Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Internal Wave Breaking in an Isothermal Atmosphere DANIEL LECOANET, Princeton University, YUBO SU, DONG LAI, Cornell University —
We present a series of two-dimensional numerical simulations of internal wave breaking in an isothermal atmosphere. Waves with a fixed frequency and wavenumber are continuously excited at the bottom of the atmosphere. As they propagate upward, their amplitude increases until they become nonlinear and break. The waves deposit their momentum and spin-up the upper layers of the atmosphere until the mean velocity is equal to the waves' phase velocity. Waves continue to break at the shear layer at the bottom of the spun-up fluid, further depositing their momentum. We find the shear layer descends as exp(-t), as the momentum flux is constant, but the density of the atmosphere increases exponentially with depth. For simulations with sufficiently high Reynolds number, we find about 50% of the wave flux is reflected by the shear layer, 10% is transmitted into waves in the spun-up fluid, and 40% is absorbed.

Daniel Lecoanet
Princeton University

Date submitted: 31 Jul 2019

Electronic form version 1.4