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Tidal flow over 3D topography generates out-of-forcing plane harmonics BENJAMIN KING, HEPENG ZHANG, HARRY L. SWINNEY, University of Texas at Austin — About 1 TW of mixing energy in the ocean comes from internal waves generated by tidal flow over bottom topography [1]. The generation of these waves in three dimensions (3D) remains poorly understood. We use a 3D axisymmetric Gaussian mountain as a model topographic feature and obtain numerical and experimental results for the internal wave field generated by tidal flow. The experiments use a model mountain in a 200 L tank, and particle image velocimetry for imaging. The numerical methods are the same as those in [2], and utilize a finite volume scheme to evaluate the 3D internal wave field. The stratification and forcing frequency are chosen such that $2\omega < N$ (N is the buoyancy frequency), allowing the propagation of second harmonics. Surprisingly, when the maximum topographic slope exceeds the slope of second harmonic wave propagation, strong second harmonics are generated in the direction perpendicular to the tidal forcing direction. At high forcing amplitude, these harmonic waves have higher amplitude than the in-forcing-plane harmonics.

[1] W. Munk and C. Wunsch, Deep-Sea Res. I **45**, 1977 (1998)
[2] B. King, H. P. Zhang, and H. L. Swinney. Submitted to Phys. Fluids

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