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Nonlinear interaction of atmospheric, surface-gravity, and hydroacoustic waves

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We discuss the generation of hydroacoustic waves by the mutual interaction of atmospheric and surface-gravity waves, through nonlinear resonant triad interaction. To this end, we consider a two fluid problem, with a half-space air layer over a compressible water layer of finite depth, and a rigid bottom. The governing equations comprise a quadratic compressible wave equation, and the standard associated boundary conditions. Using a multiple scale approach we derive at the amplitude evolution equations for all three triad members. It is shown that the energy input by the atmospheric wave is transferred to the acoustic mode, with no noticeable effect on the surface gravity mode.