Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Generation of Vortices from Internal Gravity Waves CHUNG-HSIANG JIANG, PHILIP MARCUS, UC Berkeley — Internal gravity waves are ubiquitous in both the ocean and in protoplanetary disks around forming stars. Numerical simulations of disks suggest that these waves can "break" and produce intense vortices aligned with the axis of rotation of the disk. Here we report numerical simulations in which vortices are generated by this previously unreported mechanism. The simulated waves and vortices occur in an anelastic, salt-stratified (with local Brunt-Vaisala frequency $N(z)$, where z is the vertical coordinate), rotating fluid (with Coriolis parameter f) that could be realized in a laboratory experiment. The stratification is chosen so that $N(z)$ increases with height. Internal gravity waves exist only if their frequency ω satisfies $N < \omega < f$ or $f < \omega < N$. In these simulated experiments the waves satisfy the first condition. However, as the internal waves propagate upward from their source, they reach a height z where the local $N(z)$ becomes greater than ω. Rather than refract or reflect at this height, the waves breakdown and produce intense vortices.

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Date submitted: 03 Aug 2007 Electronic form version 1.4