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Direct Numerical Simulations of the Span-wise Asymmetric Kelvin-Helmoltz Instability SCOTT WIELAND, DAVID FRITTS, THOMAS LUND, GATS Inc. — Recent advancements in computational power have allowed the study of more complex fluid interactions, including exploring previously untouched regimes of the Kelvin-Helmholtz instability (KHI). Theory has predicted interesting effects stemming from the introduction of span-wise variations to the perturbations and shear layer of KHI. To investigate this, direct numerical simulations have been carried out using the Complex Geometry Compressible Atmospheric Model. These simulations have been performed at a Reynolds number of 5000 with a Richardson number of 0.05 and have explored both the effects of span-wise asymmetries in the shear layer thickness and the perturbations applied as initial conditions. The results obtained confirm the predicted development of the interactions between misaligned billows as characteristic x-shaped "knots." These knots, though, produce intense events at faster time scales expressed as vorticity and energy dissipation at least an order of magnitude higher than the standard KHI developing in the background. These results will also be compared to observations of similar KHI events obtained from imaging of the polar mesospheric cloud layer and from measurements taken from the Andes LIDAR Observatory.

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