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Internal gravity wave analysis using the wavelet transform, the cross wavelet transform and wavelet transform coherrence

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Analysis of internal gravity wave (igw) data from models or measurements using wavelets has proven useful in both a qualititative and quantitative sense (Hawkins, et al 2005). In this paper recently developed wavelet tools (Grinsted et al. 2004) are used to compare igw series from two models. In particular, the wavelet spectrum of data from the so-called 'dnoidal' model (Apel 2003) is compared to that of the 2D non-hydrostatic model developed by Lamb (Lamb 1994). The wavelet components of each data set are computed and the results compared using both the cross wavelet spectrum (xwt) and the wavelet coherence spectrum (wct). The results indicate good agreement toward the front of the igw where nonlinear effects are dominant but differ toward the trailing edge of the igw where the dynamics become linear. This indicates that the underlying physics in each case, the 2D non-hydrostatic model and the dnoidal model, are identical.