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On the role of the large-scale gradients in the scale interactions in a mixing layer DANIELE FISCALETTI, Delft University of Technology, ANTONIO ATTILI, FABRIZIO BISETTI, King Abdullah Univ of Sci & Tech (KAUST), GERRIT ELSINGA, Delft University of Technology — The interaction between the small and large scales of turbulence is investigated in a mixing layer achieving a Reynolds number based on the Taylor microscale (Re_λ) of 250. Positive fluctuations of the large-scale velocity correspond to large vorticity rms on the low-speed side of the mixing layer and to low vorticity rms on the high-speed side, respectively. The relationship between large and small scales thus depends on the position if the vorticity rms is correlated with the large-scale velocity fluctuations. However, when correlating the vorticity rms with the large-scale velocity gradients, the correlation coefficient is nearly constant throughout the mixing layer and close to unity. This observation reveals that large and small scales are characterized by a strong interaction independent of the flow position when the large-scale velocity gradients are considered instead of the large-scale velocity fluctuations usually employed in the existing literature on amplitude modulation. The vorticity from unfiltered (small scales) and from low-pass filtered velocity fields tend to be aligned when examined within vortical tubes, suggesting that part of the large-scale characteristics is not lost at the smallest scales.

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