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**Evolution of Conditionally-Averaged Second Order Structure Functions in a Transitional Boundary Layer** HANXUN YAO, Imperial College London, FELIPE ALVES PORTELA, University of Southampton, GEORGE PAPADAKIS, Imperial College London — We consider boundary layer bypass transition and compute the evolution of the second-order structure function, $\langle du^2 \rangle(\vec{x}, \vec{r})$ using DNS. In order to separate the contributions from laminar and turbulent events, we apply conditional sampling based on the local instantaneous intermittency. We then define and calculate two-point intermittencies, $\gamma^{(TT)}$, $\gamma^{(LL)}$ and $\gamma^{(TL)}$ which physically represent the probabilities that both points are in turbulent or laminar patches, or one in turbulent and the other in a laminar patch, respectively. Similarly, we define and calculate the conditionally-averaged structure functions, $\langle du^2 \rangle^{(TT)}$, $\langle du^2 \rangle^{(LL)}$ and $\langle du^2 \rangle^{(TL)}$. It is found that in the transition region, laminar streaky structures maintain their geometrical characteristics in the physical and scale space well inside the transition region, even after the initial break down to form turbulent spots. Analysis of the $\langle du^2 \rangle^{(TT)}$ fields reveal that the outer mode is the dominant secondary instability mechanism. Further analysis reveals how turbulence spots penetrate the boundary layer, approach the wall and grow in the streamwise and spanwise directions.

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