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# THE GROWTH OF TWO DIMENSIONAL SUPERNOVAE IN CIRCULAR SECTORS

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## ABSTRACT

Supernova explosions begin with the core collapse of massive stars, in which the spherical accretion shock instability (SASI) has been shown to play a key role. The origin of the SASI is under inquiry, and proposed mechanisms involve the radial and transverse propagation of the shock. Using the VH-1 hydrodynamics program, we are able to simulate the growth of supernovae in two dimensional circular sectors with arbitrary maximum angles. We attempt to isolate the transverse propagation of the shock by simulating two dimensional supernovae with fixed radii and varying sector angles. We then investigate the growth rate and angular speed of the SASI for simulations where we find isolated single arm ($m = 1$) spiral modes. We observe a nonlinear increase in the angular speed of the SASI as we reduce the sector angle, for small sectors below $1\pi$ radians. We observe linear, decreasing trends for the growth rate and angular speed of the SASI as we increase the sector angle, until the SASI begins to develop multiple spiral arms for large sector angles.

*Keywords:* accretion, accretion disks - hydrodynamics - shock waves - supernovae: general