4. DISCUSSION

The dispersion relation in linear wave theory,

$$\omega = \sqrt{\frac{2\pi g}{\lambda} \tanh \frac{2\pi h}{\lambda}} \tag{4}$$

yields similar results to the angular speed of the $m = 1$ modes of the SASI plotted against sector angles.

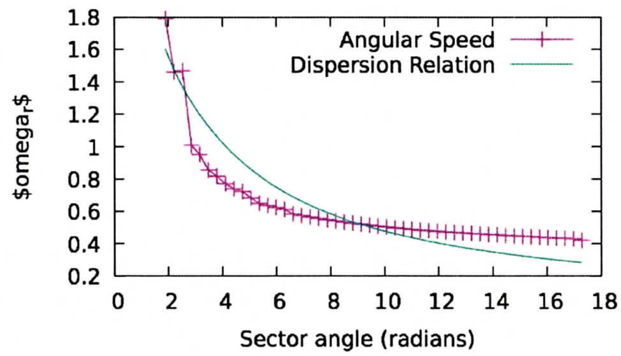

Figure 10. The angular speed of the SASI in simulations with $r_* = 0.2$ and an initial angular momentum of 0.02. The linear wave dispersion relation is shown as well.

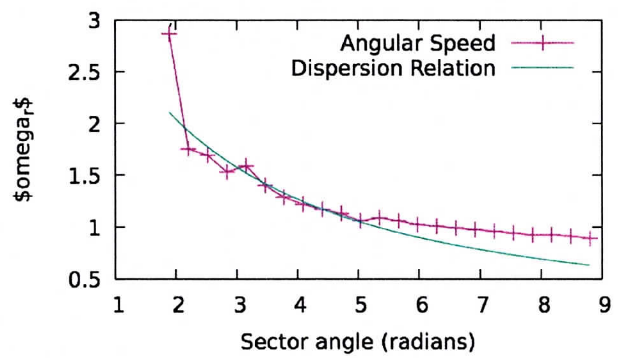

Figure 11. The angular speed of the SASI in simulations with $r_* = 0.4$ and an initial angular momentum of 0.02. The linear wave dispersion relation is shown as well.

Using 1.0 as the shock height, GM/r^2 as g (with $GM = 0.5$ and r as the shock height), and the sector angle as λ (as these are $m = 1$ modes) gives the dispersion relations as shown in Figure 10 and Figure 11. The linear wave theory equation 4 assumes a constant gravity with respect to radius in an incompressible fluid with no vorticity, none of which are applicable to the development of the SASI. However, the equation is capable of explaining the transition of the SASI from a deep depth to shallow depth context as the sector angle changes.

5. CONCLUSION

We have used two-dimensional, circular hydrodynamic simulations of supernovae with varying circular sector sizes to investigate the effects of transverse propagation in the development of the SASI. We have analyzed the growth and angular speed of $m = 1$ single arm spiral modes.

Our findings show that the angular speed of the SASI has a convex relation with respect to the sector angle, and that the growth rate of the SASI has a concave relation with respect to the sector angle.