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On the Spectral Decomposition of Skewness in the Turbulent Boundary Layer.[1] FLINT THOMAS, SAMARESH MIDYA, STANISLAV GORDEYEV, MITCHELL LOZIER, University of Notre Dame — It is now widely accepted that large-scale vortical structures are an important and universal feature of the outer region of the high Reynolds number turbulent boundary layer (TBL). It has also been demonstrated that these outer layer structures impose their imprint on the near-wall region in the form of the amplitude and phase modulation of near-wall velocity fluctuations. This effect has previously been quantified by an amplitude modulation correlation coefficient between lower frequency, outer layer fluctuations and an envelope function characterizing the amplitude modulation of near-wall, higher frequency fluctuations. It has also been clearly demonstrated that the amplitude modulation of near-wall fluctuations is closely related to the skewness. This provides the motivation for the current work which is to examine the spectral decomposition (in frequency domain) of the skewness by means of the real part of the bispectrum. In this paper, the spectral decomposition of skewness is presented for both a zero-pressure gradient high Reynolds number (Ret = 3,200) TBL as well as one at a much lower Reynolds number (Ret = 700) in which the outer layer structure is artificially imposed via a plasma-based active flow control device. This provides a periodic outer layer structure which makes the modal content of the skewness more apparent and aids in interpretation of the spectral decomposition of skewness in the higher Reynolds number TBL.

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