**Time-Resolving Model for Gravity Waves in Non-Uniformly Stratified Atmosphere**

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**Motivation**

Fast information transfer:

\[ \rho_0(z) \downarrow \zeta(z) \uparrow \] detect tsunami

- Tsunami-induced gravity wave
- Stationary mountain (tsunami) lee waves in the frame moving with tsunami
- Neglects partial back-reflection in the non-uniformly stratified atmosphere

**Modeling**

Time-resolving model allowing jump in buoyancy frequency

\[
\begin{align*}
(\psi_t + \Delta U \psi) \zeta + N^2(z) \psi & = 0 \\
\psi(t = 0^-) & = \psi(t = 0^+) = 0 \\
\zeta(z = 0) & = h(x), \zeta(z = \infty) = 0.
\end{align*}
\]

**Wave-train approximation**

Results

- Exact solution
- Wave-train approximation
- Interpolated wave

**Summary**

- Develop a time-resolving model while allowing jump in stratification
- Construct a wave-train approximation including reflections and transmissions
- Recover the gravity wave propagation scheme in the middle and low atmosphere