PHASE ERROR PLOTS FOR FORWARD MODELING SCHEMES

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In our paper, "Difference Approximations for Forward Modeling Problems" in SEP 13, the phase error plots for the proposed second and fourth order difference schemes were inadvertantly left out of the final copy. They have been included here in the following pages.

Figure 1 shows contour plots of the phase error (see paper in SEP 13 for definitions and difference schemes) for the second and fourth order explicit difference schemes for the acoustic wave equation. Figures 2 through 5 show similar plots for the second and fourth order approximations for the elastic wave equation. There are two plots for each scheme because compressional and shear waves are treated differently by the difference equations. Also, plots are given for two different ratios of compressional to shear velocities.

The figure captions refer to equations in the SEP 13 article.

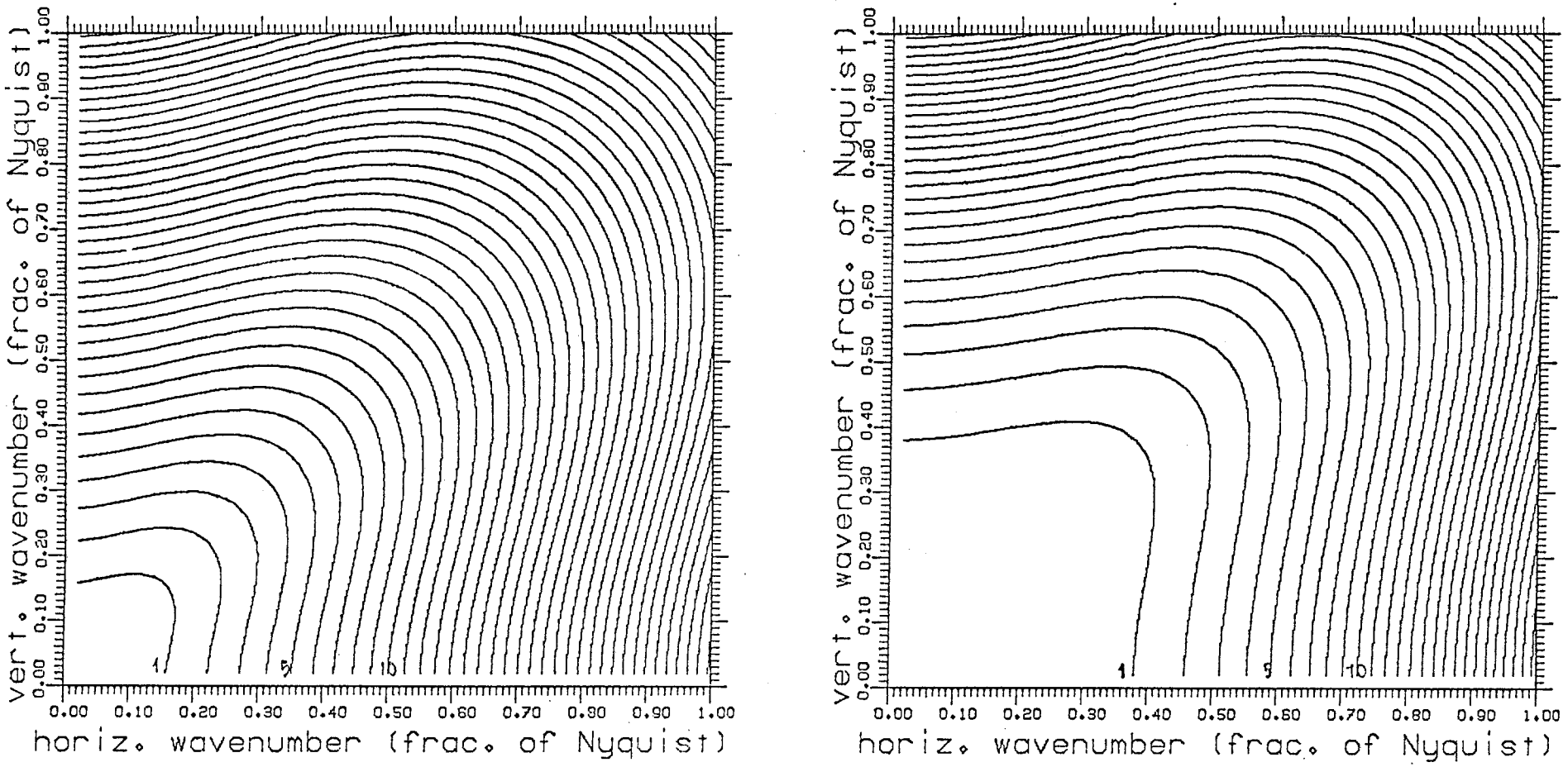


Figure 1: Contour plots of percent relative phase error *vs.* horizontal wavenumber, $k_x \Delta x$, and vertical wavenumber, $k_z \Delta z$, for acoustic wave equation approximations. Figure (a) is for the second-order scheme (equation 9); figure (b) is for the fourth-order scheme (equation 14). Note that for one-percent phase error, $2^{1/.16} \approx 76$ points per wavelength are required for the second-order scheme, while only $2^{1/.38} \approx 6$ point per wavelength are required for the fourth-order scheme. The contour interval is one per-cent.

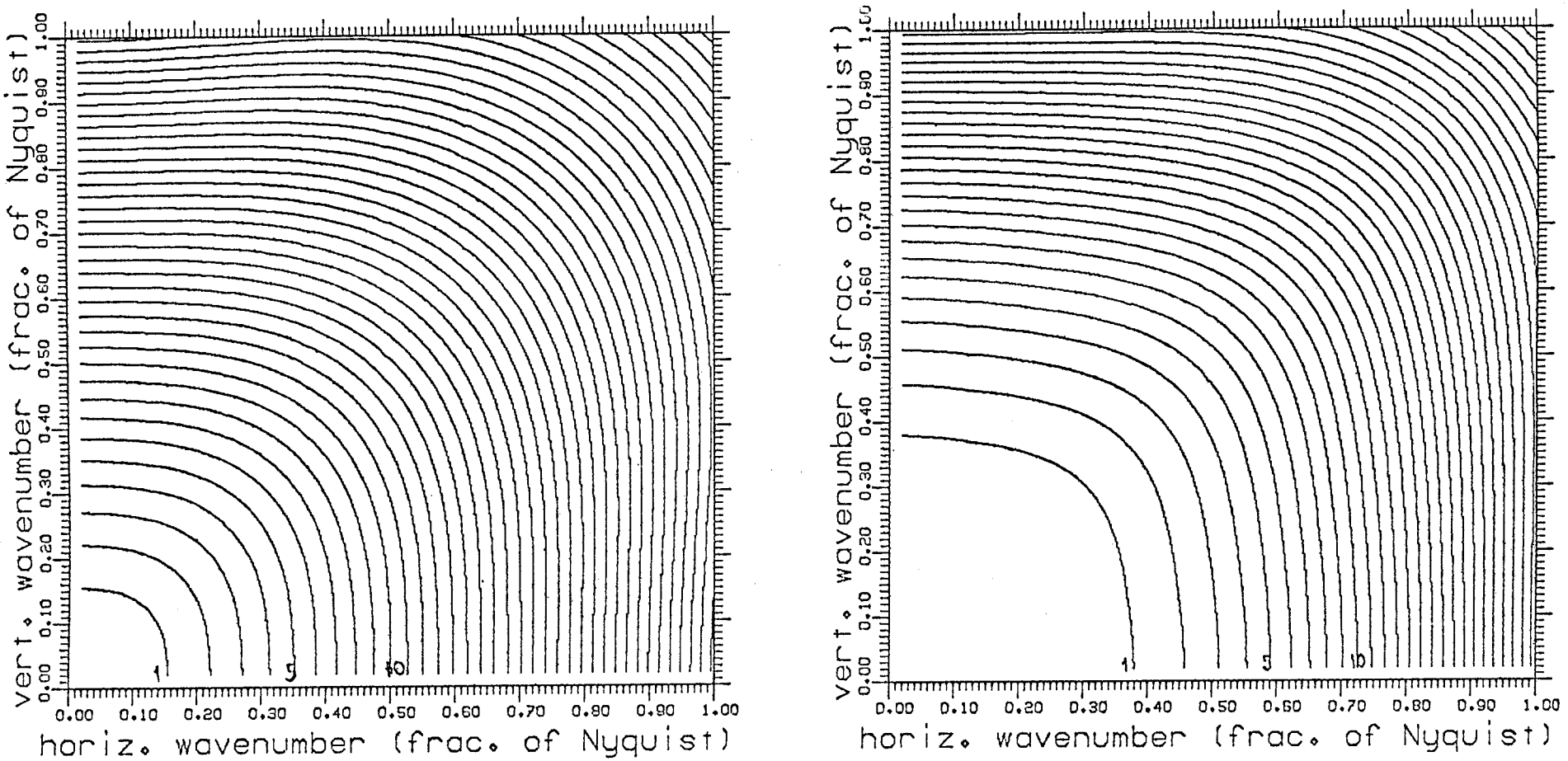


Figure 2: Contour plots of percent relative phase error *vs.* horizontal and vertical wavenumber for compressional waves using the elastic wave equation approximations. Figure (a) is for the second order schemes (equations 18 and 18a); figure (b) is for the fourth-order schemes (equation 19). The ratio of compressional to shear velocities, $\alpha/\beta = \sqrt{3}$. Contour interval 1%.

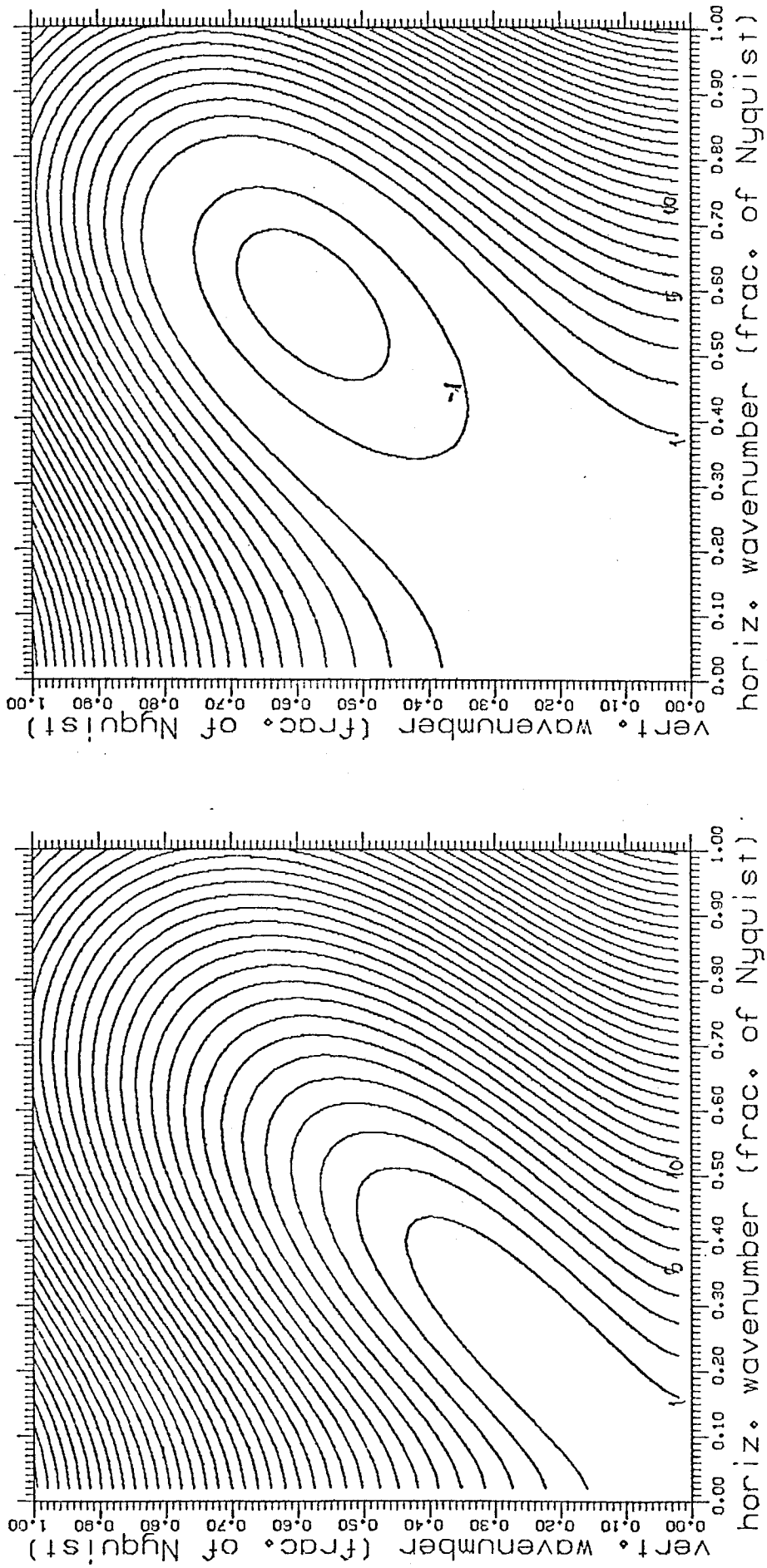
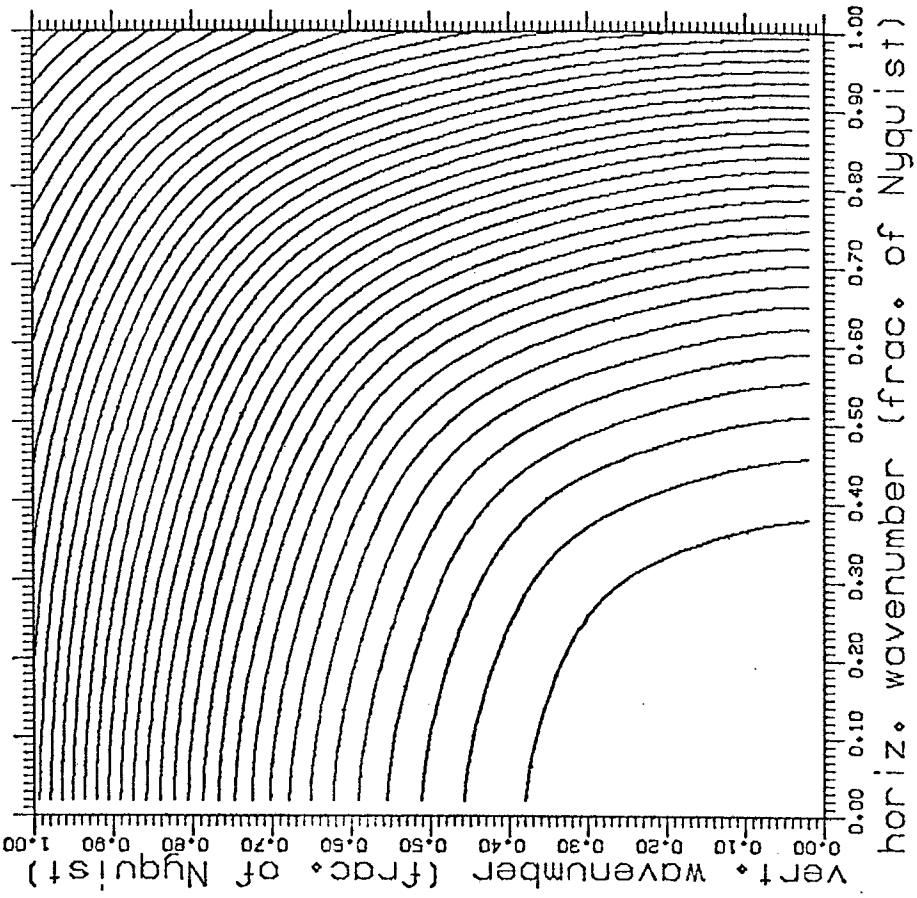


Figure 3: Contour plots of percent relative phase error *vs.* horizontal and vertical wavenumbers for shear waves using the elastic wave equation approximations. Figure (a) is for the second-order schemes (equations 18 and 18a), figure (b) is for the fourth-order schemes. $\alpha/\beta = \sqrt{3}$; contour interval 1%.



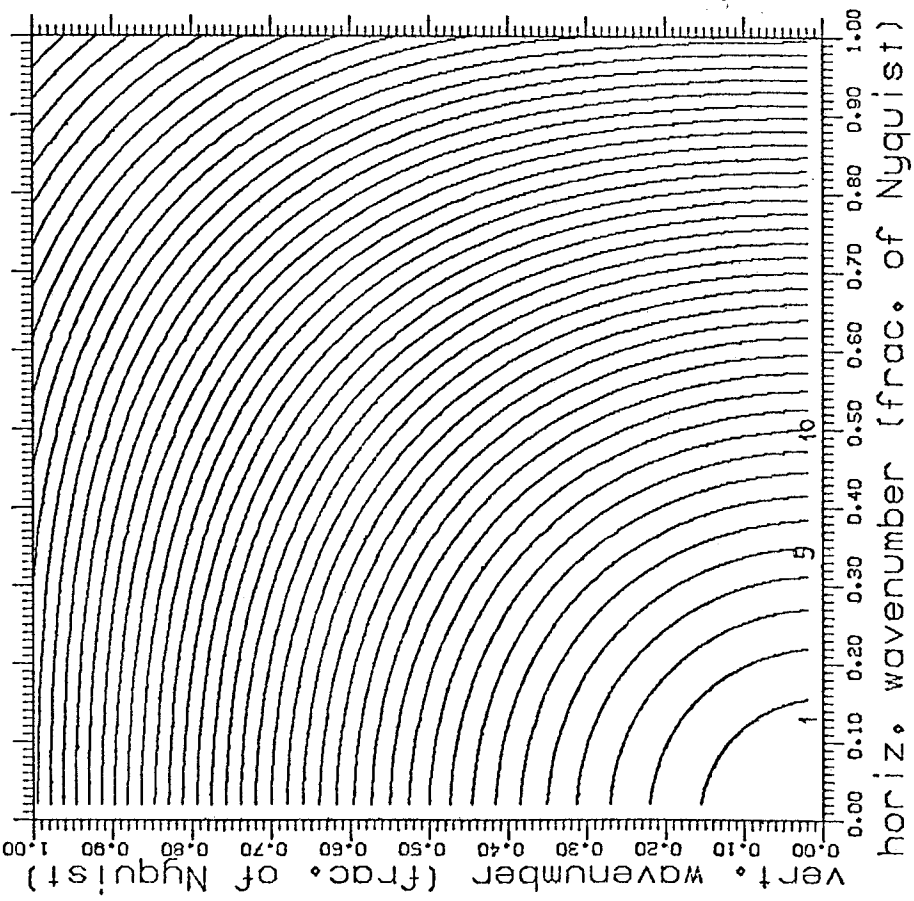


Figure 4: Same as figure 2, but $\alpha/\beta = 3$.

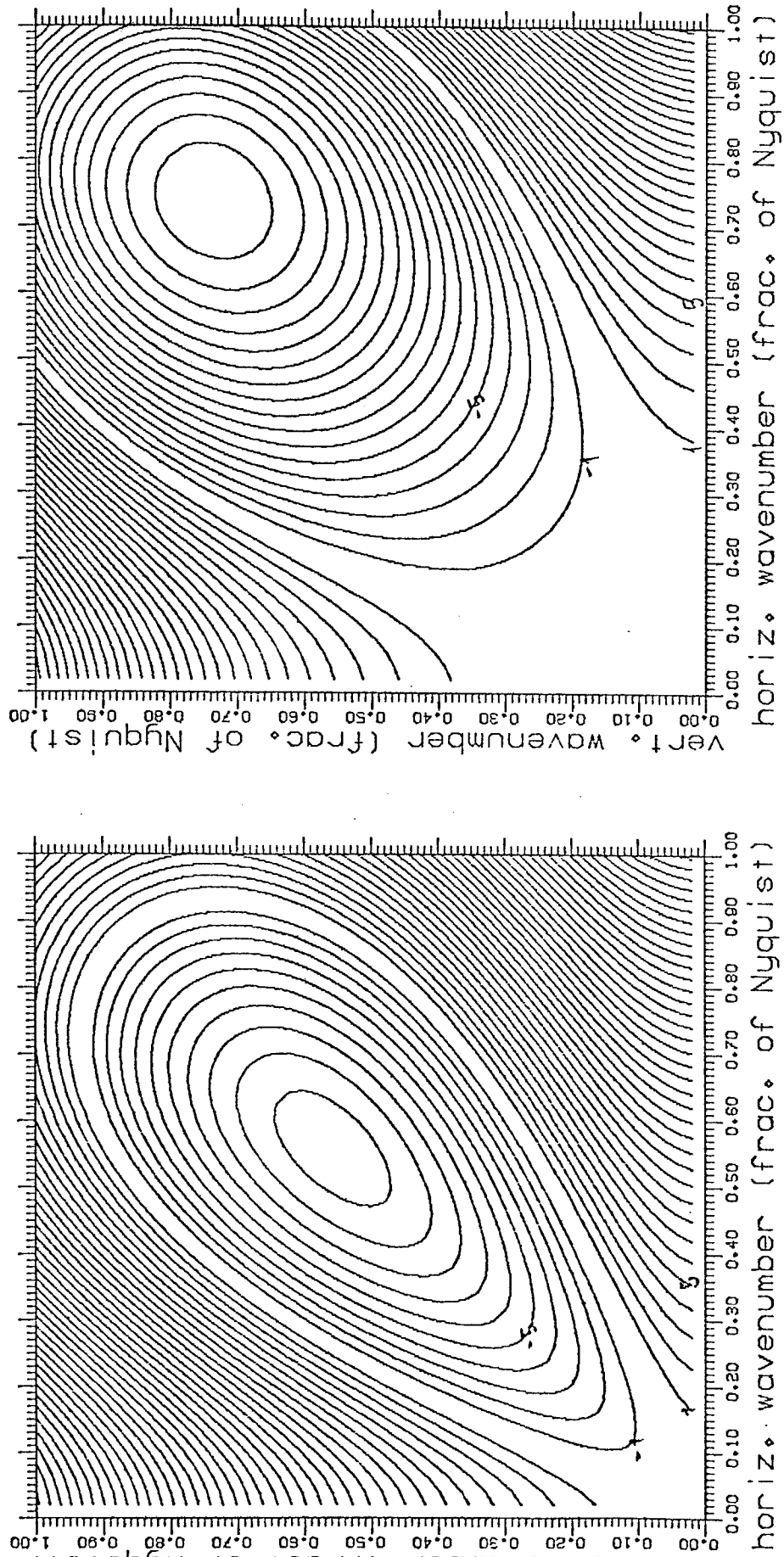


Figure 5: Same as figure 3, but $\alpha/\beta = 3$.