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Frozen waves in turbulent mixing layers BENOIT-JOSEPH GREA, CEA — Strong time-periodic accelerations applied tangentially to an infinite horizontal plane layer between two miscible fluids trigger a parametric instability leading to remarkable saw-tooth patterns known as frozen waves. The resulting turbulent mixing zones grow in time and then saturate when the resonance conditions of internal gravity waves are no longer fulfilled. The Floquet analysis of a model equation and direct numerical simulations reveal that the final mixing zone sizes evolve as the square of the forcing amplitude while, by contrast, the horizontal wavelengths grow nearly linearly. This explains why frozen waves sharpen with increasingly intense horizontal oscillations. It also suggests that an horizontal forcing mixes more efficiently fluids than a vertical one at large forcing accelerations.

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