions in turbulent channel flow[1] YI-CHEN YAO, BING-QING DENG, WEI-XI HUANG, CHUN-XIAO XU, Tsinghua University, TURBULENCE RESEARCH TEAM — Amplitude modulation of both vorticity and dissipation by large-scale outlayer structures is studied using the DNS data of turbulent channel flow at Reynolds numbers up to Re_τ =1000. Carrier and modulated signals are scale decomposed in both streamwise and spanwise directions, and small-scale envelop is extracted by Hilbert transformation. Two-point amplitude modulation correlation is calculated at a range of wall-normal locations. The modulation strength on the vorticity and the dissipation rate of turbulent kinetic energy is found to be much stronger than on all the three components of velocity fluctuations. Distinct peak value of correlation is observed when large-scale signals are extracted from center log region and the corresponding modulated information from below y^+ =10. Also the strength of this peak value increases with Reynolds number, thus supporting the top-down mechanism that the near-wall layer is becoming more influenced by the large-scale structures which gradually emerge as Reynolds number increases.

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